devoted entirely to amateur radio

March, 1947
35 Cents

PUBLISHED BY THE AMERICAN RADIO RELAY LEAGUE
Ultra compact, lightweight, these UTC audio units are ideal for remote control amplifier and similar small equipment. New design methods provide high fidelity in all individual units, the frequency response being ±2 DB from 30 to 20,000 cycles. There is no need to resonate one unit in an amplifier to compensate for the drop of another unit. All units, except those carrying DC in primary, employ a true hum balancing coil structure which, combined with a high conductivity outer case, effects good inductive shielding. Maximum operating level ±10 DB. Weight—5 1/2 ounces. Dimensions—1 1/2” deep x 2” high.

**ULTRA COMPACT HIGH FIDELITY AUDIO UNITS**

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Application</th>
<th>Primary Impedance</th>
<th>Secondary Impedance</th>
<th>± 2 DB from</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-10</td>
<td>Low impedance mike, pickup, or multiple line to grid</td>
<td>50, 125, 200, 250, 333, 500 ohms</td>
<td>50,000 ohms</td>
<td>30-20,000</td>
<td>$15.00</td>
</tr>
<tr>
<td>A-11</td>
<td>Low impedance mike, pickup, or line to 1 or 2 grids</td>
<td>50, 200, 500 ohms</td>
<td>50,000 ohms</td>
<td>50-10,000</td>
<td>16.00</td>
</tr>
<tr>
<td>A-12</td>
<td>Low impedance mike, pickup, or multiple line to push pull grids</td>
<td>50, 125, 200, 250, 333, 500 ohms</td>
<td>80,000 ohms overall in two sections</td>
<td>30-20,000</td>
<td>15.00</td>
</tr>
<tr>
<td>A-18</td>
<td>Single plate to two grids</td>
<td>8,000 to 15,000 ohms</td>
<td>8,000 ohms overall, 2.3:1 turn ratio overall</td>
<td>30-20,000</td>
<td>14.00</td>
</tr>
<tr>
<td>A-24</td>
<td>Single plate to multiple line</td>
<td>8,000 to 15,000 ohms</td>
<td>50, 125, 200, 250, 333, 500 ohms</td>
<td>50-10,000</td>
<td>14.00</td>
</tr>
<tr>
<td>A-25</td>
<td>Single plate to multiple line</td>
<td>8,000 to 15,000 ohms</td>
<td>50, 125, 200, 250, 333, 500 ohms</td>
<td>30-20,000</td>
<td>15.00</td>
</tr>
<tr>
<td>A-26</td>
<td>Push pull low level plates to multiple line</td>
<td>8,000 to 15,000 ohms each side</td>
<td>50, 125, 200, 250, 333, 500 ohms</td>
<td>30-20,000</td>
<td>10.00</td>
</tr>
<tr>
<td>A-30</td>
<td>Audio choke, 300 henrys @ 2 MA 6000 ohms D.C., 75 henrys @ 4 MA 1500 ohms D.C., Inductance</td>
<td>with no D.C. 450 henrys</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above listing includes only a few of the many Ultra Compact Audio Units available... write for more details.

**United Transformer Corp.**

150 Varien Street
New York 13, N. Y.
Negligible driving power requirements . . . this advantage underscores Type GL-4D21/4-125A’s desirability for your rig. At 500 w max CW input, only 2.5 w driving power is required. At 380 w max phone input, only 3.3 w.

No neutralization at most frequencies . . . a feature typical of tetrodes, that greatly simplifies your circuit design! (Grid-plate capacitance in this case is only .05 mmfd.)

Modern . . . compact . . . efficient! . . . these qualities reveal themselves in the tube’s up-to-the-minute appearance, its structural sturdiness, and in electrical performance that matches your highest expectations.

An ideal tube for your final . . . alone, or in push-pull. A pair of GL-4D21/4-125A’s in push-pull will take 1 kw input CW, or 760 w input phone.

Because of ultra-compact construction, this tetrode needs a very limited amount of forced-air cooling for the base, and if operated at higher ratings, the bulb also requires some forced air. However, a small household fan will “do the trick” in both respects.

Ask your G-E tube distributor for further details. He will be glad to discuss with you this outstanding modern addition to the G-E tube line. Or write to Electronics Department, General Electric Company, Schenectady 5, New York.

ELECTRONIC TUBES OF ALL TYPES FOR THE RADIO AMATEUR

GENERAL ELECTRIC
HERE ARE THE MARCH WINNERS OF NEW SYLVANIA MODMETERS!

Again, this month, three winners were selected for our crystal diodes contest. They will receive—free—a new Sylvania Modmeter. For details on this handy instrument see your September, 1946 issue of QST.

—THE MONTH'S WINNING CRYSTAL KINKS—

1 Contributed by: Charles T. Brasefield, Jr. Alabama Power Company Birmingham 2, Alabama

Compact Series—Gate Noise Limiter. Install this highly-efficient, hum-free noise limiter in your present receiver in less than two hours, and enjoy relatively noise-free operation. Contributor suggests building limiter in small, shielded plug-in can.

\[
R_1, R_2 = 270,000 \text{ ohms.} \\
R_3 = 820,000 \text{ ohms.} \\
R_4 = 1,000,000 \text{ ohms.} \\
SW_1 = \text{S.P.D.T. toggle switch.} \\
C_1 = .0001 \mu \text{fd mica condenser, 400 V.} \\
C_2 = .01 \mu \text{fd paper condenser, 400 V.} \\
C_3 = .1 \mu \text{fd paper condenser, 400 V.}
\]

2 Contributed by: G. Franklin Montgomery, W3FQB 4557 South Chelsea Lane Bethesda, Maryland

Bias Supply for Class A Audio Stage from 6.3 Volt Heater Supply. Uses Voltage-Doubling Circuit with two 1N34 Crystals.

\[
R_1 = 500,000 \text{ ohms.} \\
R_2 = 100,000 \text{ ohms.} \\
C_1 = 30 \mu \text{fd, 25 Volt Electrolytic Condenser.} \\
C_3, C_4 = .1 \mu \text{fd, 25 Volt Paper Condenser.}
\]

Our hearty congratulations to the winners this month and our thanks to the many other contributors from all over the world who sent us their ideas. The tremendous interest and response to this contest prove one thing conclusively...that Crystal Diodes 1N34 and 1N35 have many varied uses, some of which are still to be found.

Remember that Sylvania cannot assume responsibility concerning any use made of the entries or the ideas expressed therein. Remember, too, that you can find complete details about the handy new Sylvania Modmeter in your September, 1946, issue of QST.

Watch for our ad in the May issue of this magazine naming the final three winners of the contest!

3 Original idea submitted by: Francis G. Southworth, W5JJ 7006 Coronado Avenue Dallas 14, Texas

(Circuit simplified by Sylvania Engineering Dept.) Try this simple voice-operated transmitter switch for rapid “phone” break-in operation. Requires no external power supply. Shunt primary \((E_p)\) of \(T\) across 500 ohms output of speech amplifier and parallel contact terminals \((E_c)\) of relay \(R_Y\) with present transmit-receiver switch. Adjust potentiometer \(R\) so that relay \(R_Y\) is actuated only when microphone is addressed. Adjust receiver gain and \(R\) so that loudspeaker will not trigger \(R_Y\).

\[
T = \text{standard audio interstage transformer.} \\
R = 100,000 \text{ ohm potentiometer.} \\
C = .5 \mu \text{fd paper condenser (increase, if longer “hold” time is preferred).} \\
R_Y = \text{Sigma Type 5F1600S relay, or equivalent.}
\]

SYLVANIA ELECTRIC

Electronics Division...500 Fifth Avenue, New York 18, N. Y.

MAKERS OF ELECTRONIC DEVICES; RADIO TUBES; CATHODE RAY TUBES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS
CONTENTS

"It Seems to Us ..." .............................................. 11
Low-Cost Six-Meter 'Phone .................................. 13
C. Vernon Chambers, W1JEQ

Our Cover ....................................................... 17
More on Speech Clipping .................................... 18
W. W. Smith, W6BCX

Fundamental Beam Patterns ................................. 23
David C. Cleckner, W8YBF

Clean-Cut Break-In Keying .................................. 27
Harry G. Burnett, WILZ

Technical Topics
N.F.M. Reception ............................................. 30
Bonus for 28-Mc. Observers ................................. 32

ARRL QSL Bureau .............................................. 33

Navy Day — 1946 ............................................... 34

An Improved Receiver for Two Meters ................... 35
Calvin F. Hadlock, W1CTW

Silent Keys ...................................................... 40

Happenings of the Month .................................... 41

The BC-221 Frequency Meter as a VFO ................. 43
Howard W. Johnson, W7NU

Rotten 'Phones ................................................ 48
William R. Marks, WIDEF

How's DX? ....................................................... 50

In QST 25 Years Ago This Month ......................... 52

Foreign Notes .................................................. 53

Finding the Inductance of R.F. Coils ................... 54
Robert M. Crottinger, W6GUY

The World Above 50 Mc. ................................... 57

The Balloon Antenna Rides Again! ....................... 60
George Bonadio, ex-W8OMM

Hints and Kinks ................................................. 61

Correspondence from Members ............................. 62

How to Cook a Ham ........................................... 64
C. L. Stong, W2PFM

Lament for the Past .......................................... 64
Mrs. Doris C. Grautoff

Feed-back ....................................................... 65

Operating News ............................................... 65

Station Activities ............................................. 74
Hallicrafters famous radio equipment, sold and distributed around the world before the war and used with superb effectiveness in every theater during the war is once again on the move. Watch for latest details of the Gatti-Hallicrafters mobile radio equipped expedition to the Mountains of the Moon in deepest Africa—a new and exciting test for the ingenuity of hams and the performance of Hallicrafters equipment.
3 GREAT RECEIVERS designed and priced for hams who are going places, too

Model SX-42 Described by hams who have operated it as "the first real postwar receiver." One of the finest CW receivers yet developed. Greatest continuous frequency coverage of any communications receiver—from 540 kc to 110 Mc, in six bands. FM-AM-CW. 15 tubes. Matching speakers are available.......................... $27500

Model S-40A Function, beauty, unusual radio performance and reasonable price are all combined in this fine receiver. Overall frequency range from 540 kc to 43 Mc, in four bands. Nine tubes. Built-in dynamic speaker. Many circuit refinements never before available in medium price class.......................... $8950

Model S-38 Overall frequency range from 540 kc to 32 Mc, in four bands. Self contained speaker. Compact and rugged, high performance at a low price. Makes an ideal standby receiver for hams. CW pitch control is adjustable from front panel. Automatic noise limiter.......................... $4750

BUILDERS OF Skyfone AVIATION RADIO TELEPHONE

hallicrafters RADIO
THE HALLICRAFTERS CO., MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U.S.A.
Sole Hallicrafters Representatives in Canada:
Rogers Majestic Limited, Toronto-Montreal
Section Communications Managers of the ARRL Communications Department

Reports Invited. All amateurs, especially League members, are invited to report station activities on the first of each month (for preceding month) direct to the SCM, the administrative ARRL official elected by members in each Section. Reports from club reports are also desired by SCM. As for inclusion in QST. All ARRL and Organization appointments are now available to League members. These include ORS, OES, OPS, OD, and OBS. Also, where vacancies exist SCM desires applications for SEC, EC, RM, and PAM. In addition to station and leadership appointments for Members, all amateurs are invited to join the ARRL Emergency Corps (ask for Form 7).

### ATLANTIC DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Pennsylv...</td>
<td>Jerry Mathis</td>
<td>623 Crescent Ave.</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td></td>
<td>132 Tennessee Ave., N.E.</td>
</tr>
<tr>
<td>Maryland</td>
<td></td>
<td>142 E, Ray Tomlinson</td>
</tr>
<tr>
<td>Delaware</td>
<td></td>
<td>4158 Ridge Road, West</td>
</tr>
<tr>
<td>New Jersey</td>
<td></td>
<td>937 East Jtld St.</td>
</tr>
<tr>
<td>Southern</td>
<td></td>
<td>2641 College Ave.</td>
</tr>
<tr>
<td>New York</td>
<td></td>
<td>720 E. 6th St.</td>
</tr>
<tr>
<td>Western</td>
<td></td>
<td>1106 Manitou St., R.F.D., J.</td>
</tr>
<tr>
<td>New York</td>
<td></td>
<td>5411 North Chas.</td>
</tr>
<tr>
<td>Western</td>
<td></td>
<td>2616 Main Ave.</td>
</tr>
</tbody>
</table>

### CENTRAL DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td></td>
<td>4355 Howell Ave.</td>
</tr>
<tr>
<td>Indiana</td>
<td></td>
<td>Room 3 J. Jefferson Hotel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>110 North Howell St.</td>
</tr>
<tr>
<td>Kentucky</td>
<td></td>
<td>1653 Beechwood Ave.</td>
</tr>
<tr>
<td>Michigan</td>
<td></td>
<td>R.F.D. 2, Box 265</td>
</tr>
<tr>
<td>Ohio</td>
<td></td>
<td>1290 Colliage St.</td>
</tr>
</tbody>
</table>

### DELTA DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas</td>
<td></td>
<td>1444 Lexington Parkway</td>
</tr>
<tr>
<td>Louisiana</td>
<td></td>
<td>57 Sayre St.</td>
</tr>
<tr>
<td>Mississippi</td>
<td></td>
<td>2712 Washington St.</td>
</tr>
<tr>
<td>Tennessee</td>
<td></td>
<td>434 N. Terrace Drive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1101 Moffett Ave.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>101 Ariarki Ave.</td>
</tr>
</tbody>
</table>

### GREAT LAKES DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michigan</td>
<td></td>
<td>131-46 84th Dr.</td>
</tr>
<tr>
<td>Ohio</td>
<td></td>
<td>57 Sayre St.</td>
</tr>
<tr>
<td>Indiana</td>
<td></td>
<td>90 Arwater St.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>370 Oak Drive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70 Columna Ave., Gaspee</td>
</tr>
<tr>
<td></td>
<td></td>
<td>78 3rd St.</td>
</tr>
</tbody>
</table>

### HUDSON DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td></td>
<td>1017 East Jefferson St.</td>
</tr>
<tr>
<td>New Jersey</td>
<td></td>
<td>320 Admherst Ave.</td>
</tr>
<tr>
<td>Northern</td>
<td></td>
<td>870 Missouri Ave.</td>
</tr>
<tr>
<td>New Jersey</td>
<td></td>
<td>47 Madison Ave.</td>
</tr>
<tr>
<td>Western</td>
<td></td>
<td>6703 Roosevelt Rd.</td>
</tr>
</tbody>
</table>

### MOUNTAIN DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td></td>
<td>1020 E. 6th St.</td>
</tr>
<tr>
<td>Utah-Wyoming</td>
<td></td>
<td>2138 N. 7th St.</td>
</tr>
<tr>
<td>Wyoming</td>
<td></td>
<td>2590 Arden Ave.</td>
</tr>
<tr>
<td>New Mexico</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Arizona</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>Nevada</td>
<td></td>
<td>870 California Ave.</td>
</tr>
</tbody>
</table>

### NEW ENGLAND DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Hampshire</td>
<td></td>
<td>1421 North Chas.</td>
</tr>
<tr>
<td>Vermont</td>
<td></td>
<td>25 Roosevelt Dr.</td>
</tr>
<tr>
<td>Rhode Island</td>
<td></td>
<td>70 Columna Ave., Gaspee</td>
</tr>
<tr>
<td>Connecticut</td>
<td></td>
<td>78 3rd St.</td>
</tr>
<tr>
<td>Maine</td>
<td></td>
<td>90 Arwater St.</td>
</tr>
<tr>
<td>Massachusetts</td>
<td></td>
<td>370 Oak Drive</td>
</tr>
<tr>
<td>New Hampshire</td>
<td></td>
<td>70 Columna Ave., Gaspee</td>
</tr>
</tbody>
</table>

### NORTHWESTERN DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Dakota</td>
<td></td>
<td>103 E. 6th St.</td>
</tr>
<tr>
<td>South Dakota</td>
<td></td>
<td>2156 Amherst Ave.</td>
</tr>
<tr>
<td>Minnesota</td>
<td></td>
<td>1203 E. Brookland Blvd.</td>
</tr>
</tbody>
</table>

### PACIFIC DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td></td>
<td>P. O. Box 281</td>
</tr>
<tr>
<td>Idaho</td>
<td></td>
<td>1017 East Jefferson St.</td>
</tr>
<tr>
<td>Montana</td>
<td></td>
<td>320 Admherst Ave.</td>
</tr>
<tr>
<td>Oregon</td>
<td></td>
<td>870 Missouri Ave.</td>
</tr>
<tr>
<td>Alaska</td>
<td></td>
<td>47 Madison Ave.</td>
</tr>
<tr>
<td>Hawaii</td>
<td></td>
<td>1020 E. 6th St.</td>
</tr>
<tr>
<td>Nevada</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Montana</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Idaho</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>Oregon</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Washington</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
</tbody>
</table>

### SOUTHERN DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas</td>
<td></td>
<td>1444 Lexington Parkway</td>
</tr>
<tr>
<td>Louisiana</td>
<td></td>
<td>57 Sayre St.</td>
</tr>
<tr>
<td>Mississippi</td>
<td></td>
<td>90 Arwater St.</td>
</tr>
<tr>
<td>Tennessee</td>
<td></td>
<td>370 Oak Drive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70 Columna Ave., Gaspee</td>
</tr>
</tbody>
</table>

### ROCKY MOUNTAIN DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td></td>
<td>2590 Arden Ave.</td>
</tr>
<tr>
<td>Utah-Wyoming</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Wyoming</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>New Mexico</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>Arizona</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Nevada</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
</tbody>
</table>

### SOUTHEASTERN DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td></td>
<td>1021 Alabama Ave.</td>
</tr>
<tr>
<td>Florida</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Georgia</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
</tbody>
</table>

### WESTERN DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Utah</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Nevada</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>New Mexico</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Montana</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Idaho</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Oregon</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>Washington</td>
<td></td>
<td>870 California Ave.</td>
</tr>
</tbody>
</table>

### ALLIANCE DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Oklahoma</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Arkansas</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>Louisiana</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Mississippi</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
</tbody>
</table>

### MARINE DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florida</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Georgia</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Mississippi</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>Louisiana</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Alabama</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>North Carolina</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>South Carolina</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Virginia</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>West Virginia</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>Georgia</td>
<td></td>
<td>870 California Ave.</td>
</tr>
</tbody>
</table>

### MOUNTAIN DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Utah</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Nevada</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>New Mexico</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Montana</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Idaho</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Oregon</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>Washington</td>
<td></td>
<td>870 California Ave.</td>
</tr>
</tbody>
</table>

### ALLIANCE DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florida</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Georgia</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Mississippi</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>Louisiana</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Alabama</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>North Carolina</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>South Carolina</td>
<td></td>
<td>870 California Ave.</td>
</tr>
</tbody>
</table>

### PRAIRIE DIVISION

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minnesota</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>South Dakota</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>North Dakota</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>Wisconsin</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Nebraska</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Iowa</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>South Dakota</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>North Dakota</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Montana</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
<tr>
<td>Idaho</td>
<td></td>
<td>870 California Ave.</td>
</tr>
<tr>
<td>Oregon</td>
<td></td>
<td>50 Northerly Dr.</td>
</tr>
<tr>
<td>Washington</td>
<td></td>
<td>301 E. 1st St.</td>
</tr>
</tbody>
</table>

* Officials appointed to act temporarily in the absence of a regular official.
**STABILITY**
Stay put with PRs! They're really LOW DRIFT...without sacrificing high output characteristics. X-ray orientation guarantees uniform cut for maximum low-drift performance...drift limited to less than 2 cycles per MC per degree.

**ACCURACY**
Guaranteed accurate...within .01 per cent of specified frequency or better. When doubling and quadrupling accuracy is absolutely necessary. You KNOW where you are with PRs.

**POWER OUTPUT**
PRs are designed to give maximum power output from the exciter stage. They will stand up under the high voltages and currents common in amateur operation. PRs can “take it” and like it.

**ACTIVITY**
PRs give you high activity. They “come in” instantly on phone...key without chirps, even at high bug speeds, without excessive “backing off.”

**Unconditional Guarantee**
Every PR Precision CRYSTAL is guaranteed unconditionally by the makers of fine crystals since 1934.

**EXACT FREQUENCY**
You pay no premium for the exact frequency you want (integral kilocycle). PR makes a special effort to keep its jobbers supplied with EVERY FREQUENCY available to amateurs. The factory maintains 24-hour airmail service to its jobbers. If your jobber doesn’t have the exact frequency, he can get it at once from the factory AT NO EXTRA COST.

---

### 10 METERS
**Harmonic oscillator. Ideal for “straight through” mobile operation.**
PR Type Z-5.

### 20 METERS
**Harmonic oscillator. Low drift, high activity. Can be keyed in most circuits. High power output.**
PR Type Z-8.

### 40 & 80 METERS
**Rugged, low drift fundamental oscillators. High activity and power output with maximum crystal currents.**
PR Type Z-2.

---

Since 1934
A fine watch—delicate Italian lace—these are synonymous with superb craftsmanship. But imagine such hand-to-eye co-ordination at mass production speeds. The mount operator who assembles with a small spot welder the tiny internal parts of your Hytron tubes displays just such craftsmanship. Despite painstaking engineering and intricate machinery, it is finally her accuracy, speed, perseverance, and appreciation of fine tolerances which build Hytron quality. Assembly mistakes once sealed within a tube cannot be corrected.

That is why Hytron is so fussy about selecting and training its mount operators. Each applicant must pass exacting tests for eyesight and for finger and tweezer dexterity. Then begins a long training cycle: two months to master a single constructional step; up to two years to develop the versatility of the expert mounter.

Every possible aid is given to the Hytron mount operator. Work simplification helps her co-ordinate smoothly and efficiently motions of eyes, hands, and feet. Parts design is simplified; supporting micas serve as templates. Welding is automatically timed. Tight spacing tolerances (.003") and frequent engineering changes prohibit widespread use of jigs and fixtures. Magnification is impracticable, because of width and depth of field. Major effort must always be to train the mounter's keen eyes and nimble fingers to assemble delicate parts to fine tolerances, despite varying materials and machine set-ups.

Yet the Hytron mounter works so effortlessly that it all looks easy. It is easy only because she has the know-how. Next time you pick up a Hytron tube, examine her handiwork.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON
RADIO AND ELECTRONICS CORP.
MAIN OFFICE: SALEM, MASSACHUSETTS
Here's the most versatile and practical antenna insulator-connector ever offered the radio amateur or the professional operator. The IMPEDACOUPLER makes a secure and weatherproof junction between Amphenol coaxial line and any current fed antenna or array. It also can be used in many other ways: for connection to flat lines, to an open wire line and to serve as a center insulator of a $\frac{1}{2}$ wave doublet.

Equipped with an Amphenol type IR receptacle, the IMPEDACOUPLER provides quick, positive connection without fanning and without disrupting terminal impedance of the line.

**INSULATION PLUS STRENGTH**

A genuine MYKROY center insulator block provides optimum dielectric properties, has ample strength to withstand the pull of the antenna and to support the weight of the coaxial line.

The insulator is drilled at both ends for bolt or rivet for holding tubing and connections, or for looping wire if latter is to be used.

The insulator ends are machined to fit the inside diameter of standard aluminum or dural tubing having 1" outside diameter, commonly used for rotary beams. However, the user can easily turn down the insulator ends to fit his particular needs. With the IMPEDACOUPLER, losses from moisture, deterioration at antenna end of the line and resultant insulation breakdown are eliminated.

Write for IMPEDACOUPLER folder illustrating fifteen practical applications, or see the IMPEDACOUPLER at your dealer's.

Weight Only 6 oz.  
Net Price Less Amphenol 1SP Connector ............

$3.50

Other J-K Products Include Quartz Crystals, Crystal Ovens, Frequency Standards.
THE AMERICAN RADIO RELAY LEAGUE, INC.,

is a noncommercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite, although full voting membership is granted only to licensed amateurs.

All general correspondence should be addressed to the Secretary at the administrative headquarters at West Hartford, Connecticut.

Past Presidents
HIRAM PERCY MAXIM, W1AW, 1914-1936
EUGENE C. WOODRUFF, W8CMP, 1936-1940

Officers

President .......................... GEORGE W. BAILEY, W2KH
Washington, D. C.
Vice-President ...................... J. LINCOLN MCCARGAR, W6EY
Oakland, California
Secretary ......................... KENNETH B. WARNER, W1EH
West Hartford, Connecticut
Communications Manager ........... F. E. HANDY, W1BDI
West Hartford, Connecticut
Treasurer .......................... DAVID H. HOUGHTON
West Hartford, Connecticut
General Counsel ..................... PAUL M. SEGAL
1026 Woodward Building, Washington 5, D. C.

DIRECTORS

President
GEORGE W. BAILEY ................. W2KH
921 19th St., N.W., Washington, D. C.

Vice-President
J. LINCOLN MCCARGAR ............. W6EY
60 Hamilton Place, Oakland 12, Calif.

Canadian General Manager
ALEX REID ........................ VESBE
269 Ontario Ave., Toronto, Ont.
Alternate: Leonard W. Mitchell ... VESAZ
78 Raglan Ave., Toronto, Ont.

Atlantic Division
EDWARD G. RASER ................. W22I
315 Beechwood Ave., Tuxedo, N. Y.
Alternate: J. Victor Brothenon ... WSRHN
1748 Ottawa Drive, Erie, Pa.

Central Division
CLYDE C. RICHARDS ............... 4HARE
4901 Bo. 50th St., Milwaukee 14, Wisc.
Alternate: Harold H. Janzen ...... W9DJG
4019 California Ave., Aton, Ill.

Dakota Division
TOM E. DAVIS ....................... W6SW, ex-W9VYA
916 W. Beaver Ave., Willmar, Minn.
Alternate: Harold B. Love ........ W9ERT
Box 420, Mandan, N. D.

Delta Division
GEORGE S. ACTION ................ W5BMM
Plain Dealing, La.
Alternate: Eugene H. Treadaway ... W5DR
P. O. Box 44, La Place, La.

Great Lakes Division
HAROLD C. BIRD .......................... W25PE
114 Hickory Dr., B. F. D. 2, Pontiac 2, Mich.
Alternate: Joseph H. Wrigley .... W2OFP

Hudson Division
JOSEPH M. JOHNSTON .............. W2S0X
427 Lincoln Ave., Avon-by-the-Sea, N. J.
Alternate: Robert A. Kirkman ... W2DSY
1910 Oak Drive, West Belmont, N. J.

Midwest Division
G. A. COLVIN ......................... W6HR
C/o Omaha & Council Bluffs St. Railway Co.,
Omaha 2, Nebr.

New England Division
PERCY C. NOBLE .................... W1BVR
37 Broad St., Westfield, Mass.
Alternate:...

Northwestern Division
HAROLD W. JOHNSTON ............. W7DXF
2227 Berclaire Ave., Seattle 6, Wash.
Alternate: R. Rex Roberts ......... W7CPY
110 W. Breenen St., Glendale, Mont.

Pacific Division
WILLIAM A. LADLEY .............. W2RBO
200 Naylor St. S., Oakland 12, Calif.
Alternate: Albert J. Armantrite ... W6F8W
1673 Dale Ave., San Jose, Calif.

Roanoke Division
H. L. CAVENESS .................... W4DW
2607 Vanderbildt Ave., Raleigh, N. C.
Alternate: J. Frank Kuy ........... W2ZSA
Box 767, Buena Vista, Va.

Rocky Mountain Division
FRANKLIN L. MATEIKA ............ W6IDD
P. O. Box 212, Estes Park, Colo.
Alternate: Arthur Small ........... W8EDV
529 No. Nevada Ave., Colorado Springs, Colo.

Southeastern Division
WILLIAM C. SHELTON ............. W4ABR
527 Revolution Blvd., Daytona Beach, Fla.
Alternate: William P. Sideby .... W4AUP
Fleming Road, Montgomery, Ala.

Southwestern Division
RANER R. SPITZ ..................... W4KD
Alternate: Arthur E. Sulliferman, Jr. W6KBB
1445 Raymond Ave., Henderson, Nev.

West Gulf Division
WAYLANI M. GROVES ............ W5NW
Mail Box 586, Station Humble Pipe Line Corp,
Odessa, Texas
Alternate: Jack T. Moore ........ W5ALA
1429 Fairway, Dallas 4, Texas
"It Seems to Us..."

SHOULD WE HAVE A CLASS D LICENSE?

This article appears at the direction of the ARRL Board of Directors to inform you that the Board will again have under consideration at this May's meeting the question of whether amateur radio would be benefited by having a no-code license available exclusively for the microwaves; to explain the proposition precisely; and to solicit your opinion on it, pro or con, for the information of the Board.

This proposal first took form in ARRL circles about a year ago, as a recommendation to the Board from its Regulations Committee, a committee made up of directors and having the duty of proposing desirable changes in amateur regulations. The report reached directors only a few days before their departure for their annual meeting, with insufficient time to sound out division sentiment on the proposal, and too late for mention in QST before the meeting. While the Board considered the proposal to be in the interests of amateur radio and adopted it as a request to FCC, it was later withdrawn when considerable membership objection to it was expressed. It was apparent that it needed a fuller discussion in our circles. It is believed that the objection stemmed more from lack of understanding of the proposition, and from the feeling of surprise at not having heard of it previously, than it did from the honest belief that the scheme was contrary to our best interests. This year the Board wants to reconsider it in the light of collected amateur opinion, believing that that will permit final disposition of the matter one way or the other on the basis of a fair examination of its merits, or lacks, by amateurs generally. You are asked to avail yourself of the opportunity to express your views.

In preparing this article the Headquarters has endeavored to be a neutral and impartial reporter. If it seems to lean in favor of the proposal it is perhaps only because what it reports is that the Board last year favored it and believed that it had worked out detailed safeguards that made it a desirable thing. To the best of our HQ. ability we are presenting all the pros and cons that have been mentioned or that occur to us. We have no viewpoint to sell. Our purpose is solely to present the facts so that you can appraise them.

The Argument

The proposal is that the League ask FCC to make available an additional class of amateur license without examination in the telegraph code, the license to be good only on the microwaves, the arrangement to incorporate various safeguards to prevent abuses or unwholesome conditions as hereinafter described in detail. For want of a better term the proposed new ticket is being called a Class D license. Here is the argument that gives rise to the proposal:

"Regular" amateurs, particularly the great body of older prewar amateurs, so far are making relatively little use of amateur allocations above 200 Mc. and very little use of those above 1000 Mc. We have numerous allocations there, fought for by the League so that we could have our share of the new part of the spectrum in which so many people believe much of the future of the art to lie. Commercial and Government services are actively working in that part of the spectrum. We aren't. Already there is allocation pressure and some of our unoccupied bands have been kicked around a bit. In any long-range planning it is important that we retain our fair share of this new world. So we need occupancy. The ordinary amateur of the older school is, generally speaking, simply not interested at all — yet. It is a different world and it requires different techniques. It is the world of special tubes and magnetrons and klystrons, of cavity resonators and wave-guides, of dish and horn and slot antennas, of pulse and television techniques and automatic relaying, and of construction techniques built around lathe-
work and silver plating and the brazing of "plumber's nightmares." It is, in short, the world of the skilled experimenter of laboratory leanings, of men who will get as much of a boost out of working crosstown on thousands of megacycles as the rest of us do from handling traffic in a hot net or working Timbuctoo and Patagonia. Most of us, it seems, are not equipped for this new work or not interested. It doesn't have much appeal to the "communicator," which is what most of us are. Almost no apparatus exists for amateur communication on these bands.

Yet just outside the doors of amateur radio, it is said, there is a considerable body of trained men awaiting admittance to this branch of our game. They are, for example, the war-trained radar technicians and microwave maintenance men and, in particular, the laboratory workers who have acquired experience through development work on these projects. They move in this other world we have just described. Our lower frequencies have never interested them; they aren't, let's say, the communicator type. But they are experimenters, and they are interested in applying to the amateur type of communication the microwave techniques in which they do possess skill, and they would approach it as amateurs — that is, as persons with a personal and non-pecuniary interest in the technique. They do want to be amateurs on microwaves. Their trouble is that, being more of the scientific type and less of the operator or communicator type, they don't know the code. Nor is code used on the frequencies that interest them. Of course it could be, and if you and we were moving into the 10,000-Mc. band we'd very possibly rig up for A2 and a key. But it is a fact that in all our experience there has never been any appreciable amount of telegraphy above 30 Mc. It's 99.99% voice operation. On our lower frequencies we use c.w. and 'phone more or less interchangeably, whereas our present practice clearly requires amateurs to have code knowledge in bands where it wouldn't be used, even though we do know code ourselves, and that those of us who have no interest in the microwave bands shouldn't oppose a plan that will add very valuable men to the amateur ranks and do much for amateur radio generally.

On the objectors' side it is suggested that there are plenty of people who would like the right to operate 'phone on lower frequencies without a code requirement, and if we're to waive it on microwaves why isn't it just as sensible to do it in the case of, say, 75-meter 'phone? There are several answers. The international treaty regulations clearly require amateurs to have code knowledge for the use of frequencies of international effect, although this isn't true in the microwave field where the treaty doesn't apply. On our lower frequencies we use c.w. and 'phone more or less interchangeably, whereas our present practice is almost exclusively voice above 50 Mc. On frequencies of longer range it is logical that we should be prepared to use code, to be able to deal with c.w. distress messages or to understand other imperative messages from code stations. The two ranges are, it is thought, quite different worlds, and different standards could be regarded as logical.

There are also, on the contrary side, several objections more nearly based on fear or mistrust of the way the scheme would work out. Just what they are, and the safeguards against them which the Board has in mind, will be more apparent in an examination of the pros and cons of each feature of the pending proposal.

The Proposal

Let us therefore put down just what would be contemplated by the plan the Board has under consideration, and look at the whys and wherefores of each item.

I. The proposed Class D license would authorize operation only on frequencies above 1215 Mc. (wavelengths below ¼ meter).

II. The examination for it would be the same (Continued on insert after page 58)
Low-Cost Six-Meter ‘Phone
Receiving-Type Tubes in a Complete One-Chassis Transmitter

BY C. VERNON CHAMBERS, W1JEQ

Thanks to the crystal manufacturers, it is no longer necessary to employ a mile-long string of frequency doublers to secure v.h.f. output. For example, output in the six-meter band can be obtained by using nothing more complicated than an ordinary Tri-Tet oscillator with its plate circuit tuned to the second harmonic of a 25-Mc. crystal. As a matter of fact, crystals of lower fundamental frequency can be used to obtain the same result if a higher order of frequency multiplication is used in the oscillator circuit. But it must be admitted that a Tri-Tet delivers considerably more output at the second harmonic than it does at higher multiples and this allows a low-power amplifier to be driven directly by the oscillator-tube output.

The transmitter to be described takes advantage of this type of operation. It not only gets to “six” with the minimum number of stages but does so at low cost — less than fifty dollars — including a high-frequency crystal, the tubes, and every other component from bias battery to chassis.

Circuit Details
As shown in the wiring diagram, Fig. 1, the oscillator is a 6V6GT tube in the Tri-Tet oscillator arrangement. A Valpey Type CB5 25-Mc. crystal is used so that the second harmonic (the one to which the oscillator plate circuit is tuned) will fall within the 50-54-Mc. range. The tuned plate circuit includes a fixed condenser, C5, so that the tuning condenser frame can be grounded, which simplifies the mounting job. A dropping resistor, R2, reduces the power-supply output voltage to a value suitable for the screen grid.

* Haven't tried “six”? If it’s cost or unwillingness to revamp your present transmitter that has held you back, here’s a little job that’s inexpensive and complete in itself. Low power, naturally, but the 80-Mc. band is still open enough for a 15-watt transmitter to show results.

Considerable care was given to the determination of the constants of the cathode circuit, $C_L$, and the recommended capacity and inductance should be duplicated as closely as possible. In the event that the values are altered, the resonant frequency of the combination should be approximately 31 Mc., because this frequency gives maximum oscillator efficiency along with minimum crystal current. The crystal current in the oscillator shown is too low to light a 50-ma. dial lamp to full brilliancy.

A closed-circuit jack, J1, is connected in series with the cathode of the 6V6GT for checking the plate-and-screen current. Reading combined plate and screen current is not the most desirable method because the plate current alone cannot be determined without auxiliary voltage measurements and calculation, but it is even more desirable to have the metering-jack frame grounded so that the operator is protected against accidental contact with a high-potential point. Fortunately, the screen current of this oscillator is only 3 to 4 ma. and it is a simple matter to subtract this small amount from the total cathode current indicated by the milliammeter. A by-pass condenser, C4, is connected between the cathode coil and ground so that r.f. current need not flow through the meter.

A front view of the complete six-meter transmitter. The components and controls along the front wall of the chassis, from left to right, are as follows: microphone jack and pilot-light assembly, audio gain control, stand-by switch, phone-e.w. switch, oscillator tuning knob, jacks J1 through J4, and amplifier plate-circuit tuning control.

March 1947
Fig. 1 — Circuit diagram of the six-meter transmitter.

C1 - 35-µfd. variable (Cardwell ZR-35-AS).
C3 - 100-µfd. mica.
C4, C10 - 0.01-µfd. paper.
C1, C2 - Neutralizing condensers; see text.
C11, C12 - 8-µfd. 600-volt electrolytic.
C13 - 50-µfd. 25-volt electrolytic.
C14 - 8-µfd. 450-volt electrolytic.
R1 - 0.1 megohm, ½ watt.
R2 - 12,000 ohms, 1 watt.
R3 - 10,000 ohms, ½ watt.
R4 - 4700 ohms, 2 watts.
R5 - 15,000 ohms, 10 watts.
R6 - 0.5-megohm potentiometer.
R7 - 1000 ohms, ½ watt.
R8 - 10,000 ohms, 2 watts.
R9 - 300 ohms, 10 watts.
L1 - 3 turns No. 18 enamelled, close-wound, ½-inch diam.
L2 - 3 turns No. 14 tinned, 1½-inch diam., ½ inch long.
L4 - 2 turns No. 14 tinned, 1⅛-inch diam., turns spaced wire diam.; a space of ⅜ inch is left between sections.
L5 - Filter choke, 4 by, 250 ma., 60-ohm d.c. resistance (Stancor C-1763).
B1 - 45-volt bias battery.
B2 - 1.5- or 3-volt microphome battery.
B1 - 6.3-volt a.c. pilot-lamp-and-socket assembly.
J - Panel-mounting a.c. male socket (Amphenol 61-M1).
J1, J2, J3, J4 - Closed-circuit jack.
J5 - Open-circuit jack.
RFC1 - 2.5-mh. r.f. choke.
RFC2, RFC3 - V.h.f. r.f. choke (Ohmite Z-1).
S1 - S.p.s.t. switch; mounted on potentiometer Ro.
S2 - S.p.d.t. toggle switch.
S3 - S.p.d.t. toggle switch.
T1 - Power transformer, 370 volts a.c. each side of center-tap, 275-ma. rating. Filament windings: 6.3 volts, 7 amp.; 5 volts, 3 amp. (Stancor P-6315).
T2 - Microphone transformer, a.b.-to-single-grid type (Stancor A-4705).
T3 - Interstage coupling transformer, single plate to push-pull grids (Stancor A-62-C).
T4 - Modulation transformer, primary 10,000 ohms, secondary 5000 ohms (Stancor A-3845).
The push-pull amplifier is inductively-coupled to the oscillator stage, the amplifier grid coil, L3, being placed inside the oscillator plate coil. Inductive coupling between a single-ended circuit and a self-resonant push-pull circuit has a certain amount of capacity unbalance because one end of the amplifier coil is near the plate end of the driver coil while the other end is nearer the grounded end of the driver coil. Such unbalance may cause one of the amplifier grids to receive more excitation than the other and the amplifier tubes will not function with equal efficiency. The unbalance can be corrected to an acceptable degree by proper orientation of the grid coil with respect to the plate coil, a point which will be covered more thoroughly later. Bias for the amplifier tubes is obtained from a 45-volt "B" battery, plus the voltage drop across the grid leak, R6.

Because of the low plate-grid capacitance of the 6V6GT, it is not practical to employ standard condensers to neutralize the amplifier — and, unfortunately, neutralization is necessary. Complete neutralization is realized by making use of the capacity that exists between the wires of low-impedance Twin-Lead. The material used for the neutralizing condensers, C1 and C2, is the 75-ohm type, but 150-ohm line, or even insulated wires twisted together, can be used with equal success. The plate circuit of the amplifier is perfectly standard and is of the type that permits grounding the condenser frame.

The screen-dropping resistor is R4, while C3 and C10 are the screen-by-pass condensers. Jacks J2 and J3 are provided for grid and cathode metering. The screen current will be 14 ma. when the amplifier is properly excited, and this value plus the grid current can be subtracted from the total reading to obtain the plate current. Coupling to the antenna load is adjusted by means of a swinging link, L6. The amplifier may be used for c.w. operation by plugging keying leads into the cathode jack, J3.

The audio system uses a single-button carbon-microphone transformer coupled to a 6J5 which drives 6V6GT push-pull modulators. Voltage for the microphone can be obtained from any small flashlight or bias battery that will deliver from 1.5 to 3 volts. The gain can be varied by adjustment of potentiometer R4. The tube is biased by the voltage drop across resistor R7, which is by-passed for audio by C13. Resistor R8 drops the power-supply voltage to 250 for the speech-amplifier tube. A decoupling condenser, C14, is connected between the "B"-plus side of the transformer and ground.

Transformer coupling, through T3, transfers the driver-tube output to the 6V6GT modulator-tube grids. These tubes operate with the full supply voltage applied to both the plate and screen. Cathode bias is developed across resistor R9 and cathode metering is employed. The plate-to-plate load impedance required by the tubes is 10,000 ohms, and the output transformer used is one which provides a match between this impedance and the 6000-ohm (approximately) load presented by the r.f. amplifier. The modulator operates as a Class AB1 amplifier and is capable of delivering approximately 15 watts of audio output.

The power-supply circuit uses a condenser-input filter consisting of condensers C11, C12 and filter choke L6. The output voltage is 320 when loaded by the entire transmitter, and rises to 350 when only the r.f. system is in use. A snap switch, S1, mounted on the audio gain-control potentiometer serves as the a.c. on-off control, and a s.p.s.t. toggle switch, S2, connected in the high-voltage center-tap lead, allows the transmitter plate voltage to be removed during "stand-by" periods. A third switch, S6, removes plate voltage from the audio system and at the same time shorts out the modulation-transformer secondary winding, when thrown to the c.w. position. The power-supply bleeder, R6, is a 10-watt resistor which may have any value between 10,000 and 50,000 ohms.

Construction

The photographs show how the components are laid out on the 3 x 8 x 17-inch chassis. The audio driver tube is well toward the left end of the base, with the modulator tubes and output transformer to the right. Several inches of clear space are left on either side of the driver tube so that the microphone and interstage transformers can be mounted "below deck" during the last stages of construction.

The r.f. section starts to the right of the modulation transformer with the crystal socket, oscillator-tube socket, and sockets for the amplifier tubes in line. The leads from the plate coil to the condenser go through two holes, 3/4 inch in diameter, to the right of the amplifier tubes. A feed-through insulator, used to complete the "B"-plus lead to the center-tap of the plate coil, and the antenna terminals are at the right end of the chassis. The output link, L6, is soldered to the lugs with which the strip is provided.

The power transformer, T1, is at the rear left-hand corner of the chassis. The rectifier tube is to the rear of the modulator tubes, and the filter condensers, C11 and C12, are directly to the rear of the oscillator tube.

The audio-system layout and wiring are non-critical because the chances of feed-back or similar audio difficulties are slight since there are no high-gain stages. Spare tube prongs are used as tie-points and for resistor mounting. In the bottom view, the microphone transformer is to the left of the 6J5 tube and the interstage coupling transformer is between the driver and modulator tube sockets. A small microphone battery can be wedged in between the power trans-
former and the rolled-over edges at the bottom of the chassis.

A two-terminal connector strip is located at the front center of the chassis; these terminals are used as tie-points for the plate-voltage leads and as the support for the hot end of the bleeder resistor, \( R_b \). The coiled-up leads to the left of the bleeder resistor are the three spare output leads from the modulation transformer.

The r.f. section is at the top right in the bottom-view photograph. The oscillator tuning condenser, \( C_1 \), mounted on the front chassis wall, is located midway between the crystal and oscillator-tube sockets. \( L_1 \), the cathode coil, is mounted between the grid-prong end of the crystal socket and an insulated tie-point; the lead to the cathode jack and the ungrounded lead from the cathode by-pass condenser both connect to this terminal. The grid r.f. choke is mounted on a stand-off insulator to the rear of the tube socket and the grid-leak resistor is self-supported between the choke and ground. A small stand-off insulator is mounted at the front of the chassis just to the right of the tuning condenser and is used as a connection point for the plate by-pass condenser, plate r.f. choke, screen resistor, and the cold end of \( L_2 \). The power-supply end of the r.f. choke and the positive-voltage input lead are brought to an insulated tie-point mounted by means of the nut and screw that hold the variable-condenser stator terminals in place. The plate end of the tank coil is returned to the plate prong of the tube socket.

Two small stand-off insulators, separated 1\( \frac{1}{2} \) inches, are mounted between the oscillator and amplifier tube sockets and are used as mounting posts for the amplifier grid coil, \( L_4 \). Before the grid coil is mounted, the oscillator plate inductance, \( L_2 \), should be wound and wired in place with its axis in line with and above the tops of the two stand-off insulators, and a center-tap lead should be soldered to the grid coil. The grid coil may then be slipped through the plate coil and soldered in place. Pin 6 of the amplifier tube socket, located toward the center of the chassis, is used as the connection point between the coil center-tap and the grid resistor, \( R_g \). The grid circuit is completed by connecting the battery end of \( R_g \) to a tie-point mounted at the rear of the tube socket and by installing a lead between the resistor and the bias battery. The positive side of the battery is connected to the metering jack, \( J_3 \). Incidentally, this jack must be insulated from the chassis and connected as shown in the circuit diagram if a single meter is to be used for making both grid and cathode readings; if the frame of \( J_3 \) is grounded the meter leads will have to be reversed when the meter is shifted from one circuit to the other.

The plate tuning condenser requires slight modification before being mounted. The screws holding the stator-plate assemblies in place should be removed and husky soldering lugs slipped under the screw heads. After the condenser has been reassembled, the soldering lugs are used as terminals for the plate-coil leads that come down through the \( \frac{3}{4} \)-inch holes in the chassis. Leads of No. 14 wire are connected between the condenser terminals and the plate prongs of the tube sockets. The r.f. choke is supported by its own leads between the feed-through insulator at the right of the condenser and the tie-strip at the rear of the tube socket. The screen resistor, \( R_4 \), and the positive high-voltage lead for the final also join at the tie-strip terminal. However, do not solder this connection until after the amplifier has been neutralized, because the plate and screen voltages must be removed while neutralizing.

The neutralizing condensers are connected in crisscross fashion, between the plate-condenser stator terminals and the grid prongs of the tube sockets. The approximate lengths of the strips required will be three inches of 75-ohm line or five inches of 150-ohm line. If twisted wires are used, it is suggested that the lengths be five inches, also.

Testing

If a voltmeter is available it is well to test the power-supply section before attempting to operate the rest of the transmitter. With all tubes turned off and the transformer removed, the power input leads are shorted together and all high-voltage leads are grounded. The battery is plugged into the metering jack and the meter is set to the 1000-volt range. A voltmeter of the shunt type is also recommended. A battery voltage of 1000-1100 volts should be read by the meter. The high-voltage leads from the transformer are then connected to the battery and the meter should read zero. If not, the high-voltage leads are disconnected and the meter is grounded. The meter readings should be 115 volts, which is the normal value when the neutralizing condensers are shorts between the plate-condenser stator terminals and the grid prongs of the tube sockets. The approximate lengths of the strips required will be three inches of 75-ohm line or five inches of 150-ohm line. If twisted wires are used, it is suggested that the lengths be five inches, also.

A bottom view of the six-meter transmitter. The r.f. section components are grouped at the upper right-hand end of the chassis and the audio stages are located at the left end. The filter choke is mounted on the rear wall of the chassis along with a male connector for 115-volt a.c. input.
except the rectifier removed, apply 115 volts a.c. and close S1, leaving S2 open. After the rectifier filament warms up, close S2 and check the voltage across R5. The voltmeter should indicate well in excess of 400 volts.

Next, S2 should be opened and the audio tubes should be inserted in their sockets. A 0-100 milliamp-meter, equipped with a 'phone plug and leads, should be plugged in J4 and, after setting S2 at the 'phone position, S2 may be closed. The modulator cathode current should approximate 70 ma. The operation of the driver stage can be checked by plugging a microphone into J4 and talking into the microphone. Driver output is indicated by an upward fluctuation of the modulator plate current. These audio tests should occupy the shortest possible period of time because the output stage is operating without load.

To test the r.f. stages, disconnect the high voltage by opening S2, set S3 for 'phone operation, and plug the crystal and r.f. tubes in their sockets. Disconnect the h.v. lead to the amplifier plate and screen at the junction point previously mentioned. Voltage may now be applied to the oscillator and C1 tuned for maximum output, as indicated by amplifier grid current. This current should be 8 to 10 ma. The oscillator cathode current should be approximately 45 ma.

The next step is neutralizing the amplifier. With the milliamp-meter connected in the amplifier grid circuit, rotate C2 until there is a flicker in the grid current. The lengths of the neutralizing capacity strips should then be reduced by clipping off a fraction of an inch at a time until the plate condenser can be rotated through resonance without affecting the grid current. It is advisable to open S2 each time a condenser is pruned because the r.f. and battery-bias voltages are present at the grid side of the circuit and, although not dangerous, are not especially pleasant on accidental contact. It is also important to prevent the ends of the wires in the condensers from short-circuiting, a thing that may happen when 75-ohm line is clipped.

To test the amplifier grid circuit for any capacity unbalance, touch the socket grid prongs with a pencil and observe the effect on the grid current. Unbalance is made evident by unequal dips in grid current when the pencil is moved from one grid to the other. It can be corrected by forcing the entire grid coil farther toward the cold end of the oscillator plate coil. Changing the position of the grid coil may change the tuning range of the oscillator plate circuit, and if this happens the turns of both coils should be spread or squeezed together until the oscillator tunes to resonance with C1 set at half capacity.

After the amplifier is neutralized and balanced, a dummy load should be connected to the output terminals and the milliamp-meter plugged into the cathode jack, J5. Voltage can then be applied to the plates and screens of the amplifier and the plate circuit tuned to resonance, as indicated by minimum cathode current. It must be remembered that the meter reads the combined plate, screen and grid currents. The screen current cannot be assumed to be 14 ma. (the correct value) until the excitation has been adjusted. The best method of excitation adjustment requires a voltmeter connected between the screen and ground; the oscillator tuning should be adjusted to make the meter read 250 volts. Since this reading will vary as the amplifier loading is changed, the oscillator tuning must be reset as the loading is adjusted. Proper operation and loading of the amplifier is indicated by the following readings: amplifier grid, 2.5 to 3 ma.; screen potential, 250 volts; cathode current, 90 ma. (73 ma. plate current, 3 ma. grid current, and 14 ma. for the screens). A 15-watt lamp used as a dummy load should show practically full brilliancy. Actual measurement of the power output under the conditions described shows it to be 14 watts.

As a final check, under full load the voltage at all points connected directly to the high-voltage supply should be 320. The oscillator screen voltage should be 250 to 260 volts, as should also the voltage at the plate of the speech-amplifier tube. The cathode pin of the 6J5 should be 8 volts positive with respect to chassis, and the bias developed across the modulator cathode resistor should be approximately 20 volts when the plate current is at the static value. All voltages will increase somewhat when the transmitter is switched to c.w. operation because of the decreased drain on the power supply when the audio system is inoperative.

The output link allows the transmitter to be coupled either to a flat line, to a link-coupled antenna tuner, or to a higher-power amplifier. With voice modulation, the modulator cathode current should be 90 to 100 ma. on peaks. And incidentally, it is wise to remember that the audio system is capable of overmodulating the final — so don't let the amplifier plate current take any upward excursions while working 'phone!

**OUR COVER**

It's a far cry from guided missiles to amateur 6-meter transmitters, but ex-Sergeant Chambers, AAF, has happily negotiated the transition. Our cover shows Technical Assistant W1JEQ back at his old spot in the ARRL lab, putting his latest creation through its final tests. You'll find Vern's low-cost receiving-tube rig described in this issue, starting on page 13.
More on Speech Clipping
Practical Design Data and Circuit Information

BY W. W. SMITH,* W6BCX

The author's first QST article on speech clipping was intended primarily as an introduction to the basic principles of premodulation speech clipping and the considerations involved. It must be admitted that the low-level clipper-filter circuit that was shown as a prototype in order to facilitate explanation of the basic system is somewhat more elaborate than necessary for practical application to typical amateur transmitters. While it could be used to advantage in a transmitter boasting a modulator with virtually zero distortion and a modulated Class C stage with virtually perfect linearity, the residual splatter resulting from the harmonic and intermodulation distortion generated after a low-level clipper-filter is, in practical amateur transmitters, far from zero. Therefore there is no point in trying to achieve absolute perfection in the clipper-filter.

A much simpler low-level circuit which gives very good results was shown in November QST, and one of still different persuasion and intermediate complexity is shown in Figs. 1 and 2. Fig. 1 shows the basic series clipper circuit, and Fig. 2 shows the complete clipper-filter incorporated in a speech amplifier suitable for amateur work.

As was stated in the author's original article, there are many types of series limiters and many types of shunt limiters which can be made to work satisfactorily, but the many limiters in either class differ only as to detail. When one analyzes them carefully it becomes apparent that all shunt limiters are basically the same and all series limiters are basically the same, even though there are many ways of obtaining delay bias and feeding the signal in and out. The similarity between speech-clipper circuits and conventional receiver noise-limiter or "chopper" circuits also becomes apparent.

A Practical Speech-Amplifier Front End

Fig. 2 is intended as the front end of a speech amplifier for an amateur 'phone transmitter. It has sufficient gain for any of the common p.a.-type diaphragm crystal or high-impedance dynamic microphones for moderately close talking. It is not designed for the ham who likes to sit

This high-level clipper and filter employs inexpensive components and can be used at inputs up to 500 watts (ideal for use with a BC-610 transmitter). Starting from the left may be seen the stack of 5000-volt mica capacitors; the two improvised air-core chokes which are clamped and mounted by means of Lucite strips; the 866 clipper tube; and finally the rectifier filament transformer. Because of the high peak voltages involved, and also to simplify construction, the entire unit is mounted on a sheet of Masonite, which in turn can be supported above a metal chassis if desired.


* 215 West Cook St., Santa Maria, Calif.
across the room from the microphone and whisper at it. The amplifier incorporates a moderate amount of bass suppression ahead of the clipper-filter, a highly desirable feature for communications work at any time and a virtual necessity when a low-level clipper-filter is employed in a transmitter using anything other than “broadcast-quality” transformers following the clipper-filter. The suppression is obtained by proportioning the RC values in the grid coupling circuits of the first two stages to give a cut-off frequency, that is about as high as can be tolerated without the quality becoming quite thin and unnatural.

The resistors $R_8$, $R_{11}$, and $R_{13}$ are very critical if symmetrical clipping is to be accomplished. $R_9$, $R_{10}$, and $R_{12}$ are also fairly critical. The exact values are not so important as their uniformity and ratio. $R_9$, $R_{10}$, $R_{11}$, $R_{12}$ and $R_8$ should all be equal in value and $R_8$ should be equal to exactly one-quarter the positive bias voltage. The clipping level is one-fourth the positive bias voltage.

There should be no external path for d.c. across either the input or output terminals.

The values shown are recommended as a good compromise between voice “naturalness” and “get-through” ability, but if the reader insists upon slightly more bass the values of $C_1$ and $C_2$ can be increased to 0.002 µfd.

Mica condensers are specified at these points to avoid possible leakage and consequent short life of the bias cell, and to prevent the possibility of application of positive voltage on the grid of the next stage. When a high value of grid resistance is employed, many paper capacitors have or eventually develop enough leakage to put a volt or two of positive voltage on the grid of the next tube. There is no excuse for using anything but mica when 0.006 µfd. or less is required, but when larger capacities are indicated the writer has found it wise to use only top-quality paper capacitors rated at 1000 working volts and to make the capacity as small as can be tolerated from the standpoint of frequency response or phase shift.

The clipping accuracy of the ohmmeter is unimportant. Good quality resistors should be used at these points to ensure that they retain their characteristics with age.

It is recommended that the 6F5 be mounted so that the grid cap is close to the microphone connector, and that $C_1$, $R_8$, $R_9$, and $B_1$ be placed in a shield can which also shields the grid end of the tube and the back side of the microphone connector. Sometimes this saves trouble later on, and it is more easily done in the first place.

The filter uses two standard 125-mh. powdered-iron core “r.f.” chokes, such as are made by Meissner or Bud. When a wire-wound potentiometer is used at $R_{16}$ to set the output level it need not be touched after once being set, regardless of changes in the weather, provided that the modulated stage is run at the same input. A slight change in the characteristics of a composition- or carbon-type potentiometer will not be noticed when the potentiometer is used as a volume control, but even a slight change can cause trouble if it is used to set the modulation “ceiling,” and initially is advanced as far as is possible without producing splatter.

The maximum peak voltage available across $R_{13}$ is about 8 volts. The rest of the speech system should be so designed or altered that between 2 and 8 volts peak input produces approximately 95-per-cent modulation. If less than 2 volts is required, proper adjustment of $R_{13}$ becomes difficult, because wire-wound potentiometers ordinarily are not available with tapered windings. If less than 2 volts is needed, the situation can be saved by using two resistors as a voltage divider at $R_{16}$, proportioning them to give the desired voltage with $R_{16}$ at about half scale. If between 10 and 25 volts is required at the next grid, the primary of a 1-to-3 ratio interstage transformer can be connected from the pot arm to “B” plus, eliminating $C_{13}$ and $R_{16}$ — but be sure the transformer is not of the bargain-counter variety.

The correct adjustment of $R_{15}$ is the one that gives the highest percentage modulation that can be used without splatter even when screaming into

![Fig. 1 — Full-wave series clipper which maintains constant load on an RC driving circuit, thus preventing axis shift.](image)
the microphone with the gain control full on. If the following stages have very good low-end phase-shift characteristics, $R_{15}$ can be advanced somewhat more than would otherwise be the case. Phase shift tends to cant the flat-topped waves after they leave the clipper-filter.

Actually, phase shift can be tolerated if it is linear with respect to frequency, but when phase shift is due to inadequate capacity in coupling condensers or inadequate transformer inductance, the resulting phase shift is not linear with respect to frequency and the waveform is distorted.

**Modulation Distortion**

If a 'scope check should indicate that the clipped waves are substantially flat-topped into the modulator but no longer so when the rectified carrier envelope is viewed on the 'scope, the Class B modulation transformer is guilty. This condition is most common with a combination of cheap modulation transformer, high plate-to-plate load on the modulators, and Class C plate current flowing in the transformer secondary. If the condition is not cured when the d.c. is eliminated from the secondary by resorting to shunt feed, a bigger and better modulation transformer is in order.

With a low-level clipper-filter the modulator distortion either must be kept low at full modulation, or else the high-order components must be removed from the modulator output by filtering. The latter can be done fairly well, simply by shunting both primary and secondary of the Class B output transformer with as much capacity as can be employed without excessive attenuation at 3500 cycles. These capacitors act in conjunction with the leakage inductance of the transformer to constitute a pi-section filter. If this does not do the trick — and it may not if the transformer is of very good quality and has low leakage reactance — then the solution is to augment the leakage inductance with a filter choke designed for the purpose, such as a Thorndarson-"splatter choke."

**Linearity of Modulated Amplifier**

With any type of speech clipper, linearity in the modulated Class C stage is of vital importance. Distortion generated here can produce
Fig. 3 — High-level half-wave clipper-filter system for use with 8000- to 10,000-ohm loads and plate voltages up to 2000. If the same power supply is used for both the modulator and Class C amplifier, the latter should be decoupled by means of a suitable choke and capacitor.

L1, L2 — Approximately 0.4 hy., capable of carrying 250 ma. without overheating; high-voltage insulation. See text.

T1 — Class B modulation transformer.

T2 — 866 filament transformer, 7500-volt insulation.

NOTE: If plate blocking condenser is 0.001 µfd. or larger, refer to text regarding value of Cs.

Clipping Symmetry

When a speech clipper is built into any speech system, all single-ended stages ahead of the clipper should have fairly low distortion even under conditions of maximum clipping. Bad overloading of any single-ended stage ahead of the clipper will cause an asymmetrical wave to be fed to the clipper because of shifting of the axis, and will prevent maximum realization of the clipper benefits. In other words, for best performance the clipping should be confined to the clipper.

The series clipper shown in Figs. 1 and 2 utilizes two diodes and three resistors whose only purpose is to maintain a constant load on the RC driving circuit over a complete cycle regardless of the amount of clipping. This provides a slight improvement in the performance of the clipper proper by keeping the axis where it belongs. Although the improvement is slight it is not negligible, and it certainly is worth the cost of one 6H6 and three carbon resistors.

High-Level Clipper

Illustrated in Fig. 3 is a practical high-level clipper-filter system for use at Class C inputs up to 2000 volts at 250 ma. The particular filter constants shown are for a load impedance of 8000 to 10,000 ohms, and the filter is designed to use some of the thousands of surplus 0.002-µfd. 5000-volt-test mica condensers that are reposing on bargain counters around the country.

Because inexpensive filament transformers with high-voltage insulation are more readily available in 2.5-volt rating, an 806 is shown, as a clipper tube instead of a 5R4GY or other high-vacuum rectifier. The use of an 866 is perfectly feasible so long as it is run at reduced rating, as is done here, and careful checks indicate that the performance is as good as with a high-vacuum rectifier.

The two air-core "splatter chokes" for the high-level filter are obtained by removing the iron cores from ordinary filter chokes of suitable current rating, and then removing turns or adding a few laminations to trim up the inductance to the desired value. The nonlinear characteristic of conventional laminated iron-core chokes makes them inferior to air-core chokes for use in splatter filters which must carry lots of d.c. and handle high a.c. voltages within the pass-band, as is the case when the filter is placed after the modulator. The slightly-greater d.c. drop in an air-core choke, because of the greater number of turns required, is not of serious consequence.

Because inexpensive uncased filter chokes have comparatively low-voltage insulation can be doctored up to make excellent air-core splatter chokes if the current rating is adequate. With the core removed it cannot "talk back," and it is an easy matter to insulate the whole coil from a metal chassis. The greater number of turns reduces the voltage between turns and between windings, and

March 1947
the only possible vulnerable point is the termination for the inner end of the winding. If the choke originally was designed for low-voltage use, this wire probably crosses over one end of the coil and is anchored to a lug or pigtail lead taped to the outside of the coil and not too well insulated from it. This is easily remedied by snipping the wire and fixing it up with its own tie-point or lug, well spaced from the outside end of the coil.

Some very useful information would be a list of all the popular filter chokes of commercial manufacture by type number, with exact inductance with the core removed. Unfortunately the author is not in a position to supply such information at the present time, but it is hoped that such information can be made available at a later date. The two chokes used in the filter shown in Fig. 3 were obtained by removing the cores from two old homemade filter chokes, vintage 1927, which were found in the junk box. The inductance with no d.c. superimposed was measured at 17 henries before removal of the core, and 0.32 henry with core removed. Just to get some idea of what could be expected of typical chokes of recent commercial manufacture, a choke rated at 8 henries at 150 ma. was measured with no d.c. in the winding and the inductance found to be 21 henries. With the core removed the inductance was measured at 0.43 henry. A 250-ma. factory-made choke rated at from 6 to 10 henries with rated d.c. in the winding probably would give just about the right inductance for the filter of Fig. 3, without removing any turns or replacing any laminations.

Naturally it is desirable to hit the inductance value on the button (or nearly so) with all of the core removed and no alteration of the winding. However, removing a few layers of the winding is not a very big job should this be necessary. If the inductance is too low, it can be raised by sticking a few of the straight laminations (not the "E" pieces) through the coil, separating them with tape and wedging them in tightly to prevent "talking" once the right number of laminations has been determined. This is a little more messy than removing turns, but still is not a formidable job. Even if enough iron is inserted to double the inductance, the total reluctance still is so high that the characteristics of the choke still will be substantially those of an air-core choke.

When checking the inductance it is best to make the measurement at approximately the cut-off frequency of the filter. Because of the comparatively high distributed capacity of an air-core choke of this type, and the tendency for it to increase the mutual inductive coupling between different portions of the coil at the higher frequencies, the inductance as measured at or near the cut-off frequency of the filter will be appreciably higher than that measured at 60 cycles. If one does not have access to equipment suitable for direct measurement, the inductance can be determined with fair accuracy using an audio oscillator and diode peak voltmeter, making reference to a reactance-frequency chart to determine the reactance of a capacitor of known value which resonates the choke at a known frequency.

If the plate blocking condenser in the modulated stage is 0.001 μfd. or larger, the value of C5 should be reduced by approximately the same amount. Obviously the blocking condenser should never be much larger than 0.002 μfd. The filter constants are not extremely critical, and some leeway can be tolerated. But for best performance the values should not deviate too much from those specified.

When using a high-level clipper-filter it is important that there not be appreciable "lopsided" overloading of any stage ahead of the modulator at maximum clipping level. It is recommended that a Class A1 push-pull a.f. driver stage be used ahead of the modulator, and that a 250,000-ohm resistor be placed in series with the grid of each driver tube, right at the grid. If the driver stage uses fixed bias, then the resistance value should be as high as is permitted for fixed-bias operation, usually 50,000 ohms. The stage ahead of the a.f. driver also should use 250,000-ohm series resistors at each grid, and preferably be push-pull, although this is not absolutely necessary if the stage is capable of delivering without serious distortion several times the peak output voltage required for 95-per-cent modulation.

It is true that the high-level clipper-filter system is more expensive than the low-level system, but it has the advantage of being self-adjusting, removes splatter components generated in the modulator stage, and renders harmless any phase shift in the modulation transformer. Also, if a husky modulator is employed in conjunction with plenty of r.f. excitation to the Class C stage and a comparatively low plate-to-plate load on the modulator, the signal will have noticeably more "punch" for the same resting carrier power.

**Strays**

ARRL President George W. Bailey, W2KII, has been elected a director of Army Signal Association Post No. 1, in his dual capacity as a League official and executive secretary of IRE.

No, Hobart, Q fever isn't an occupational malady prevalent among efficiency-minded radio design engineers — it's a form of virus pneumonia sometimes mistaken for influenza, according to Science News Letter.

**Switch to Safety!**
Fundamental Beam Patterns
Simplified Plotting of Antenna Characteristics
BY DAVID C. CLECKNER,* W8YBF

* Here is a story designed to take a little of the black magic out of how antenna patterns are obtained. By following the principles set forth, anyone can see how some of our common types of arrays "get that way" and what can be expected from them in the way of directivity, and you don't have to be a super-mathematician or slide-rule pusher to figure them out.

Amateurs are becoming increasingly aware of the importance of taking advantage of the directional characteristics of even a simple half-wave antenna, particularly at the higher frequencies, but many may feel that the plotting of directional patterns of common combinations of half-wave elements is too complicated for the average operator. It is the purpose of this story to show that the technique is well within the reach of any interested ham with some paper and a pencil.

Basic Patterns
A short review of first principles is in order, for background purposes. It will be recalled that the free-space pattern of a half-wave antenna is a figure-8 pattern revolved about the antenna, and that this pattern is modified by the orientation (horizontal or vertical) of the antenna and its height above ground. Thus the pattern of any half-wave antenna is obtained by multiplying the figure-8 pattern by the ground-reflection factor for the particular height above ground. This subject is elaborated in Chapter Three of *The ARRL Antenna Book.* The maximum lobe (or lobes) may be at any vertical angle, depending on how many wavelengths or fractions thereof that the antenna is mounted above ground, and it should be kept in mind that all of the patterns to be described are modified in exactly the same manner.

Studying the patterns obtained for a half-wave antenna immediately shows that at some heights above ground there is considerable radiation upward at undesired angles, undesirable because low-angle radiation is the most useful at the higher frequencies. The radiation at undesired angles represents lost power, or at least power that could be utilized to improve the signal strength in a desired direction. This power can be directed to some extent by selecting the proper height above ground, and to a greater extent by combining antenna elements in an "array" and feeding them with currents of correct phasing and amplitude so that the radiation from the individual elements adds in the desired direction and cancels in the undesired directions. In a parasitic array this is done by choosing an optimum spacing, usually between 0.1 and 0.2 wavelength, and tuning the parasitic elements until the correct induced currents flow on the reflectors and directors. The elements are combined in such a way that the radiation from the driven element and the reradiations from the parasitic elements add in the desired direction.

In arrays where all of the elements are driven, there are three basic arrangements that are normally used: collinear, broadside and end-fire, as shown in Fig. 1. The elements can of course be grouped in more complex designs than those shown, to obtain more gain and sharper patterns, but these arrays can always be broken down into a combination of the basic types; e.g., one might have an array of two broadside sections arranged and excited to give end-fire operation through the two broadside sections, and so on. Also, one could consider a broadside array of four elements as a broadside arrangement of two broadside arrays or a collinear array of four elements as a collinear arrangement of two collinear arrays.

![Fig. 1](image)

(A) (B) (C)

Fig. 1 — The three basic types of driven arrays.

The collinear (A) has the axis of each element in the same line and the elements are excited in phase. The maximum radiation is at right angles to the common axis.

The broadside array (B) uses elements in the same plane, spaced from \( \frac{1}{4} \) to 1 wavelength, and the elements are excited in phase. The maximum radiation is perpendicular to the plane of the elements.

The end-fire array (C) uses elements in the same plane, spaced from \( \frac{1}{3} \) to \( \frac{1}{2} \) wavelength, and the elements are excited out of phase. The maximum radiation is in the plane of the elements and at right angles to them.
Combining the Patterns

In order to compute the beam patterns of arrays that are composed of vertical or horizontal half-wave elements, it is only necessary to multiply the fundamental pattern of the horizontal or vertical element of which the array is composed by the pattern of the group. Table I gives the group patterns for vertical elements for the following popular conditions: (A) in phase, half-wave spacing (broadside), (B) 180° out of phase, (C) 180° out of phase, close spacing (end-fire), and (D) 90° out of phase, spaced quarter wavelength (unidirectional end-fire). The table also gives the necessary values for patterns of the basic horizontal (E) and vertical (F) elements. These patterns are plotted in Figs. 2, 3, 4, 5 and 6. In converting the patterns of A, B, C or D for horizontal elements, it is necessary to multiply them by the values in E. For example, the horizontal pattern of the popular W8JK horizontal end-fire array can be obtained by multiplying E by C. The multiplication is simply that of multiplying the value given in Table I for 5° for E by the value given for 5° for the group pattern, C. This is then repeated for 10°, 15° and so on until the complete pattern is obtained, after which it can be plotted on polar-coordinate paper.

To find the pattern of two horizontal half-wave elements strung end to end and fed in phase (collinear), the fundamental pattern of the horizontal half-wave element (E) is multiplied in 5° steps by the group pattern of two vertical antennas fed in

**Table I — Pattern Values of Simple Antennas and Arrays**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 vert.</td>
<td>2 vert.</td>
<td>2 vert.</td>
<td>Fed in</td>
<td>Fed in</td>
<td>Fed in</td>
</tr>
<tr>
<td>ant.</td>
<td>spaced</td>
<td>ant.</td>
<td>out of</td>
<td>half-wave</td>
<td>out of</td>
</tr>
<tr>
<td>spaced</td>
<td>half-wave</td>
<td>spaced</td>
<td>phase</td>
<td>wave</td>
<td>wave</td>
</tr>
<tr>
<td>( \theta )</td>
<td>( \theta )</td>
<td>( \theta )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
</tr>
<tr>
<td>0</td>
<td>150</td>
<td>111</td>
<td>124.5</td>
<td>146</td>
<td>154.5</td>
</tr>
<tr>
<td>10</td>
<td>145</td>
<td>108</td>
<td>122.5</td>
<td>144.5</td>
<td>158.5</td>
</tr>
<tr>
<td>15</td>
<td>140</td>
<td>108.5</td>
<td>120</td>
<td>142.5</td>
<td>158</td>
</tr>
<tr>
<td>20</td>
<td>139</td>
<td>108.1</td>
<td>117</td>
<td>141</td>
<td>158</td>
</tr>
<tr>
<td>25</td>
<td>135</td>
<td>107.5</td>
<td>115.5</td>
<td>139.5</td>
<td>157</td>
</tr>
<tr>
<td>30</td>
<td>130</td>
<td>107</td>
<td>113.5</td>
<td>138</td>
<td>155.5</td>
</tr>
<tr>
<td>35</td>
<td>125</td>
<td>106.5</td>
<td>111.5</td>
<td>136.5</td>
<td>153</td>
</tr>
<tr>
<td>40</td>
<td>120</td>
<td>106</td>
<td>109.5</td>
<td>135</td>
<td>151.5</td>
</tr>
<tr>
<td>45</td>
<td>115</td>
<td>105.5</td>
<td>107.5</td>
<td>133.5</td>
<td>149.5</td>
</tr>
<tr>
<td>50</td>
<td>110</td>
<td>105</td>
<td>105.5</td>
<td>131.5</td>
<td>147.5</td>
</tr>
<tr>
<td>55</td>
<td>105</td>
<td>104.5</td>
<td>103.5</td>
<td>129.5</td>
<td>145.5</td>
</tr>
<tr>
<td>60</td>
<td>100</td>
<td>103.5</td>
<td>101.5</td>
<td>127.5</td>
<td>143.5</td>
</tr>
<tr>
<td>65</td>
<td>95</td>
<td>102.5</td>
<td>100</td>
<td>125.5</td>
<td>141.5</td>
</tr>
<tr>
<td>70</td>
<td>90</td>
<td>101.5</td>
<td>98</td>
<td>123.5</td>
<td>139.5</td>
</tr>
<tr>
<td>75</td>
<td>85</td>
<td>100.5</td>
<td>96</td>
<td>121.5</td>
<td>137.5</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
<td>99.5</td>
<td>94</td>
<td>119.5</td>
<td>135.5</td>
</tr>
<tr>
<td>85</td>
<td>75</td>
<td>98.5</td>
<td>92</td>
<td>117.5</td>
<td>133.5</td>
</tr>
</tbody>
</table>

For the group pattern, the fundamental pattern is repeated for 10°, 15° and so on until the complete pattern is obtained, after which it can be plotted on polar-coordinate paper.

**Fig. 2** — A plot of A in Table I — the horizontal pattern of two vertical radiators spaced one-half wavelength and excited in phase.

**Fig. 3** — The horizontal pattern of two vertical radiators spaced one-half wavelength and excited 180° out of phase — B in Table I.
A plot of C in Table I — the horizontal pattern of two close-spaced vertical radiators excited 180° out of phase.

Fig. 5 — The horizontal pattern of two vertical radiators spaced one-quarter wavelength and excited 90° out of phase — D in Table I.

One of the most fundamental configurations — the horizontal pattern of a horizontal half-wave antenna — E in Table I.

Fig. 7 — A plot of the result of Table II, the horizontal pattern of two collinear horizontal antennas spaced one-half wavelength.

The ARRL Antenna Book (pages 16 through 19) for the particular height at which your array is located. The ground-reflection factor then shows you at what vertical angle the lobe of maximum radiation is directed.

By using combinations of group patterns, particularly the cardioid pattern of Fig. 5 (D in Table I), many more complicated arrays can be computed. Also binomial arrays — arrays in which lesser currents are fed to the outer elements, for minor-lobe reduction — can be computed. For example, the pattern of a binomial array in which three horizontal elements in line are fed with unit current in the outer elements and twice this current in the center element (all
Table II — Sample Calculation for Collinear Elements

<table>
<thead>
<tr>
<th>θ</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.50</td>
<td>1.34</td>
<td>202</td>
<td>369</td>
</tr>
<tr>
<td>5</td>
<td>1.45</td>
<td>1.34</td>
<td>198</td>
<td>355</td>
</tr>
<tr>
<td>10</td>
<td>1.50</td>
<td>1.31</td>
<td>190</td>
<td>350</td>
</tr>
<tr>
<td>15</td>
<td>1.45</td>
<td>1.28</td>
<td>179</td>
<td>345</td>
</tr>
<tr>
<td>20</td>
<td>1.50</td>
<td>1.23</td>
<td>162</td>
<td>340</td>
</tr>
<tr>
<td>25</td>
<td>1.45</td>
<td>1.17</td>
<td>149</td>
<td>335</td>
</tr>
<tr>
<td>30</td>
<td>1.50</td>
<td>1.11</td>
<td>130</td>
<td>330</td>
</tr>
<tr>
<td>35</td>
<td>1.45</td>
<td>1.03</td>
<td>98.2</td>
<td>325</td>
</tr>
<tr>
<td>40</td>
<td>1.50</td>
<td>0.95</td>
<td>74.7</td>
<td>320</td>
</tr>
<tr>
<td>45</td>
<td>1.45</td>
<td>0.84</td>
<td>54.2</td>
<td>315</td>
</tr>
<tr>
<td>50</td>
<td>1.50</td>
<td>0.75</td>
<td>39.3</td>
<td>310</td>
</tr>
<tr>
<td>55</td>
<td>1.45</td>
<td>0.65</td>
<td>27.4</td>
<td>305</td>
</tr>
<tr>
<td>60</td>
<td>1.50</td>
<td>0.55</td>
<td>18.2</td>
<td>300</td>
</tr>
<tr>
<td>65</td>
<td>1.45</td>
<td>0.49</td>
<td>9.80</td>
<td>295</td>
</tr>
<tr>
<td>70</td>
<td>1.50</td>
<td>0.35</td>
<td>3.85</td>
<td>290</td>
</tr>
<tr>
<td>75</td>
<td>1.45</td>
<td>0.33</td>
<td>1.39</td>
<td>285</td>
</tr>
<tr>
<td>80</td>
<td>1.50</td>
<td>0.28</td>
<td>0.88</td>
<td>280</td>
</tr>
<tr>
<td>85</td>
<td>1.45</td>
<td>0.24</td>
<td>0.49</td>
<td>275</td>
</tr>
<tr>
<td>90</td>
<td>1.50</td>
<td>0.22</td>
<td>0.00</td>
<td>270</td>
</tr>
<tr>
<td>95</td>
<td>1.45</td>
<td>0.17</td>
<td>0.08</td>
<td>265</td>
</tr>
<tr>
<td>100</td>
<td>1.50</td>
<td>0.16</td>
<td>0.03</td>
<td>260</td>
</tr>
<tr>
<td>105</td>
<td>1.45</td>
<td>0.11</td>
<td>0.02</td>
<td>255</td>
</tr>
<tr>
<td>110</td>
<td>1.50</td>
<td>0.10</td>
<td>0.01</td>
<td>250</td>
</tr>
<tr>
<td>115</td>
<td>1.45</td>
<td>0.07</td>
<td>0.00</td>
<td>245</td>
</tr>
<tr>
<td>120</td>
<td>1.50</td>
<td>0.06</td>
<td>0.00</td>
<td>240</td>
</tr>
<tr>
<td>125</td>
<td>1.45</td>
<td>0.04</td>
<td>0.00</td>
<td>235</td>
</tr>
<tr>
<td>130</td>
<td>1.50</td>
<td>0.03</td>
<td>0.00</td>
<td>230</td>
</tr>
<tr>
<td>135</td>
<td>1.45</td>
<td>0.02</td>
<td>0.00</td>
<td>225</td>
</tr>
<tr>
<td>140</td>
<td>1.50</td>
<td>0.02</td>
<td>0.00</td>
<td>220</td>
</tr>
<tr>
<td>145</td>
<td>1.45</td>
<td>0.02</td>
<td>0.00</td>
<td>215</td>
</tr>
<tr>
<td>150</td>
<td>1.50</td>
<td>0.02</td>
<td>0.00</td>
<td>210</td>
</tr>
<tr>
<td>155</td>
<td>1.45</td>
<td>0.02</td>
<td>0.00</td>
<td>205</td>
</tr>
<tr>
<td>160</td>
<td>1.50</td>
<td>0.02</td>
<td>0.00</td>
<td>200</td>
</tr>
<tr>
<td>165</td>
<td>1.45</td>
<td>0.02</td>
<td>0.00</td>
<td>195</td>
</tr>
<tr>
<td>170</td>
<td>1.50</td>
<td>0.02</td>
<td>0.00</td>
<td>190</td>
</tr>
<tr>
<td>175</td>
<td>1.45</td>
<td>0.02</td>
<td>0.00</td>
<td>185</td>
</tr>
<tr>
<td>180</td>
<td>1.50</td>
<td>0.02</td>
<td>0.00</td>
<td>180</td>
</tr>
</tbody>
</table>

in phase and spaced one-half wavelength) can be obtained by multiplying by itself the pattern of two vertical elements spaced one-half wavelength, fed in phase, and then multiplying the result (approximately a figure 8 squared) by the fundamental pattern of a horizontal half-wave antenna. This is possible because the center element with its twofold current can be considered as two superimposed elements with unit current in each element. This antenna might then be made unidirectional by adding another three half-waves spaced a quarter wavelength from the first set, feeding them in phase with each other but 90° out of phase with the initial set and with unit currents in the outer elements and twice unit current in the center element. This pattern could be computed by multiplying the pattern of the initial three-element section by the pattern for two vertical elements spaced one-quarter wavelength and fed 90° out of phase (D in Table I).

Other Arrangements

The patterns of a good number of arrays can be calculated by the above method, and a little paper work in one’s spare time will be found interesting and educational. However, it must be remembered that gain comparisons cannot be readily made with these patterns unless something is known about the impedances of the various elements making up an array, since the only way the patterns can be compared directly to give relative gains is to reduce them to a common basis with equal currents flowing in the elements of the arrays under consideration. If this can be done, by a knowledge of the impedances present, and assuming unit power delivered to each system, a direct graphical comparison can be made. However, some idea of the relative gains can be obtained by visualizing the amplitude of the major lobes if the two antenna patterns under comparison were drawn on such a scale as to have equal total areas.
Clean-Cut Break-In Keying

Primary Keying and a T9 Note

BY HARRY G. BURNETT, * WILZ

Ten years ago, if someone had said that he could key his whole transmitter in the primary and produce sharp break-in keying with a T9 note, we probably would have said that it just could not be done. Believe it or not, it can be done. Here is the story of such a system of primary keying.

From 1932 until 1937, WILZ was keyed conventionally in the primary of the final power supply (Fig. 1). The power-supply filter nicely eliminated all clicks but, because of the keying lag, the filter was of necessity only a small input choke and a 1-µfd. condenser. In 1937, the FCC began to bear down hard on near-d.c. notes, and we were politely informed that our signal would comply with the law only if the power supply were more adequately filtered. Necessity then became the mother of invention; a long series of experiments was begun which led finally to the primary-keying system to be described.

Keying only in the primary of the driver power supply was first tried. The keying characteristic was none too good, and the note still could not be made really pure without introducing a bad keying lag. Keying in the primaries of both the driver and final power supplies proved to be no better. A resonant filter on the final supply gave better keying, but resulted in pronounced tone modulation, in addition to ruining the mercury-vapor rectifier tubes.

T9 Primary Keying

Then a faint glimmer of inspiration began to flicker. If there were only some way to keep the filter condensers of the final power supply charged all the time the transmitter was in operation, there would be no bad lag as the filter charged and discharged with primary keying. Automatic grid-leak bias was being used on the final amplifier, but a bias pack with higher than cut-off potential was connected across this grid leak. Things began to happen fast. We had stumbled on the secret of clean primary keying with a pure d.c. note!

First, by keying simultaneously the respective primaries of the driver and final power supplies — second, by using the fixed more-than-cut-off bias on the final amplifier — and third, by not connecting a bleeder across the final power supply, when the key was lifted, excitation was immediately removed from the final amplifier, the fixed-bias pack sharply cut off the plate current of the final, and the final filter condensers remained charged. True, the first time the key was pressed the transmitter acted as it would under normal primary keying; the filter condensers and chokes storing up energy drew heavy current from the line. But from that time on, the output voltage of the filter remained practically constant, because there was no drain from the supply with the key up.

When the fixed-bias pack was used and the final power supply only was keyed, the continuing excitation from the driver prevented cut-off of the final amplifier’s plate current and permitted the final amplifier to drain the filter of the final power supply as soon as the key was raised, thus producing a keying lag. If the fixed-bias pack was eliminated, but the driver and final power supplies were keyed simultaneously, plate current of the final amplifier did not cut off when the key was opened, and consequently the final filter discharged through the tube and caused a keying lag. Of course, connecting a high-current bleeder across the final power pack would also drain the final filter when the key was raised. With no final bleeder, however, and with simultaneous removal of excitation and application of cut-off bias to the final amplifier, we had what we had been seeking — lagless primary keying.

March 1947

* % Hytron Radio & Electronics Corp., 78 Lafayette St., Salem, Mass.
The clean-cut “make” and “break” of the keying thrilled us. Now to try some real filter in the final power pack. We piled the chokes and condensers on until the note was unquestionably T9. We were keying in the primary with no lag and with a truly p.d.c. note!

This new system was so effective that several local amateurs were persuaded to experiment with it. They had no difficulty in obtaining the same results. Radio published two articles we wrote on the system in their March and April, 1937, issues. Incidentally, remember that old saying about great minds running in the same channel? W6CUH described a similar system in an article appearing simultaneously in the March, 1937, issue of QST.

When WILZ was put back on the air after the war, this plate-current cut-off form of primary keying was again used. The ability to work break-in had always seemed desirable. Perhaps it could be used with primary keying, by applying the plate cut-off principle already discussed. Well, there's nothing like trying.

Our present 14-Mc. rig consists of a Type 53 twin-triode crystal oscillator/doubler, an HY-69 beam-pentode doubler, an HY-5514 triode driver, and an HK-354 triode final. It was decided to use the 900-volt pack which fed the HY-5514 alone to power also the 53 and HY-69. A suitable dropping resistor was connected between the positive terminal of the 900-volt pack and the plate of the HY-69. (Power wasted in these dropping resistors is negligible, because the plate current for the 53 is only 20 mA. and plate-and-screen current for the HY-69 only 40 mA.) Simultaneous primary keying of the 900-volt and the final plate supplies now keyed all stages of the transmitter (Fig. 2). Darned if it didn’t work! When the key was pressed, we had clean-cut primary keying of a T9 note, and complete break-in.

Considerable tinkering disclosed that the best filter for the 900-volt oscillator/doubler/driver pack is a condenser-input set-up consisting of 2 µfd., 15 henries, and 2 µfd. Choke input is not recommended, because it will introduce an undesirable lag. If two 866A tubes are used for rectifiers in this supply, the peak current will be below the maximum permissible value (250 mA.), even with condenser input. If you prefer high-vacuum rectifier tubes with condenser input, the 1616, 5R4GY, 5Z3, or 80 (dependent on voltage and current) would be suitable. A 45-volt B battery in addition to resistor bias is employed on the HY-69 and HY-5514 stages, and combination cathode and resistor bias on the 53 stage — for protection only.

By experimentally keying the 53 oscillator/doubler stage alone, it was found that a 17,000-ohm bleeder across the 900-volt pack quickly drains energy from its filter when the key is opened, and thus removes traces of keying lag or chirp. Since a bleeder is required across this supply, you may prefer to use it also as a voltage divider, and thereby eliminate the dropping resistors. Or you may need no dropping resistors,
because your oscillator, doubler, and driver stages may all operate at the same potential. We preferred separate dropping resistors for flexibility in adjusting our various voltages and the bleeder current. No special treatment of the crystal stage is necessary, except that it must be one that is reasonably free from chirps.

Yes, the keying will follow a bug easily at high speeds. The keying relay used is a d.p.s.t. 115-volt a.c. Model 1177-BF Leach relay with the two poles connected in parallel and the 3/4-inch contacts adjusted to close simultaneously. To reduce sparking, a 0.1-mfd. condenser is connected across the key contacts and a 1-mfd. condenser across the relay contacts. If you can find a suitable relay with a 12-volt a.c. solenoid, sparking at the key contacts and shock hazard will be lessened. Adjustment of the dot lever of the bug is made until the plate current of the final amplifier hovers around 50 per cent of the normal value when the dot lever is held over.

This system of keying does not even sound like primary keying. Most amateurs guess it to be blocked-grid or tube keying. Needless to say, there is not a click to be heard by local hams or by BCLs, even with a kilowatt input to the final amplifier. You can make the tone as pure as you wish simply by adding filter to the final power supply. At 4000 volts, we have 5 henries, 1 µfd., 18 henries, 4 µfd., 18 henries and 4 µfd. — which at that potential is certainly an adequate filter. Actually this large filter is not necessary, and was employed only to prove that it is feasible to use a husky filter. The filter has been increased successfully to as much as 17 µfd. at 4000 volts.

There are some additional ideas in which you will be interested, if you decide to test this system. For safety’s sake, you may wish to have a high-resistance bleeder across the output of the final power supply. A one-watt one-megohm resistor for each 400 volts of power-supply potential will be satisfactory. In practice, however, you may omit this bleeder, if your bias pack is switched on and off simultaneously with your plate supplies. When the bias pack is switched off, the energy in the filter condensers is dissipated instantaneously through the static d.c. plate resistance of the final-amplifier tube.²

If your final amplifier is running well into the Class C region under saturated grid conditions, the filter for the oscillator/doubler/driver power pack need not be large. A small percentage of a.c. ripple in the grid excitation will not introduce serious hum into the output of the final amplifier, because under such Class C conditions, your final amplifier is insensitive to grid-bias modulation. Remember, however, that too little filter on this pack gives very sharp keying, but tends to modulate the note undesirably. Let your monitor be your guide.

No input choke should be included in the final grid-bias pack. Filter condensers for this pack should be capable of withstanding the full operating grid voltage, but their capacitance may be small, because current flows in this pack only when the key is up. With the key down, current flows through the grid leak in the reverse direction, and no current is supplied from the pack.³

Since the potential across the final power-supply filter remains constant (filter is always fully charged) and at the normal key-down operating value, you can readily understand why clicks and thumps are washed out better than they would be with other forms of keying. This is particularly true if the voltage regulation of the final power supply is not well-nigh perfect with other keying methods. Then, too, with this system, the power-supply filters themselves serve as excellent key-click filters.

In a nutshell, this simple plate cut-off primary keying system requires only that you: (1) key the final power supply and the combined oscillator/doubler/driver supply simultaneously in the primary, (2) connect a simple bias pack with more than cut-off potential across the grid-leak resistor of the final amplifier, (3) use no high-current bleeder for the final power supply, but (4) use a bleeder across the oscillator/doubler/driver pack which should have condenser input and an adequate but not excessively-large filter. The final power supply may have as much filter as you desire. Output voltage of the final grid-bias pack should be approximately twice the cut-off potential (for a triode, cut-off potential is the plate voltage divided by the amplification factor).

Principal advantage of the break-in system of plate cut-off primary keying described is that it is sure-fire. There is no exasperating cut-and-try of chokes, condensers and resistors for a special keying filter. Other advantages are: no clicks on broadcast or amateur bands; clean-cut fast

(Continued on page 118)
Technical Topics —

N.F.M. Reception

From the beginning of its commercialization, frequency modulation has been promoted as a noise-reducing system, permitting higher fidelity in broadcasting and a better signal-to-noise ratio in emergency services operating with mobile equipment. The latter point is of considerable interest to us amateurs; anything that will enable us to hear weaker signals through the noise level is all to the good. Practical information on how to build and adjust amateur f.m. equipment and the kind of results it will produce has appeared in QST from time to time over a period of several years. Nevertheless, except for a few more or less isolated experimenters, amateurs have made practically no use of f.m. for the purpose of obtaining a better signal-to-noise ratio in reception.

The over-all situation — a rather curious one — is this: F.m. receivers are used to some extent on v.h.f., particularly 144 Mc., as a means for obtaining better-sounding speech from modulated oscillators than can be secured with straight a.m. reception; and f.m. transmitters are used to some extent on the 28-Mc. band as a means for operating “phone without causing interference to broadcast reception. So in the one case we have a group of receivers without any transmitters and in the other a group of transmitters without f.m. receivers. And in neither case is f.m. used because of its outstanding feature, noise reduction, but because some peculiarity of the system happens to meet an amateur need better than a.m. methods.

We wonder whether this doesn’t indicate that the amateur perspective on f.m. shouldn’t have a different orientation than the commercial. Our problems are different, certainly. Below 30 Mc., our principal problem is QRM, not noise. In fact, a.m. noise-reducing systems have been developed to the point where man-made noise can be eliminated practically as well in a.m. reception as it can by an f.m. receiver, when the channel utilized is kept down to the width of an a.m. transmission. And on frequencies below 30 Mc., wide-band f.m. is out of the question.

So far, reception of narrow-band f.m. on the 28-Mc. band has been by the rather makeshift method of detuning the incoming signal so that it falls on one side of the selectivity curve and its frequency modulation is thereby converted to amplitude modulation, for later detection in the ordinary way. This has some disadvantages: the signal appears in two places, one on each slope of the selectivity curve; full use cannot be made of the receiver’s a.v.c. because detuning causes the gain to rise and thus makes the receiver much more vulnerable to a signal on a nearby frequency, as well as causing the noise to increase; the conversion from f.m. to a.m. is likely to be nonlinear, causing distortion. The frequency-modulated signal is under a handicap in such reception, as compared with an a.m. signal of the same power.

F.M. Receiver Defects

But is a true f.m. receiver a real solution to the reception problem? We have our doubts, at least for frequencies below 30 Mc. Besides increased complexity, there are two features of a conventional f.m. receiver that appear to us to be distinctly undesirable in amateur work. These are the suppression of a weaker carrier by a stronger one when the two are close to each other in frequency, and the inherent spurious responses in an f.m. receiver. The first is all right when you happen to want the stronger signal, but the usual problem is to pull the weaker fellow out from under. The phenomenon is not something that is peculiar to f.m. reception as such, incidentally; it is characteristic of any device having amplitude limiting. It just so happens that such limiting, in one form or another, is essential to f.m. reception if amplitude noise is to be suppressed.

There seems to be no way to circumvent spurious or “side” responses in an f.m. receiver. Besides the tuning that gives the main response, an additional spot can be found on each side of the main tuning where the signal will be heard again. The receiver, therefore, makes each signal appear to be three — hardly conducive to reducing interference in an amateur band! If the receiver’s selectivity curve has very steep sides the tuning width of these spurious signals will be small, but the responses are there, nevertheless. Just how serious the side responses may be depends upon a number of factors, including the signal strength, shape of the selectivity curve, the shape of the discriminator curve and its relation to the selectivity curve, and so on. Some of the newer f.m. detectors such as the ratio detector have less side response than the discriminator type. It appears to be physically impossible, however, to design an f.m. detector that will be wholly free from such responses, for the simple reason that there is of necessity always a threshold signal amplitude below which any f.m. detector, no matter how good, ceases to be responsive only to frequency modulation and not to amplitude changes. After all, any detector has to have a signal before it can do any detecting — and there is always a signal.

1 For a discussion of some of these factors, see “Some Thoughts on Amateur F.M. Reception,” QST, March, 1941.
smaller than the one it does detect. When the receiver is detuned sufficiently from an incoming carrier the signal level eventually will drop to the threshold level, and when that happens the frequency modulation on the carrier will be converted to amplitude output, creating a new response point. The fact that the output is usually distorted does not help matters particularly.

As it looks to us at the moment, these two "features" of f.m. reception are more likely to be appreciated in the absence than in the presence. They need not be introduced if we forget about noise suppression, limiters, discriminators, and the like. On the other hand, we need a better method of receiving f.m. than just detuning an a.m. receiver. For one thing, the value of "single-signal" reception has been established too long in c.w. reception — a truly comparable case — for us to tolerate two-spot tuning in 'phone work. For another, the f.m. signal doesn’t get a fair break.

**Crystal-Filter Detection**

The fact is that once the intriguing objective of obtaining a small improvement in signal-to-noise ratio is replaced by the simple one of getting good f.m. detection, the means to be found right in every good a.m. communications receiver. Crosby has pointed out that an off-neutralized crystal filter converts phase modulation to amplitude modulation, and the practical difference between phase and frequency modulation is simply the audio-response characteristic. When the phasing condenser in a crystal filter is set to neutralize the crystal-holder capacitance exactly, the crystal has an essentially symmetrical resonance curve just like any tuned circuit. However, if the phasing capacitance is slightly too small or too large, the resonance curves take the form shown in Fig. 1. The well-known rejection notch appears, either above or below the resonant point depending on whether the phasing capacitance is too small or too large, and the response on the side on which the notch is placed is reduced in comparison to the response on the other side. The point to note about these curves (which are for the crystal filter alone, without any other i.f. selectivity) is that the response drops rapidly at first as the frequency is moved away from resonance, but then flattens off. Over a moderate frequency range the energy transfer off resonance will be substantially constant, assuming that the output circuit (that is, the circuit into which the crystal filter works) is not in itself highly selective. Insofar as the crystal filter itself is concerned, this characteristic results in substantially uniform transmission of sidebands in a modulated signal when the carrier is tuned to the crystal peak. There is no progressive cutting of sidebands as the modulation frequencies become

![Fig. 1 — Typical frequency-response curves of an off-neutralized crystal filter with rejection notch set 1 kc. above resonance (upper curve) and below resonance (lower curve). (From M. G. Crosby, Proc. IRE, February, 1939.)](image)

higher provided the filter is adjusted to be as sharp as possible. With a broad filter the lower frequencies are allowed to get through with greater amplitude and hence are accentuated in the final audio response. Inasmuch as the response is greater on the side of resonance opposite to that on which the phasing notch is placed, a form of single-sideband reception results. This characteristic, useful in a.m. reception through interference, also is helpful in converting f.m. to a.m.

However, an off-neutralized filter is responsible for another effect. Off the resonance peak the filter acts as a reactance, while at resonance it looks like a comparatively low series resistance. The consequence is that if the carrier is tuned to the peak, the phase of the sidebands (which are off the peak) is shifted with respect to the carrier by 90 degrees. This 90-degree phase shift will convert phase modulation into amplitude modulation. It will also convert frequency modulation into amplitude modulation, but because of the difference between phase and frequency modulation with respect to the a.f. characteristic, frequency modulation comes out with the lower frequencies accentuated while a phase-modulated signal comes out with the audio frequencies in their proper proportions.

---


March 1947
There is nothing makeshift about this method of converting f.m. or p.m. into a.m. Since every good a.m. communications receiver has a crystal filter, no special equipment is required for n.f.m. reception. What is required is the development of an operating technique. In the first place, the filter should be set to the sharpest position and the carrier should be tuned in on the crystal peak, not set off to one side. The phasing condenser should be set not for exact neutralization but to give a rejection notch at some convenient side frequency such as 1000 cycles off resonance. There is considerable attentuation of the sidebands with such tuning, but it is not selective attenuation except for the added selectivity of the i.f. amplifier, and it can readily be overcome by using additional audio gain.

The fact that a crystal filter so used is inherently a phase-modulation detector rather than an f.m. detector brings up the question of p.m. versus a.m. at the frequencies at which this type of detection will be used. The argument that the means of reception is already at hand, without modification, in every good a.m. communications receiver strikes us as being a potent one for p.m. rather than f.m. There are at least two others on the side of p.m.: If the carrier frequency is to be stabilized — which is certainly essential in low-frequency operation — phase modulation is the natural method, and is simpler than any of the stabilized reactance-modulator methods we have seen. (It is questionable whether reactance modulation applied to a crystal oscillator actually results in frequency modulation. The “stiffness” of the crystal and the easily-demonstrated fact that sufficiently large frequency changes cannot be obtained on a static basis by varying reactances in the oscillator circuit indicate that phase modulation rather than frequency modulation is actually what takes place.) The other argument in favor of phase modulation is that, as demonstrated by Crosby in the same paper, it is less affected by selective fading in long-distance transmission than is frequency modulation. Changing from one system to the other involves nothing more serious than proper shaping of the audio-frequency characteristic, but it so happens that no special shaping is necessary in the transmitter's speech amplifier if phase-modulated output is desired from a phase-modulation system, nor is any a.f. compensation required in a crystal-filter receiver if the incoming signal is phase-modulated. Phase modulation thus represents fewer complications in low-frequency work, in addition to promising better long-distance communication than f.m. — G. O.

**Bonus for 28-Mc. Observers**

The participants in the NBS-ARRL 28-Mc. Band Observing Project recently received, and will continue to receive, a very worth-while bonus for their efforts in the form of simplified prediction charts for 28-Mc. F2 propagation throughout the world. Since part of the purpose of the project is to observe propagation on the band when it is not normally expected via the regular ionosphere layers and at times near the expected beginning and ending of regular layer transmission, these prediction charts are useful to the observers in determining these times. However, they also serve as very useful devices for judging the best time for communication over long distances, and in this respect they comprise a “bonus” for the participants in the program.

Starting in January, the Bureau of Standards is furnishing each month to its observers, in addition to the regular report forms, a set of simplified 28-Mc. prediction charts for the W, I and E zones, a CRPL base map of the world, a great-circle chart drawn to the same scale as the world map, and a sheet of transparent tracing cloth on which the transmission paths can be drawn.

---

“taking control” of amateur affairs would be eliminated.

There may remain the worry as to whether, having set up Class D and then denied such people a vote in our affairs, they would want to set up a competing society of microwave amateurs and buck us, to our damage. They’d claim they didn’t have representation, it is said, and they’d want their own magazine, and so on. We have heard it feared that there might become as many of them as there are amateurs knowing code, particularly if manufacturers bring out ready-made apparatus for them. Well, the writer of this article of course doesn’t know. It has seemed to our Board that there is no room to worry on such scores. We all have at least speculative interest in the microwaves and QST proposes to look after our needs for adequate information in that field. The Board, in making recommendations to FCC for changes in technical regulations, of course will always be willing to listen to the suggestions of those most active with the frequencies; the League, in short, will expect to continue to represent microwave men. The outlook is that u.h.f. and v.h.f. work will always remain relatively expensive and difficult, with rather unattractive returns in miles per dollar or hour of work. That is enough to interest the particular class of person but it is not believed that it will ever have the widespread appeal that will result in numbers that could be dangerous to our other interests.

* * *

That describes the proposal and the question now is on what you think of it. Every licensed amateur in the United States, League member or not, is invited to respond by means of the detachable card* in this article. You are requested to consider the pros and cons and decide whether you think it advantageous to amateur radio to request such a Class D license. You will wish to study whether you think the reasons are sound, whether or not it is in our long-term interest to have such an arrangement, whether or not you consider the various safeguarding provisions adequately protect us from possibilities of harm while giving us the benefits of the plan. Your responses will constitute an advisory, informative poll of amateur opinion to help guide the Board in its decision on this matter this spring. The Board wants to know how you regard it, and the subject is presented to you for expression at the Board’s order. R.a.v. p.!

* At the Board’s instruction this card provides for simple yes or no expressions on the pending plan as described, to be sent to ARRL Headquarters for tabulation and report to the directors. If you have further comments or suggestions they should be sent direct to your division director, whose name and address you will find listed in the front of this issue.

A.R.R.L. QSL BUREAU

For the convenience of American and Canadian amateurs, the League maintains a QSL-card distributing system which operates through volunteer “District QSL Managers” in each call area. To secure such foreign cards as may be received for you, send your district manager a standard No. 10 stamped self-addressed envelope. If you have reason to expect a considerable number of cards, put on an extra stamp so that it has a total of six cents postage. Your own name and address go in the customary place on the face, and your station call should be printed prominently in the upper left-hand corner. If you have held other calls in previous years, submit an envelope for each such call to the proper manager — there are many thousands of uncalled-for cards in the files. All incoming cards are routed by Hq. to the home district of the call shown in the address. Therefore, cards for portable operation in other districts should be obtained from the home-district manager.

W1 — Charles Mellen, W1FH, 320 Cornell St., Boston, Mass.
W2 — Henry W. Yahnel, W2SN, Lake Ave., Helmetta, N. J.
W3 — Maurice W. Downa, W3WU, 1311 Sheridan St., N. W., Washington 11, D. C.
W4 — Edward J. Collins, W4MS, 1003 E. Blount St., Pensacola, Fla.
W5 — L. W. May, jr., W5AJG, 9428 Hobart St., Dallas 18, Texas.
W6 — Monroe R. Greer, W6TI, 414 Fairmount Ave., Oakland, Calif.
W7 — Frank E. Pratt, W7DZK, 5023 S. Ferry St., Tacoma, Wash.
W8 — Fred W. Allen, W8GER, 1959 Riverside Drive, Dayton 5, Ohio.
W9 — F. Claude Moore, W9HLF, 1024 Henrietta St., Pekin, Ill.
W9 — Alva A. Smith, W9DMA, 238 East Main St., Caledonia, Minn.
VE1 — L. J. Fader, VE1FQ, 123 Henry St., Halifax, N. S.
VE2 — C. W. Skareted, VE2DR, 3821 Girard Ave., Montreal 26, P. Q.
VE3 — W. Bert Esowles, VE3OB, Lanark, Ont.
VE4 — C. J. Campbell, VE4CC, 270 Ash St., Winnipeg, Manitoba.
VE5 — Fred Ward, VE5OF, 809 Connaught Ave., Moose Jaw, Sask.
VE7 — H. R. Hough, VE7HR, 1785 Emerson St., Victoria, B. C.
VE8 — Yukon A. R. C., P. O. Box 268, Whitehorse, Y. T.
K4, KP4 — E. W. Mayer, KP4KD, P. O. Box 1061, San Juan, P. R.
K5, K5G — Signal Officer, K5AA, Quarry Heights, Canal Zone.
K6, K6D — Andy H. Fuchikami, K6BBA, 2543 Nanmuu Dr., Honolulu, T. H.
K7, K7J — J. W. McKinley, K7CK, Box 1533, Juneau, Alaska.

**SWITCH TO SAFETY!**
Navy Day—1946

The eighteenth Navy Day Receiving Competition, conducted jointly by ARRL and the Navy Department, was held on October 27, 1946. A message to radio amateurs from the Secretary of the Navy was transmitted on pre-announced schedule from stations NSS, Washington, and NPG, San Francisco. Transmission was at approximately 25 words per minute.

Special letters of appreciation from the Secretary of the Navy were offered to those amateurs making perfect copy of either station. Fifty-eight such letters have been awarded. Copy was submitted by a total of 202 operators, 47 of whom copied both NSS and NPG. A total of 74 participants were present or former members of the Naval Service.

All contestants are listed on the Honor Roll. Many made the mistake of attempting to correct transmission errors when submitting copy. A tip for future competitions — do not recopy; submit your original copy! Congratulations to the letter winners! — E. L. B.

1946 Navy Day Honor Roll
Letter Winners

Other Participants

1946 Navy Day Message

During the recent war it was found that the Armed Forces received a great benefit in communications from the large number of qualified radio operators who were prepared to step from their civilian lives into the military radio circuits and take over the watches. These individuals were the so-called ham operators who had spent so many hours honing their hobby or avocational building sets and perfecting themselves in the techniques of operating to the extent that they were ready to go. On this Navy Day, it is my pleasure to extend my greetings and those of the nation to those little-publicized individuals who have spent so many hours punching their keys and maintaining their sets to carry the word in the successful prosecution of a vast war against our enemies.

Naval communications has found such an enormous bulk in the ranks of the amateurs and the reserves that the entire Naval Service and the nation are happy to express their gratitude and appreciation on this occasion of renewing the Navy Day Broadcast to the radio operators of the United States and its possessions. Should the occasion arise which might require your mobilization again, we are confident of your response and your capability whereby we could promptly restore our Navy to its high operating standards which existed during hostilities.

The Secretary of the Navy

Letter of Commendation

The Secretary of the Navy
Washington

Dear .

With the recent war brought to a successful conclusion, it is gratifying to note the resumption of interest and participation in the art of radiotelegraphy displayed by the American Radio Amateurs. Many of you have served with the United States Navy during the war and your self-imposed training prior to the emergency served to promptly fit you for active duty. Manning the radio circuits which were so vital to conduct all types of naval operations, we are gratefully appreciative of the continued interest in naval affairs.

In your own case we have been notified by the American Radio Relay League, without whose cooperation the renewal of this annual event would not be possible, that you have submitted a perfect copy of the Navy Day Broadcast.

I extend to you personal congratulations on your ability and my appreciation of your interest in copying this broadcast.

Sincerely,

James Forrestal

Text of the Message Transmitted from NSS
An Improved Receiver for Two Meters

Increased Selectivity and Sensitivity to Cope with Today’s Conditions

BY CALVIN F. HADLOCK,* W1CTW

Anyone around Boston who has operated on 144 Mc. when a temperature inversion was dumping S9 signals into his lap from distances of 100 miles and over does not need to be convinced that the straight superregenerative receiver is far from adequate. At such times, the band sounds not unlike 75-meter ‘phone from the point of view of occupancy and QRM.

Although the receiver described in the May, 1946, issue of QST had given the writer good service, it was felt that a still better receiver could be built and used to advantage, since the quality of many signals has improved to the point where a sharper receiver is both desirable and practical. Four objectives were to be kept in mind: first, better selectivity; second, improved sensitivity; third, no radiation within the band limits; and fourth, a design that the average amateur with a minimum of equipment and experience could build and make work.

Design Considerations

Selectivity should be in the order of 75 kc. bandwidth at 20 db. (10 times) down. The bandwidth should remain reasonably sharp when signals of local intensity are received, in contrast to the ordinary superregenerative receiver which broadens out very rapidly with increases in signal level. A sensitivity better than 0.5 microvolt was desired and it was hoped to get down to 0.1 microvolt. Radiation within the two-meter band limits, even without an r.f. stage, would be eliminated through the use of a superheterodyne circuit with an i.f. of at least 4 Mc.

Three versions of this circuit were taken under consideration; first, a straight superheterodyne in which the i.f. stages were all on one frequency, using a conventional a.m. detector; second, a double-conversion circuit; and third, a superheterodyne using a superregenerative second detector. Since one cannot expect much gain from the r.f. section of a 2-meter receiver, it becomes necessary to get practically all the gain from the i.f. and audio amplifiers. Hum and motorboating limit the amount of audio gain that can be used, so it is up to the i.f. amplifier to provide the rest. It was felt that the i.f. sensitivity alone should get down to at least one microvolt.

A half-hearted attempt was made to build an i.f. amplifier using three stages tuned to 10.7 Mc. but it soon became apparent that to reach our desired sensitivity level, and still have the receiver remain stable, would require shielding, by-passing and care in location of parts that might be beyond the ability or desire of the average ham.

A double-conversion circuit was next considered. This circuit would be easier to stabilize, as only part of the i.f. gain would be on 10.7 Mc. while the rest would be on a different frequency, say 1.6 Mc. However, a second conversion oscillator is required and this must be chosen to avoid "birdies" from oscillator harmonics in the 2-meter band. This, too, was somewhat involved.

Ed Tilton’s article in the September issue of QST started us thinking along the lines of the superregenerative second detector. With only one i.f. stage, it should not be difficult to keep the system stable, and the superregenerative

Fig. 1 — Schematic diagram of the 144-Mc. superhet.

C1, C2 — 25-µfd. 50-volt electrolytic.
C3 — 0.01-µfd. paper.
C4 — 0.5-µfd. paper.
C5 — 0.006 to 0.01-µfd. mica.
C6 — 75-µfd. ceramic.
C7 — 470-µfd. mica.
C8 — 0.002-µfd. mica.
C9, C10 — 35-µfd. ceramic.
C11 — 10-µfd. ceramic, 0.0007 negative temperature coefficient.
C12 — 47-µfd. ceramic.
C13 — Small double-stator variable — see text.
C14 — 25-µfd. 50-volt electrolytic.
C15 — National Type PSR-25 reduced to 2 rotors and 2 stators.
C16 — 470-µfd. ceramic.
C17 — 47-µfd. special enclosed ceramic — National XLA-C.
C18 — 20-µfd. ceramic.
C19 — National Type UM-10D.
R1 — 470 ohms, 2 watts.
R2 — 0.47 megohm, ½ watt.
R3 — 0.1 megohm, ½ watt.
R4 — 4700 ohms, ½ watt.
R5 — 0.5-megohm potentiometer.
R6, R7 — 0.27 megohm, ½ watt.
R8 — 50,000-ohm potentiometer.
R9 — 4700 ohms, ½ watt.
R10 — 10 megohms, ½ watt.
R11, R12, R13 — 47,000 ohms, ½ watt.
R14 — 270 ohms, ½ watt.
R15 — 20,000 ohms, ½ watt.
R16 — 33,000 ohms, ½ watt.
R17 — 420 ohms, ½ watt.
R18 — 1 ½ turns No. 14 solid wire, about ½-inch diam.
R19, R20 — 1 ½ turns No. 14 solid wire, about ½-inch diam.
R21 — 2 ½ turns No. 14 solid wire, about ½-inch diam.
J1 — Multicircuit jack.
RFC1 — 250-mh. choke (National Type SA-52-N).
RFC2 — 750-µh. choke (National Type R-33 or two pieces of a National R-100 choke).
RFC3 — National Type R-100 choke.
S1 — S.p.s.t. switch.
T1 — 4:1 interstage audio transformer (National Type SA-100).
T2 — National Type IFN revised — see text.
T3 — 10-Mc. i.f. transformer (National Type IFN).

The receiver (Fig. 1) was built backward, starting from the 'speaker and working toward the antenna. The audio amplifier uses a Type 6J5 triode resistance-coupled to a Type 6V6GT output tube. A 'phone jack is provided which cuts out the 'speaker output when the 'phones are plugged in, and an audio gain control is inserted at the grid of the 6J5. Crystal-controlled signals give comfortable volume with the audio gain control turned up about halfway.

detector is well known for its sensitivity, a.v.c., noise-limiting action and simplicity. With the aid of a double-tuned intermediate-frequency transformer operated at a low frequency, the selectivity might be acceptable. Although being somewhat prematurely cold to superregeneration and knowing that it becomes increasingly difficult to get smooth action without squealing as the frequency is decreased, it was decided to give it a try.

Circuit Details

The receiver (Fig. 1) was built backward, starting from the 'speaker and working toward the antenna. The audio amplifier uses a Type 6J5 triode resistance-coupled to a Type 6V6GT output tube. A 'phone jack is provided which cuts out the 'speaker output when the 'phones are plugged in, and an audio gain control is inserted at the grid of the 6J5. Crystal-controlled signals give comfortable volume with the audio gain control turned up about halfway.
The i.f. amplifier uses a 6SG7 tube in a conventional amplifier circuit. The heart of the receiver is the superregenerative second detector. Several types of tubes were tried here. The 6C4 and 6J5 oscillate very well and go into oscillation at less than 10 volts, but they are prone to squeal too easily and too soon after the regeneration control is turned past the point at which superregeneration begins. A 6C5 was much better in this respect but it is an antiquated type, having been replaced commercially by the 6J5, and it may be difficult to obtain. It was found that a 6S37, triode-connected, with the plate, suppressor and screen grids tied together, worked equally well. A Type 6SK7, also triode-connected, was found to work best of all, going into superregeneration very smoothly and slowly, and it did not squeal badly at the higher voltages. Metal tubes were used in the circuits mentioned so far, as there were no electrical advantages to be gained by using the more expensive miniature tubes and no attempt was being made to save space.

It will be noticed that the fundamental superregenerative circuit is very similar to that in the previously-mentioned article by W1HDQ. Since a ready-made i.f. transformer was used between the mixer and first i.f. amplifier, it was thought that a similar transformer might be used for the superregenerative tank circuit by merely removing the upper winding from the coil form, leaving a single coil resonated by a 100-µfd. fixed condenser and tuned by an iron slug. This tank did not oscillate well, however, and it was necessary to rewind it to provide a higher L/C ratio. The winding was removed and rewound, starting at the same point on the form and using the same size (No. 26) enamelled wire, following the grooves as far as they went and then merely close-winding until there was a total of thirty turns. The condenser which resonated the coil was replaced by a small 20-µfd. ceramic condenser and the coil is tuned with the iron plug as before. If the iron plug tunes too far out of the coil to provide leeway, it may be necessary to remove two or three turns until the coil can be tuned easily to 10.7 Mc., which is the nominal frequency for which the transformer is designed.

A 10-megohm resistor is connected directly to the grid and plate of the 6SK7. The 6SG7 amplifier is impedance-coupled to the grid side of the superregenerative tank through 50 to 75 µfd. The values of this condenser and the 6SK7 grid condenser are fairly critical. The plate voltage is fed to the superregenerative detector through a 750-µh. r.f. choke. This choke is also critical but two pies of an R-100 choke should work quite well. It will be noticed that this choke is shunted by a resistor, the value of which can be adjusted to suppress the squeal which may appear when the regeneration control is advanced beyond the threshold of superregeneration.

The condenser C5 produces the quench action. The required value may vary and should be adjusted for best superregeneration, the optimum value lying between 0.006 and 0.01 µfd. It will also affect the audio fidelity, cutting highs quite strongly, thereby reducing the hiss produced by superregeneration action and producing a low ratio of hiss to audio output. The choke RFC1 should be a real husky one as this choke falls most of the work of keeping the quench frequency from getting into the audio amplifier. The audio transformer is a 4:1 interstage unit. Transformer coupling is not used for the second audio stage as this results in too much audio gain and is apt to produce a high hum level. High hum level may come from pick-up in the audio transformer if the receiver is located too close to the power supply, the chief reason why a built-in power supply was not used. If the amount of hiss or highs in the audio system still seems to be more than is desirable, a 100- or 250-µfd. condenser could be tried as a by-pass across the secondary of the audio transformer or from plate to ground on the 6J5 first-audio tube. Experimentation with the various components pertaining to the superregenerative detector is worth while to get smooth operation, but the final adjustment should be made after both the first i.f. and superregeneration transformers have been tuned to 10.7 Mc.

The screen by-pass condenser on the 6SG7 i.f. amplifier can be laid across the middle of the socket to provide additional screening between the grid and plate circuits. The cathode by-pass must be fairly large, at least 0.002 µfd.

The mixer circuit that is used is identical with the one which was worked out for the converter described by the writer in the May, 1946, issue of QST, except that the primary of the i.f. transformer is connected into the plate circuit in the conventional manner. It will be noticed that the screen voltage of the mixer is quite low, as a result of the use of a one-megohm resistor. This had been adjusted for optimum conversion gain.

March 1947
The high-frequency oscillator uses a 6C4 tube. A Type 002 could be used but the 6C4 is a husky tube and a good oscillator at this frequency, and it was felt that the oscillator frequency drift might be kept down if the larger tube were used. A split-stator condenser is used with the rotor floating, to prevent noise resulting from variable or poor contact. This rotor is driven through a flexible coupling and a bakelite shaft. The oscillator coil is mounted above the condenser from stator to stator and a small 10-pfd. ceramic condenser is also connected between the stators, making the circuit relatively high-C and reducing the tuning range of the variable condenser. The ceramic condenser should have a high negative temperature coefficient and it can be pushed toward the tube a bit to produce some temperature compensation, although the leads should be kept short.

By squeezing the coil and pulling plates off the condenser, the receiver described was made to tune from 15 to 110 on the 100-division dial scale. With this spread it was found that S9 stable signals occupied about two divisions on the dial, providing very comfortable tuning with the vernier dial. The coupling between the oscillator and mixer is very loose. Stray coupling alone might be sufficient, but a short piece of wire was used just to be sure, one end being connected to an unused contact on the 6C4 tube socket, while the other was wrapped around the 6AK5 grid condenser. At this point, the addition of a tuned circuit connected to the mixer grid completes the receiver in its simplest form and very good performance will be obtained by connecting the antenna coupling coil closely to this input tank coil.

Adjustments

If the receiver is built at home where a signal generator is not available, a signal at approximately 10.7 Mc. can be obtained by using the high-frequency oscillator of a short-wave communications receiver. Practically all receivers run the oscillator on the high-frequency side of the signal and can be set approximately to 10.7 Mc. by tuning the receiver dial to a frequency which is lower than 10.7 Mc. by the frequency of the I.f. amplifier used in that receiver. For example, if the intermediate frequency of the receiver is 406 kc., set the dial to 10.25 Mc. The oscillator will then be at 10.7 Mc. and its radiation can be picked up by connecting a wire to the grid of the mixer and bringing this wire near enough to the oscillator tank of the communications receiver to pick up a suitable amount of voltage from it. The signal thus obtained will be unmodulated and the I.f. amplifier and super-regenerative detector can be trimmed up for maximum quieting of the superregeneration hiss.

About the only satisfactory manner of checking sensitivity when using a superregenerative receiver is to use the quieting action of an unmodulated carrier input as a criterion. In all sensitivity checks made on this receiver, the input was read when a quieting action equivalent to an S5 signal was obtained. A Measurements signal generator was used with a 50-ohm coaxial output cable, and a sensitivity of one microvolt was reached when the generator was connected directly to either the grid of the 6SG7 or the 6AK5 mixer. This would seem to indicate no gain through the mixer tube but we are not interested in this but rather in the conversion gain obtained at 144-148 Mc.

With the signal generator coupled by means of a two-turn pick-up coil soldered to the end of the generator cable and with the high-frequency oscillator in operation, a sensitivity of 0.25 to 0.3 microvolt was obtained at 2 meters. There is a slight interlocking effect between the oscillator and the mixer input tank. The latter can be tuned up in the middle of the band and left alone unless the antenna or antenna coupling is changed. When tuning it up in the middle of the band, the two controls should be rocked until a setting of the mixer condenser is found which produces the maximum quieting action. A weak signal should be used for this adjustment. If the antenna is coupled directly to the mixer grid coil, care must be taken to keep 10.7-Mc. signals
from getting into the mixer grid by capacity coupling from the antenna system. The grid coupling condenser \( C'_{12} \) and grid resistor \( R_{14} \) should be connected directly to the grid contact, the tube may require a shield, the feeders should be kept away from the tube and its socket wiring, and the mixer input tank should be grounded with as short a connection as possible. With a grounded antenna system such as a coaxial feeder type, no trouble should be experienced but with a two-wire feeder type where the entire system is floating, a ground of some sort such as a quarter-wave grounded stub will undoubtedly be necessary.

The receiver as described so far should not be difficult for the average ham to construct and adjust. One warning should be given, however. Some of the parts are quite critical. A good single-peaked intermediate-frequency transformer should be used; if a double-peaked or broad transformer designed for use in f.m. broadcast receivers is used, a loss in selectivity and possibly sensitivity will result. If the circuit diagram and parts list are followed carefully the receiver should work efficiently and smoothly but if the constructor makes changes or substitutions he should do so with care and — well, “You’re on your own.”

After using the receiver for some time, the writer felt that the addition of an r.f. stage would be interesting and useful. A band-pass r.f. stage appeared to offer an out from the necessity of ganging and tracking several tuned circuits. It would eliminate any trouble from 10.7-Mc. pick-up by the mixer, and it would provide some improvement in image rejection and sensitivity. That 0.1-microvolt limit on the signal-generator attenuator looked inviting, so, although we got into a number of arguments as to “how much is 0.1 microvolt?,” it was decided to try to get the sensitivity down to that point. Alignment of the band-pass r.f. stage may be beyond the capabilities of some inexperienced amateurs, but the time and effort required are well worth while if the constructor feels equal to the task.

The first consideration, of course, was the tube to be used. Although the 6AK5, 6J4 and other recent tubes are reputed to give more gain than the lowly 954, it was believed that the difference in practice is not so great as is often expected. The \( G_m \) of the 954 is considerably less than that of the newer tubes; and, at lower frequencies, where the gain of a pentode is proportional to \( G_m \), there would be no question as to the best choice of tubes. At 150 Mc., however, another factor demands consideration. This is the input conductance. A “figure of merit” at this frequency should take into consideration both the \( G_m \) and the input conductance and in this second respect the 954 is much better than the high-\( G_m \) tubes. Moreover, the construction of the acorn provides an easy means of isolating the input and output tanks by putting one above and the other below the chassis. The Type XLA acorn socket is mounted below the chassis so that the grid end of the tube extends upward through a hole to be connected to the antenna input circuit above. This tank is tuned from the front panel, though the control is seldom used.

The acorn socket has seven contacts, two of which will not be used and are removed. The nut was removed from one heater contact and the suppressor grid contact, and the grounding block put in its place. The screws and nuts from the cathode and screen-grid contacts were removed and were replaced by the Type XLA-C ceramic by-pass condensers which are supplied especially for use with these sockets. They are completely enclosed in the socket itself and have two tabs which, after the Type XLA-S grounding shield is put in place, are soldered to this shield to provide a ground.

The only difficult part of this arrangement was the alignment of the circuits coupling the r.f. plate to the mixer grid. These use National PSR-25 condensers with all but two rotor and two stator plates removed. The coils have to be trimmed so that they will tune up with reasonable leeway and the coupling is adjusted to produce a certain amount of over-coupling. When they were finally adjusted, two peaks were obtained, occurring at approximately 144.7 and 147.3 Mc. The dip in the middle was down about 3 db, but this dip is filled in by the antenna tank which is tuned to 146 Mc. and, of course, has a single peak. The over-all band-pass characteristic is, therefore, essentially flat.

To line up the over-coupled tanks, it is necessary to eliminate the selectivity of the intermediate-frequency amplifier and the antenna tank. This is done by connecting the coaxial cable of the generator directly to the 954 grid and removing the 6SK7 detector tube. Modulation is applied to the generator and the 6AK5 mixer is operated as an ordinary detector. The audio voltage developed in the plate circuit across the decoupling resistor \( R_{13} \) is fed by means of a large condenser into the primary of the audio transformer and thence through the audio amplifier. Headphones had to be used as the audio amplifier howled if the loudspeaker were used. The input signal was run up to a level at which the modulation could be heard. Then the coupling and tuning of the two circuits were adjusted to give the band-pass characteristic just described. This is quite difficult, as anyone knows who has worked with over-coupled circuits, but eventually, after considerable effort, the desired condition can be met.

**Performance with R.F. Stage**

After the band-pass circuits were aligned, the sensitivity was checked and it was found that the desired 0.1-microvolt level was reached, but with no leeway. This showed a gain of 2½ to 3 times or...
about 8 db. in the r.f. stage which is equivalent to that of a very respectable beam antenna. The image ratio had increased from 22 db. to over 60 db. The selectivity was as follows: 2 times down (6 db.) — 40 kc.; 10 times down (20 db.) — 70 kc.; 1000 times down (60 db.) — 125 kc.; 100,000 times down (100 db.) — 600 kc. On the air the receiver performed very well. After the wind pulled the feeders off my 16-element beam and I went back to using a dipole, I found that I was hearing signals with the dipole as well as I used to hear them with the old receiver with the 16-element beam! The 2-meter band covers 75 dial divisions and S9+ signals occupy two divisions. The boys who operate mobile just behind me on the hill now occupy less than three divisions and a mobile rig operating about thirty-five feet from the antenna occupies 6 divisions.

The receiver described so far was meant for 2-meter reception only. However, James Ornets, who is hoping to be licensed soon, has built up a general-coverage receiver using ganged condensers and plug-in coils, which has a continuous range from 27 to 250 Mc. It has no r.f. stage but the performance duplicates the previously-described receiver at 2 meters without that stage. It is equally sensitive at 1¼ meters and is still better at 6 and 10 meters. At 50 Mc. it looks particularly good. It is enough broader than the usual communications receiver to make it easier to handle, yet its selectivity is adequate in view of the occupancy of this band. Credit should be given to Jimmy for several ideas that he contributed, especially in regard to the performance of the superregenerative circuit.

It is hoped that the material described here will help other amateurs to get more out of their operation on 2 meters. Many hams think that any piece of junk is good enough for 144 Mc., but the writer believes that with a good transmitter, receiver and antenna, you will get a lot more out of the band at any location.

**Silent Keys**

It is with deep regret that we record the passing of these amateurs:

- W1HGV, Ralph W. Fiske, Milford, N. H.
- W2WIF, Roy W. Wooliacott, Rochester, N. Y.
- W4PAO, George H. Pinney, Orange City, Florida.
- W5KHR, George A. Williams, Jr., Provencal, La.
- W6NRC, Harold B. Savage, Jr., San Diego, Calif.
- W8IFQ, Thorvald Petersen, Ludington, Mich.
- W9FNH/3, Grover H. Helmer, Minneapolis, Minn.
- W9IUU, David Rayfoil, Chicago, Ill.
- W9KVB, Elmer O. Calder, Council Bluffs, Iowa.
- W9LPB, John W. Stoller, Jeffersonville, Ind.
- W6JVL, Max H. Lohse, Omaha, Neb.
- G2VG, Col. F. E. Wenger, Newcastle, Staffs.
- Ex-VE7KN, Harry Meek, Vernon, B. C.

General-coverage receiver for 27-250 Mc. The audio tubes are on the right. The mixer is the miniature (6AK5) next to the 'speaker. The oscillator (9002) is next to the PW dial drive. The tuning condensers are handmade double-stator units with floating rotors. The second detector is the metal tube behind the dial drive and the i.f. tube is between the two transformers. A 5-inch p.m. 'speaker is used. The shaft in the center is for the r.f. input trimmer. The leads from tuning condenser to tube sockets are extremely short, resulting in excellent performance on 1¼ meters.
CONFERENCE PREPARATIONS

The major nations are now hard at work preparing their proposals for this year's world telecommunications conference. Although the place and date are still not entirely settled, the outlook as we write is that the portion of the conference concerned with revising the regulations will open at Atlantic City, N. J., on May 15th.

We wish that every amateur would read A. L. Budlong's report of the Moscow five-power preparatory meeting which we published on page 25 of our January issue. He was ARRL's representative at that conference. Since December 2nd he has also sat daily in Washington as a member of the Department of State's government-industry committee which, against the Moscow background, is making the final revisions of the United States proposals for the world conference. At this writing that work isn't finished and a detailed report of it must await a later issue; but up to this writing the U.S. plans maintain all our existing bands above 3.5 Mc. and continue the proposal of a new band at 21-21.5 Mc.

It is apparent that 1947 will be a very busy year for us. Although we may expect the unrelenting protection of the United States delegation, it is to be expected that the divergent viewpoints of various foreign nations will produce the usual severe fight over the preservation of our rights. For several years back, the League has participated actively in the formulation of U.S. postwar radio plans and of course it will be constantly represented at the world conference, where these plans meet their final test. Watch QST for news of further conference developments.

MORE LICENSE EXTENSIONS

Because of the confusion in determining the expiration dates of amateur licenses, as we have mentioned in these pages, FCC made a clean sweep and replaced its four previous extension orders with a new one, Order No. 115-C, on January 3rd, which should clarify the matter forever. As a result of this further extension, there will now be no expiration of licenses in 1947. Every amateur operator license originally issued for a term of three years, anywhere in the period from three years before Pearl Harbor up to the end of 1945 (and not since surrendered or suspended or renewed) will now expire on the 1948 anniversary of its date of issuance. Station licenses expire concurrently with the operator licenses. This should make the matter clear to everybody. Below is the complete text of the order:

At a meeting of the Federal Communications Commission held at its offices in Washington, D. C., on the 3rd day of January, 1947;

WHEREAS, The Commission has, by Orders 115, 115-A, 115-B, and 130-F, adopted between May 25, 1943, and April 7, 1946, reinstated and extended certain amateur operator licenses issued on or before December 7, 1945, and December 7, 1943, so that the expiration dates of those amateur operator licenses fell within the period December 7, 1946, and December 7, 1947, and validated certain amateur station licenses for the term, as extended, of the amateur operator licenses held by the licensee of the station; and

WHEREAS, It is now desirable to establish a clear and uniform understanding of the status of all amateur operator and station licenses and to eliminate the effects of certain misunderstandings that have occurred in connection with the application of the above-mentioned orders and to provide for the orderly processing of applications for new, renewed, or modified amateur licenses;

IT IS ORDERED, That all amateur operator licenses issued on or before December 7, 1938, and December 31, 1944, except amateur operator licenses hereafter at any time or hereafter revoked or voluntarily surrendered, are hereby extended, and if expired on or since December 7, 1946, are hereby reinstated and extended, until 1948, at 3 A.M., Eastern Standard Time, the same day and month as the date of issuance.

IT IS FURTHER ORDERED, That all amateur station licenses held by operators whose operator licenses are extended, or reinstated and extended, by this Order, except amateur station licenses hereafter at any time or hereafter revoked or voluntarily surrendered, are concurrently with the operator licenses. This should make the matter clear to everybody. Below is the complete text of the order:

At a meeting of the Federal Communications Commission held at its offices in Washington, D. C., on the 3rd day of January, 1947;

WHEREAS, The Commission has, by Orders 115, 115-A, 115-B, and 130-F, adopted between May 25, 1943, and April 7, 1946, reinstated and extended certain amateur operator licenses issued on or before December 7, 1945, and December 7, 1943, so that the expiration dates of those amateur operator licenses fell within the period December 7, 1946, and December 7, 1947, and validated certain amateur operator licenses issued on or before December 7, 1946, and December 7, 1947, and validated certain amateur station licenses for the term, as extended, of the amateur operator licenses held by the licensee of the station; and

WHEREAS, It is now desirable to establish a clear and uniform understanding of the status of all amateur operator and station licenses and to eliminate the effects of certain misunderstandings that have occurred in connection with the application of the above-mentioned orders and to provide for the orderly processing of applications for new, renewed, or modified amateur licenses;

IT IS ORDERED, That all amateur operator licenses issued on or before December 7, 1938, and December 31, 1944, except amateur operator licenses hereafter at any time or hereafter revoked or voluntarily surrendered, are hereby extended, and if expired on or since December 7, 1946, are hereby reinstated and extended, until 1948, at 3 A.M., Eastern Standard Time, the same day and month as the date of issuance.

IT IS FURTHER ORDERED, That all amateur station licenses held by operators whose operator licenses are extended, or reinstated and extended, by this Order, except amateur station licenses hereafter at any time or hereafter revoked or voluntarily surrendered, are hereby extended, and if expired on or since December 7, 1946, are hereby reinstated and validated, for the term, as extended, of the operator license held by the licensee of the station;

IT IS FURTHER FOUND AND ORDERED, That, WHEREAS, Authority for this Order is contained in Sections 303(8) and (r) of the Communications Act of 1934, as amended, and the effect of the Order is to extend for an additional period after December 7, 1946, the relief from certain restrictions as has been or now is afforded by Commission Orders 115, 115-A, 115-B and 130-F, and is non-controversial, and it is in the public interest that this Order be made effective immediately, notice and public procedure required by Section 4 of the Administrative Procedure Act are, hereby, Found Unnecessary, and this Order SHOULD BE, AND IS HEREBY, MADE EFFECTIVE IMMEDIATELY.

There's another way of putting this, if yours is the ordinary case of an active amateur whose licenses have not been surrendered, revoked or suspended. FCC began issuing five-year licenses the first of 1946. These of course will normally run their stated term. Up to the first of 1946 all amateur licenses were issued for a term of three years. If yours is still one of these licenses originally issued for three years, it now expires on its date in 1948. It's on the basis of calendar years now, too — no more worrying about December 7th instead of December 31st.
ARE YOU LICENSED?

- When joining the League or renewing your membership, it is important that you show whether you have an amateur license, either station or operator. Please state your call and/or the class of operator license held, that we may verify your classification.

Canadian Department of Munitions & Supply at Washington, removing after the war to Toronto. He is an ardent ham and has been for many years a contributor to QST.

"A PLAN FOR THE 10-METER BAND"

Under the above title we had an article on page 26 of QST for December, presenting for your inspection a plan for an improved subdivision of the 10-meter band which the ARRL Board of Directors has under study and which it intends to consider finally at its meeting in May. Members were requested to write their directors their opinion of the plan, pro or con, with any suggestions that occur for its improvement. We hear from several of the directors that the response has been very small and that little interest seems to be shown in the subject. This is your opportunity to express yourself and your director wants to know what you think of the proposal. Dig out December QST, refresh yourself, and drop him a card.

RESIGNATION OF BAKER

At the very beginning of his term of office, Frank L. Baker, W1ALP, the popular alternate director of the New England Division, developed a business connection as a radio salesman which made him ineligible to continue in that office and under the necessity of offering his resignation. The League has accepted it with regret. The office remains vacant.

NOTICE TO MEMBERS DISCHARGED FROM THE MILITARY SERVICES

The requirement of continuous membership in the League for eligibility to ARRL offices has been waived for members serving in the uniform of the United States or Canada. See particulars on page 27 of QST for July last. Those desirous of taking advantage of this arrangement are required to claim the right when renewing membership, stating the beginning and ending dates of their military service.

SWITCH TO SAFETY!
The BC-221 Frequency Meter as a VFO

A Combination Crystal and Variable-Frequency Exciter for Transmitter Control

BY HOWARD W. JOHNSON, W7NU

In an earlier issue of QST the use of surplus military frequency meters as frequency-control units in transmitters was suggested. This article shows how one of these meters may be made to serve as a calibrated highly-stable VFO exciter without impairing its use as a frequency meter. Not the least attractive feature of this unit is that the oscillator is sufficiently well-shielded so that it need not be keyed for break-in work, thereby minimizing the problem of good keying.

The already crowded conditions on the amateur bands plus the rapid influx of new operators have made variable-frequency exciters a necessity rather than a luxury. The subject of spot-frequency operation has been well enough covered recently so that no amateur has to be sold on its merit. It can almost be said that if two or more stations would use the same frequency during contacts, there would be twice as much effective space in the bands as there is now. This is not quite true, because many amateurs are following this practice at the present time. Obviously we can't zero-beat stations operating outside the American bands!

It is desirable that the VFO be variable only at the will of the operator; too many of those built without proper care have ideas of their own on the subject and seem to want to be constantly variable. Let's take a look at the desirable features which should be incorporated in a variable-frequency exciter for amateur use.

1) Stability: This is the primary consideration and should mean stability under vibration, temperature variation, and load variation.

2) Calibration: The combination of stability and accurate calibration are the two things which help to insure operation within the band limits.

3) Keying: The exciter should be capable of being keyed for break-in operation without being heard in the receiver with the key open, and should be free from transients or chirps.

4) Output: This will vary with transmitter requirements, but in general the output should be from two to five watts and preferably at low impedance to allow the exciter to be located at the operating position.

5) Crystals: It is desirable but not necessary to have one crystal on each band for use in band-edge operation.

Most of the commercially-available VFO exciters satisfy the first fairly well. As for the second, very few of them have calibration accurate enough for dependable operation adjacent to band edges. The third requirement is seldom met in commercial models, since it is necessary to key the oscillator for spot-frequency break-in work and this cannot be done without chirps or clicks to a greater or lesser degree.

The power output mentioned in the fourth consideration is more than ample in some of the models available. It is the opinion of the author...
Fig. 1 — Circuit diagram of the BC-221 VFO unit.

C₁, C₃, C₅, C₇, C₉, C₁₀, C₁₄, C₁₅, C₁₆ — 0.006-µfd. mica.
C₂, C₇, C₈ — 100-µfd. mica.
C₁₁, C₁₃ — 50-µfd. variable.
C₁₂, C₁₇ — 75-µfd. variable.
C₁₈, C₂₀, C₂₁ — 8-µfd. 450-volt electrolytic.
R₁, R₃ — 0.47 megohm, 1 watt.
R₁₀ — 22,000 ohms, 1 watt.
R₁₂ — 5000 ohms, 10 watts.
R₁₃ — 20,000 ohms, 10 watts.
L₁, L₂ — 30 turns No. 18, 1½ inches diameter, 2 inches long, 20 µh.
L₃ — 2 turns coupled to cold end of L₂.
L₄, L₅ — 30-hy. 65-ma. filter choke.

R₄, R₅ — 150 ohms, 1 watt.
R₆, R₇ — 68,000 ohms, 1 watt.
R₈ — 4700 ohms, 2 watts.

F₁ — 1-amp. panel fuse.
J₁ — Coax-cable connector.
N — ½-watt neon bulb.
RFC₁ — 2.5-mh. r.f. choke.
S₁ — 2-pole 4-position rotary switch.
S₂, S₃ — S.p.s.t. toggle switch.
T₁ — Power transformer: 700 volts c.t., 85 ma.; 5 volts, 3 amp.; 6.3 volts, 3 amp.

C₆, C₁₈, C₁₉ — 100-µfd. mica.
that therein lies perhaps the greatest weakness of
these units. It is impossible to achieve real
stability and still develop seven to ten watts in
only two stages. The control oscillator should
not be a power-generating device. Stability is
dependent on circuit-merit factor, and high Q
cannot be obtained with heavy power demand.

Very few if any commercially-built exciters
have the band-edge crystals mentioned in (5)
above but supplementary units are available
which serve the purpose very nicely.

The above comments on commercially-built
units may seem to be too critical. The fact is that
all of these units are good and unless you are
prepared to put some real time and care into the
construction of a VFO, then by all means buy
one, or stick by crystals.

Features

The exciter described here is built around the
BC-221 frequency meter which is now available
at most parts houses or through surplus dealers.
This unit is admirably adaptable to use as the
oscillator unit of a VFO exciter for ham trans­
mitters. The oscillator tube in the unit is a
6SJ7-Y (special nonmicrophonic type) which is
operated at very low input. The shielding of the
unit is excellent, so that the leakage with the
oscillator running continuously is below the noise
level of a good receiver. Therefore oscillator
keying is not necessary for break-in work and
advantage may be taken of the superiority of
amplifier keying.

The frequency stability of the oscillator is
exceptional. The circuit is electron-coupled and
the grid of the tube is connected to the tuned
circuit through a resistor which limits the feedback
to the minimum required to maintain oscilla­
tion. The unit is provided with a calibrated
dial which may be read accurately to 50 cycles
over the range of 2000 to 4000 kc. There is no
mechanical back-lash and return to logged settings
is dependable.

Extremely good isolation at the output ter­
mina] is achieved so that connecting a capacitive
or inductive load or even short-circuiting it to
ground causes no noticeable frequency deviation.
Because load conditions do not affect the fre­
quency, keying is as clean as with any crystal —
cleaner than many. The rugged construction
satisfies the requirements of stability under vibration.
Striking the unit with the fist during operation causes practically no instantaneous
frequency change and absolutely no permanent
change.

The FCC requires that some means other than
the dial-reading of the frequency-control oscilla­
tor shall be provided for frequency checking.
The crystal calibration which is an integral part
of the unit should satisfy this condition. It is a
separate oscillator and may be set on WWV.
The crystal frequency is 1 megacycle.

Circuit

The modification to adapt the unit to VFO use
consists of adding amplifier stages and a power
supply to bring the output level up to 3 watts or
so. The circuit diagram appears in Fig. 1. The
output of the BC-221 is capacitance-coupled to
an untuned stage in which a 6AG7 is used. This
stage operates as a Class A amplifier, since it
draws no grid current. Another 6AG7 is used in the
following stage which is tuned. A 6AG7 is used in
the output stage, and its tuning condenser is
ganged with that of the preceding stage and the
low-impedance output is fed through a link to a
coaxial-cable outlet connector.

Some eyebrows may be raised at the use of
resistor Rs across the plate coil of the second
6AG7, but because of the extremely high-gain
characteristics of the 6AG7 it showed some
tendency to operate as a t.g.t.p. oscillator under
key-up conditions in spite of careful shielding.
More output was obtained by loading the tuned
circuit than by running the second stage untuned,
undoubtedly because this stage operates Class B
or BC. The value of this resistor may have to be altered slightly depending upon output loading and
other factors.

The untuned 6AC7 doubles in brass as a Pierce
oscillator when the switch, S4, is in the “xtal”
position. Four crystals are provided for band-edge
operation on 10, 20, 40 and 80 meters. S3 is the
“on-off” switch. A pair of terminals is connected
in parallel with S3 for remote control when de­
sired.

High values of grid-leak resistance are used in
the first two stages to compensate for the dif­
ference in drive between crystal and ECO opera­
tion. The first stage operates strictly Class A on
ECO but as a Pierce oscillator a high bias is
developed which keeps the output low and
improves stability. The high-resistance grid leak
in the second stage (Rs) performs a like function
and the output is substantially the same with
either crystal or ECO. The output 6AG7 stage
has extremely-high power gain and runs well into
the Class C range. The cathode bias is approxi­
ately 6 volts and a grid bias of about 8
volts is developed for a total of approximately 14.

The power supply is standard. With condenser
input it delivers about 300 volts under load. The
high voltage to the BC-221 is regulated by a
VR-150; the voltage to the external stages is not
regulated.

Construction

The illustrations and the schematic contain
most of the necessary constructional information
and moderate deviation should not affect the
operation of the finished unit.

The lower battery compartment of the BC-221
was sawed off on a contour saw and the face of the
cabinet was cut off flush with the panel of the

March 1947 45
oscillator unit. After smoothing with a file, the unit was refinished and mounted through a cut-out in a 9½ × 19-inch panel. This is not a standard panel width but it fits the only cabinet we had. It is fastened to the panel with aluminum angle strips. The cut-out in the panel is made large enough to accommodate the calibration book underneath the oscillator. The book holder is provided with a knob and slides in and out like a drawer on two runners of aluminum angle. The chassis is made of ½-inch aluminum with welded corners and is built to fit around the BC-221 cabinet. It is 3 inches deep and 17 inches long at the rear. The depth will be determined by the amount of space required behind the frequency meter for the power transformer.

In the top-view photograph, the power supply components are lined up along the rear edge of the chassis with the additional r.f. stages to the left. The first untuned 6AC7 stage is to the rear with the second 6AC7 stage in the middle and the 6AG7 output stage toward the front. Baffle shields between stages are provided both above and below the chassis. Four crystal sockets are provided although there is space for additional sockets if they are found desirable. The two padder condensers, \( C_{11} \) and \( C_{12} \), are mounted vertically beneath the chassis with their shafts protruding above so that they may be adjusted with a screwdriver. The resonance-indicator neon bulb is mounted on the front panel with a single lead connecting its center terminal with the top end of \( L_2 \).

In the underneath view, the crystal switch, \( S_1 \), is to the left and the function switch, \( S_2 \), to the right near the rear. They are fitted with shafts extending to the front panel. R.f. ground returns in each stage are tied to a common point within the stage.

The output lead from the frequency meter is run down inside the inside corner of the cabinet from the underside of the binding post and through a feed-through insulator at the bottom of the cabinet to the wafer switch. This keeps it shielded from the output stage and prevents any tendency for feed-back. Some of the BC-221 meters have the antenna post on the other side of the cabinet, and in this case it might be well to mount the unit on the right side of the panel to shorten this important lead. No attempt has been
made to specify manufacturers' names on transformers or other components, since it is the experience of the author that the average ham usually comes up with a pretty good substitute out of the junk box. If desired, an equivalent arrangement can be made up by combining a $3 \times 4 \times 17$-inch chassis across the back and a $7 \times 7$-inch chassis to the left.

**Operation**

The switch $S_2$ performs four functions. In the "Freq. meter" position plate voltage is applied to the BC-221 directly from the power supply without the necessity for closing the "local-remote" switch. The frequency meter then performs in the normal manner and the amplifiers are inoperative. The antenna post may be used for coupling to receivers, oscillators, etc. In the "ECCO" position the output of the BC-221 is connected to the grid of the first 6AC7 and, when the "local" switch is thrown to the "on" position, plate voltage is applied to the oscillator and the amplifiers. The tuning control for the two tuned amplifiers may be rotated until the neon light indicates maximum output. With the switch in the "ECCO" position the trimmer condensers $C_{11}$ and $C_{15}$, may be set so that maximum output occurs when the output tuning control is at mid-scale and the frequency meter is set at 3750 kc. The range from 3500 kc. to 4000 kc. is used since this range covers all of the amateur bands in use at the present time. The output is always in the 80-meter band and any frequency multiplying should take place in stages external to the unit. Quick frequency readings of received signals may also be taken in this position by logging the dial setting being used for transmitting and then zero-beating the received signal for a check, after which the dial is returned to the former setting.

In the "stal" position the first amplifier functions as a Pierce oscillator and plate voltage is removed from the BC-221. In the "check" position the crystal oscillator functions and plate voltage also is applied to the frequency meter so that the crystal frequency may be checked. This makes a convenient method for a quick check on any crystal by simply plugging it into one of the crystal sockets.

A small calibration chart is mounted on the front panel which contains the following information for each band:

1) Upper and lower settings for total band
2) Upper and lower settings for 'phone band
3) Check-point for either range

This makes it unnecessary to refer to the book for anything but exact frequency checks.

If the coaxial cable between the exciter and the transmitter exceeds 6 or 8 feet it should be terminated at approximately its surge impedance or reflections will cause detuning of the output stage. In most cases a 75- or 100-ohm resistor across the line will still give ample voltage to drive a former crystal-oscillator stage nicely. If more drive is required a small tuned circuit with a link will give good voltage step-up and serve to terminate the line. The transmitter at W7NU is remotely controlled from the floor above and the coaxial line is about 30 feet long.

Let us have more variable-frequency oscillators, but let us have good ones. But, of course, the best VFO in the world will be no better than the nut on the dial.

---

**About the Author**

- Howard W. Johnson, W7NU since 1927, was first licensed in 1923 as 7JJ. This long-time two-letterer is currently handling radiotelephone, teletype and carrier-shift equipment for the Army Signal Corps. He is in charge of the construction and maintenance shops of the SCA Alaska Communication System. The Seattle Radio Club named W7NU its president in 1940.

---

**Strays**

Brooklyn's Metropolitan Amateur Radio Society is holding its first postwar hamfest on March 13th at the Livingston, 301 Schermerhorn Street. Prizes, dancing and refreshments are scheduled. Admission: OMs $1.50; YLs and YFs, 75 cents.

United Airlines is now using spun-glass lacing cord instead of the familiar linen type in applications affected by heat and humidity.

"Lecturing at N.Y.U. the other night, one of our radio advertising professors — no doubt a fugitive from Radio City's gilded halls — gave us this one. He claims that on the b.c. band, stations on the 550-kc. end get out better than those on the high end. The reason: The ground waves vibrating at 550,000 c.p.s. are not so quickly exhausted of energy as those vibrating at 1,600,000 c.p.s. or so. Well, now I know why my 144-Mc. sigs get so tired going from the Bronx to Brooklyn!" — W2QPQ.

"New Electronic Terms" Department: Evening Tribune, Lawrence, Mass., via L. G. Wilde: "... a live wire carrying 110 colts." Boston Record, to W1ATJ: "... amplifier... maintains two watts of undisturbed output."

The C-D Capacitor for September, courtesy W3DRH: "R-1 is 500 kilowatts or higher in value."

*Radio News* for November, spotted by W6ITH: "This set designed for... locating grounds, shorts, crosses, split pears."

(Italicics ours.)

March 1947
Rotten 'Phones
(With Apologies to the Spirit of The Old Man)

Whether you're an old-timer with a two-letter call and recollections of decoherers — and maybe a past customer of Wm. B. Duck! — or whether your ticket is of the post-World War II era, you should be cognizant of the preponderance of rotten 'phones in our ham bands. And, more to the point, the length of your ham career is not a yardstick for measuring the quality of your 'phone signal. If some of us only could hear our own signals we might be reluctant to mention over the air 'how long a ham life is behind such a rotten 'phone. The 'phone bands never seem large enough, but with so many broad and raspy QRM contrivances in our midst it must be time to get out the broom. Let's look into the situation.

All of us who have worked the most commonly-used amateur 'phone bands have many times been on the losing end of a QSO ruined by an interloping signal of broad and rough characteristics, a signal whose center frequency often was fifteen or more kilocycles removed from the station we tried to copy. We all deplore such conditions, especially when it's the other fellow causing the trouble. Such signals have no legal or ethical basis for existing, but we must accept the fact that they are with us and attempt to clean house. It has been my observation that while any one of us might be guilty occasionally of radiating an offensive signal (from a strictly technical point of view, of course) the most common offender of this sort is of a habitual nature; his signal never is good and no amount of suggestion from other hams seems to convince him of the unnecessary QRM he inflicts on fellow amateurs. Admittedly, there are a few hams who just don't care about the other fellow so long as they themselves can blast through, but fortunately such fellows are few and far between. So it is to the fellows interested in operating in a legal and ethical manner that these remarks are addressed.

First, we all know the radio-frequency end of the transmitter generates and radiates a signal on the operating frequency. Also, we know that the audio equipment is arranged to superimpose on the radio frequency another signal whose alternations vary at the frequency rate of the sound going into the microphone at a given moment. In plate modulation, probably the most common method, we are told that the audio system should provide power equal to 50 per cent of the input power to the modulated radio-frequency amplifier to give 100-per-cent modulation of the radiated signal. Of course we don't modulate the r.f. signal 100 per cent all of the time, but only on occasional speech peaks. Now all of this appears relatively simple and would seem to be easily achieved; however, practice proves there must be some pitfalls along this seemingly smooth path.

It should be obvious to even the least informed of the ham brethren that such things as improperly-neutralized amplifiers, stages infested with parasites and other conditions indicative of instability, economy-minded low-C plate tanks, and finals with too-low drive or improper grid bias should not be modulated and used for communication until the trouble is corrected. It might be mentioned that low filament voltage and overloaded Class C tubes are contributing factors in otherwise acceptable amplifiers that give unacceptable results. The filament emission is insufficient for the modulation peaks. Of course r.f. getting back into the speech amplifier and modulated r.f. getting into a VFO are basic causes for trouble and should not be tolerated. Also, with filter condensers so cheap there is no excuse for so much hum on so many carriers today.

Let us now assume we have a stable r.f. amplifier to which is coupled a modulator with a speech amplifier whose audio characteristics seem to meet good ham standards. We now contact another ham who, in his best diplomatic manner,
also diplomatically, it won't bother him too much the time and we occupy only the upper half, any­
tells us we have a slightly broad signal.
we closely observe the data sheet furnished with
our signal takes up such a wide channel; didn't
way. Now, how does he get that way telling us
audio gain control
our Class B tubes and isn't our speech amplifier
“high-fidelity”? Our case may be one of over­
can we be overmodulating? 'rhe Class B plate
modulation and a slight backward twist on the
the audio gain control will work wonders — if only
we have the courage and the will to do it. But how
can we be overmodulating? The Class B plate
meter doesn't go over to the tube manu­
ufacturer's rated peak very often. Well, sad as the
revelation may be, the answer can be over­

Most of our 'phone transmitters have far more potential audio power than we oftentimes realize. The Class B ratings provided by the tube manu­
facturer are based on sine-wave conditions which don’t correspond with the complex waveform of human speech, and the power peaks of speech
may be far greater than a sine-wave peak for a
given Class B plate-current reading. So at best
the Class B plate meter is a poor device to in­
dicate audio power and should not be relied upon
too much. If you don’t now have separate means for determi­
ing your percentage of modulation, obtain such a device and not only comply with
the law but expect a revelation. It may irk you to
find your audio gain should be turned down. But
hold on, there may be a silver lining in an other­
wise slightly dark cloud — you may find you can
run a little more r.f. input and still modulate
fully without sentencing the modulator tubes to
too short a life. Let me hasten to say that the tube
manufacturer is not trying to delude you with
his ratings on the data sheet; also, you are not
getting something for nothing because Class B
amplifiers are no exception to the basic physical
laws. The reason for the apparent discrepancy is
that the average power in speech waveforms may
be low while the peak power, which does the
damage in cases of overmodulation, can be quite
high.

It is unfortunate, but many of us hams give
indication of being naive enough to suppose a
pair of Class B tubes rated at 100 watts of audio
power must stop generating any additional power
beyond their ratings once the top of 100 watts has
been reached. If this were true you would not be
able to modulate fully even a 200-watt r.f. am­
plifier with the 100-watt modulator because the
Class B output transformer, being an imperfect
device, consumes some of the power itself before
the audio reaches the Class C stage. While the
loss in the output transformer is small, the fact
that the loss is seldom considered in ham circles
proves we have some excess audio power in most
cases. These points, which have been discussed at
length in many technical articles, are no invit­
a­tion for you to run more power with no change in
the audio system but are intended for your con­
sideration next time you are sure your signal
“just can’t be overmodulated.” If you want
proof of Class B plate-current readings in relation
to actual developed audio power, visit a broad­
cast station using high-level Class B modulation
and observe the modulator plate meter and the
percentage-of-modulation indicator during trans­
mission of speech. Music will not make such a
striking difference, but hams are legally banned
from music transmission so we have no reason to
consider it unless some of us who delight in
whistling for testing purposes feel that our efforts
have something in common with music.

There is another common cause for a broad
signal, and although this cause is common it does
not seem to be apparent to many operators even
when their signals cut a wide swath in the 'phone
bands. The culprit is audio distortion. Anything
that alters the waveshape causes distortion, and
distortion may be represented as an output
waveshape that is an unfaithful reproduction of
the input signal. Most audio amplifiers are
guilty of some distortion but the better ones are
less guilty. If the distortion reaches the point of
greatly changing the waveshape so that a high
order of audio harmonics is developed, then our
modulated signal will be at least as broad as
the frequency of the highest-frequency
audio harmonic. While these high-order har­
monics may be cut off after being generated by
use of by-pass condensers, the over-all quality
will still suffer if the harmonic-distortion per­
centage was high in the first place. The average
ham can minimize distortion in his speech ampli­
ifier by careful adherence to good design prac­
tice as outlined in the ARRL Handbook and in
many QST articles; so, with a good speech ampli­
der and an r.f. section working properly, where
else may he look for distortion troubles? The only
thing left is the Class B modulator.
A listen across any ham 'phone band might in­
dicate a common notion that about the only
thing that can be wrong in the seemingly simple
circuit of a Class B stage is the “match” or the
relation of the Class C load reflected back on the
plates of the modulators. While this point is of

(Continued on page 180)
CONDUCTED BY JOSEPH E. GRAHN,* WICH

How:
The mail bag continues to spill forth letters from the DX gentry griping over the operating practices. This column for the past several months has made many worth-while suggestions, but no one seems to have put them into use, with the possible exception of a few of the rare DX stations (more power to them!). Jeeves suggests that the W gang try calling the DX 5 to 10 kc. off his frequency, so that when the DX does come back (maybe not to you) he can be heard, regardless of how many are calling him. I've tried this procedure for the past couple of months or so, with not-too-good results, for the simple reason that upon finishing the call and listening to the DX was buried under --- mind you -- not by newcomers, but "old-timers."

To the DX: Not answering any W calls on your own frequency makes the chances of your being heard much greater --- you have at your fingertips the power to control DX QSOs. There really is strong agitation for running a "Pig Pen" to list the violators of good ethics, the worst stinker of all, the "off-frequency bird," plus the "hanger-on-till-the-DX-fades," although the last-mentioned is now beginning to be a rare specimen.

W6VBY is all riled up because the Ws pay no attention to QLM, etc., to which I add "old-timers" again. The above-mentioned list is growing daily, both via mail and personal contacts. Stop a moment and think how your call would look in a box, set aside in this column and marked "Pig Pen" in bold type. Not nice, eh? Okay — be a gentleman and it won't appear.

All right, Jeeves, you can come out from under the table now — I feel a little better.

What:
The 80-meter boys are doing themselves proud and showing some of the 14- and 28-Mc. gang how to do it. W3WJF starts the ball for 80, having worked PA6NG (3505), G1SUR (3513), HB9EO (3528), G16TK (3535), G5HH (3537), G8QZ (3538), G5LI (3538), ON4WR (3540), G2HFO (3540) and HB9AJ (3549). W4IWT with a No. 18 wire in the trees hidden from BCLs snagged W8QEN/CT2, FN4PB (French airplane over Marseille) and a flock of stuff on 40. What kind of trees are they? W2PWU worked GSJU (3550), GSR1 (3515), G6ZO (3509), G6DZ (3519), PA6DC (3543) and GSRM (3527). W2AIS tagged onto a6 pieces of 3.5-Mc. DX in 10 countries. VE1EP hooked G5LI (3545), HB9OD (3525), OK1CX (3530), OK1FF (3525), G2DOW (3515), PA6SS (3520), ON4HM (3528) and G6RB (3510). W6LHN snagged G6ZO (3510) which isn't bad. Seven Mc. is one of our pets, and is still holding its own. W3KCI worked ZL2MM (7120), U8KAE (7040), LA7Y (7120), OK2JR (7030), HB9BX (7035), ON4AU (7062), EI9Q (7180), ZL2MM (7040), OK2JR (7030), GW3VB (7025), G3AXI (7020), LA2H (7040) and SM4WZ (7180). W8WSL kept busy knocking off 41 DX stations but gives no frequencies. He lists just about everything except Asia. W2PUD sez 40 is better than 30 during rush hours, and his proof is YN1GJ (7180), PA6YN (7085), ZL2MM (7120), OK2MR (7030), GW3VB (7025), G3AXI (7020), LA2H (7040) and SM4WZ (7180). W6VOM/KH6 (7090), UB5AL (7187), V2KRA (7226), ZL2PM (7241), ZL2BH (7241), T14MAR (7222), OK1AA (7235), KH6AO (7094), IRZ (7046), PY2AFA (7040), HB1CE (7146) and HIUS (7088).

Roaring 20 is always good, VFOs and all. W6SN snagged 34 nice hunks for...
himself, the best of which are U8SKAE (14,050), UA4HB (14,075), VP9K (14,050), W6VYJ (14,090), UN1AO (14,000), ET1JJ (14,040), V839AU (14,000), ZB1AD (14,085), OX5JJ (14,040), CR7VAL (14,040), QV8AD (14,015), T8A (14,125) and VQ5JTW (14,065). KP4KD has been keeping busy with EK1AZ (14,100), VSIBU (14,140), W3EKK/J2 (14,130), ZD4AB (14,130), ZA2D (14,140), VQ2HC (14,130), VS9AU (14,000), ZB1AD (14,085), OX5JJ (14,040), CR7VAL (14,040), VQ8AD (14,015), TF3A (14,125) and VQSJTW (14,065). KP4KD has been keeping busy with EK1AZ (14,100), VSIBU (14,140), W3EKK/J2 (14,130), ZD4AB (14,130), ZA2D (14,140), VQ2HC (14,130), VS9AU (14,000), ZB1AD (14,085), OX5JJ (14,040), CR7VAL (14,040), VQ8AD (14,015), TF3A (14,125) and VQSJTW (14,065). KP4KD has been keeping busy with EK1AZ (14,100), VSIBU (14,140), W3EKK/J2 (14,130), ZD4AB (14,130), ZA2D (14,140), VQ2HC (14,130), VS9AU (14,000), ZB1AD (14,085), OX5JJ (14,040), CR7VAL (14,040), VQ8AD (14,015), TF3A (14,125) and VQSJTW (14,065).

Close observers of this column will notice that it is now being run by one DX man instead of by W1DX. The reason behind the change is, of course, pretty obvious — By Goodman just couldn't take the booking he was getting about his new call, and at present he is hiding in a corner of the laboratory, trying to confirm Ohm's Law. The change is all for the good — QST gains a real DX editor, W1CH, who will handle the job from his home in Worcester, Mass.

The photo last month of CR9AN showed only one-half of his shack. Here is the other side with the rig that is now doing the business. The transmitter is a 6LO driving an 813, and crystal switching is used when quick QSY is required to get out from underneath the DX hogs. The receiver is an NC100A and the antenna is a single-section W8JK. Those cards on the wall are all a result of the QRP work, however.

March 1947
Tidbits:

VP3JM has 10,000 cards printed and all contacts will receive one in due time.

W9KXN/CT2 will QSL to anyone not having received his card upon receipt of one. His QTH is Ray Lane, 918 E. Macon, Clinton, Ill.

W2ITD wants more c.w. activity from Venezuela.

HZ1AB comes through with the info that the station is run by J. P. Anderson, 1130 Leighton Ave., Anniston, Ala., who is W4JMQ, and A. M. Buta, 418 Great Falls Street, Falls Church, Va., W3JEG. QSLs for HZ1AB should go to 1432 AAFBU, APO 816, c/o PM, N. Y. C.

From W6BCX, re W1DX's call: "It don't mean a thing even if it has got that swing!" W6VBY is looking for some way to pry QSLs loose from the DX stations, and suggests the "shotgun" routine. If it works let us know, Herb — we'll furnish the gun and shells.

To all stations: did you check yourselves on the "DX Personality" chart given in February's DX column? No? We did, and found ourselves to be an "optimistic stupe"!

With that, 73 till next month.

To round out the description of amateur radio in Macau, here is the rig of CR9AG, ex-VS6AG, John Alvares has always had neat stations and this one is no exception. The transmitter on the top shelf uses a 6L6-807-811, and the power supply rests below it. The receiver is an NC-102A, and a two-element rotary beam is used for transmitting and receiving.

March 1922 QST’s hottest story — appetizingly served up by Clyde Darr’s Hawaiian beach-scene cover of grass-skirted hula maids, a sailor, the moon and a wireless receiver — tells the startling news of the reception of two dozen of our stations by Clifford J. Dow, 6ZAC, now living in the Island Paradise. American amateurs as far inland as Wisconsin were heard on Mr. Dow’s detector and one, sometimes two, stages of audio. Traffic already has been handled, and now that we have one leg secured in the hurdle of the Pacific, we read predictions of a Honolulu-Pekin-The Hague relay!

Reports are still arriving on the Transatlantics. We were heard by eight British amateurs, as well as stations in France and Holland. Only c.w. stations — including the new rig at 1ZE — were copied by the British. "The Successful Transatlantic Stations," by Robert C. Higgy, replete with pictures and diagrams, describes these noteworthy performers. There are many lessons to be drawn about antennas, adjustments and operating techniques. The record of 1BDT’s 5-watter alongside the kilowatters has thrown the power consideration wide open.

Destined to enjoy wide readership is "The Improved Reinartz Tuner," this month’s leading technical paper. Fixed, tapped spider-web coils have replaced the movable coils used in the original. To expedite wide frequency coverage, provision has been made for changeable exterior coils. In another receiver article, Charles T. Jacobs details a method for receiver condenser switching using the new anticapacity switches. "A Spark-Coil C.W. Transmitter," by Francis L. J. Duffy, 9DDY, gives the plan for a popular new 5-watt c.w. transmitter with a spark-coil plate supply.

The advent of the radiophone has disturbed the tranquillity of our amateur radio world. With 14,000 of us—sparks, c.w. and 'phones—strongly crowding the upper limit of our 200-metres-and-down assignment, operation has been none too pleasant. S. Kruse’s "The Radiophone and the Code Station" argues convincingly for cooperation between these two factions in our ranks. New commercial radiophones have been making their appearance in the wavelengths above us, and in line with their regulation, our voice stations have been temporarily prohibited from broadcasting programs of information and entertainment. Editorially, QST points to the seriousness of the situation and calls for local discussion. There are policy-making days ahead, new laws to be written, and a rapidly-growing
R.C.A. 25TH ANNIVERSARY

The Argentine amateur society recently celebrated the 25th anniversary of its founding, commemorating the date with a banquet attended by more than 200 persons, including telecommunications officials of the government and representatives of the amateur societies in Brazil, Uruguay, Paraguay, Bolivia, Peru and Puerto Rico.

President Osvaldo Risso Peuser, in addressing the group, recounted many memories of the early days and briefly described the society's history. Perhaps the keynote of the speech, however, was contained in his final words, "This is America ... in its own modest sphere the Radio Club Argentino, now celebrating its 25th anniversary, tries to contribute to a better understanding and mutual friendship among all the peoples of the world ... I propose a toast to the brotherhood of the ether ... Salud!"

QSL PROCEDURE

There seem to be some amateurs who still are not fully aware of the required methods of preparing and dispatching QSL cards distributed through the various member-societies of the International Amateur Radio Union.

A list of QSL bureaus of the world appears in the "Foreign Notes" section of each May and October QST. Each address is that of an individual (or group) who has volunteered to arrange the local distribution of cards intended for amateurs in his country. American and Canadian hams should send their foreign cards direct to the proper QSL bureau and not via ARRL Hq. If you have cards for countries not listed, and the individual addresses have not been published in "How's DX?" they may be sent via ARRL.

Do not affix postage to cards. They are sent in bulk via the bureau system. U. S. postage is not valid in foreign countries! (But you can sometimes make a hit with the QSL manager, in case he is also a stamp collector, by using U. S. commemorative issues on the outer envelope.) There is no need to include international reply coupons with cards sent via the bureau system.

Please take note that the QSL bureau address in a foreign country may be different than that of the headquarters office. R.S.G.B. is a case in point; British cards should be sent to the October QST address and not to that shown, in error, in current editions of the Call Book. It is also well to keep in mind that foreign amateur societies in most cases will not handle cards for GIs temporarily operating in their countries; such cards should be sent direct.

Specific instructions on how American and Canadian amateurs can obtain incoming cards appear in another part of this issue and will continue to appear in every other issue hereafter.

POPULATION SUMMARY

Simply as one of the factors complicating the attempts at solution of international operating and suballocation problems by informal agreement between the member-societies of I.A.R.U., it is interesting to note the following tabulation of amateur population in several countries selected at random. If nothing else, it is mute evidence why amateurs outside the United States do not look with favor on agreements limiting their phone operation to the same channels available for A3 in America.

<table>
<thead>
<tr>
<th>Country</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>1040</td>
</tr>
<tr>
<td>Australia</td>
<td>1700</td>
</tr>
<tr>
<td>Belgium</td>
<td>300</td>
</tr>
<tr>
<td>Colombia</td>
<td>87</td>
</tr>
<tr>
<td>Cuba</td>
<td>250</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>150</td>
</tr>
<tr>
<td>Denmark</td>
<td>300</td>
</tr>
<tr>
<td>El Salvador</td>
<td>60</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>45</td>
</tr>
<tr>
<td>Mexico</td>
<td>545</td>
</tr>
<tr>
<td>Netherlands</td>
<td>407</td>
</tr>
<tr>
<td>New Zealand</td>
<td>52</td>
</tr>
<tr>
<td>Norway</td>
<td>150</td>
</tr>
<tr>
<td>South Africa</td>
<td>365</td>
</tr>
<tr>
<td>Sweden</td>
<td>549</td>
</tr>
<tr>
<td>Switzerland</td>
<td>145</td>
</tr>
<tr>
<td>U.K.</td>
<td>4500</td>
</tr>
<tr>
<td>U.S.A.</td>
<td>75,000</td>
</tr>
</tbody>
</table>

R.S.G.B. PROGRESS

Exceeding all expectations, the membership of the British society increased by nearly 3000 in the past year to bring the total to 12,570. This compares with 9600 and 7700 as of the end of March 1947 (Continued on page 188)
Finding the Inductance of R.F. Coils

The Grid-Dip Oscillator for Convenient Measurement

BY ROBERT M. CROTINGER, * WØGUY

High-school algebra teaches that if we know two of the unknowns in a formula containing three, we can find the third by transposing the formula. This principle is the basis of many present-day test instruments.

The resonant frequency of a circuit is determined by two factors, the inductance and the capacitance constituting the circuit, and can be found from the formula

\[ f = \frac{1}{2\pi\sqrt{LC}} \]

The solution of the equation frequently is expressed in various forms that require little or no arithmetical work: for example, nomographs such as the one in the ARRL Handbook, slide rules and calculators of various types, tables of LC products at different frequencies, and so on. The principle, either with or without the aids to calculation, offers a simple way to determine the one quantity, inductance, that is generally known to a lesser degree of accuracy than the other two quantities.

In laboratories, inductance is generally measured on a Q-meter or on an r.f. bridge. These instruments are quite costly and cannot be made in the low-priced field. Therefore, the amateur must turn to some other method. A generally accepted device is the grid-dip oscillator.

The principle of the grid-dip oscillator is based on the fact that an LC circuit tuned to resonance with a self-excited oscillator and coupled to the oscillator inductance draws power from the oscillator. Because the oscillator is then supplying power to a load, less power is fed back from the plate to the grid to sustain oscillations. This results in a decrease in the grid current of the oscillator.

With this method of measurement it is necessary to know the oscillator frequency and the capacitance required to resonate the unknown coil to that frequency. An oscillator easily can be calibrated for frequency by methods that are well known to most amateurs. The condenser is a little harder to calibrate, but a sufficiently-good calibration can be obtained by methods to be described later.

The instrument pictured offers a convenient and quite accurate means for measuring r.f. inductance values. It consists basically of an electron-coupled oscillator variable from 2000 kc. to 16 Mc., and a standard condenser with a group of shunts to extend its range.

* Among the collection of gadgets that is to be found in every ham station that has got beyond the bare transmitter-receiver stage there certainly ought to be a grid-dip meter. Like a voltmeter and a "Little Gem," it's so useful that once you have one you'll consider it indispensable. Measuring inductance values is just one of its applications.

The oscillator circuit, Fig. 1, employs the usual Hartley-type frequency-determining tank, which permits the condenser rotor to be placed at ground potential with consequent elimination of hand-capacity effects in tuning. Provision is made for obtaining r.f. output from the oscillator plate circuit, with the 1000-ohm potentiometer, $R_2$, offering a means for adjusting the output voltage. This is useful for lining up receivers. When using the unit for this purpose a metal shield is placed over the oscillator coil and electrically connected to the cabinet to avoid pick-up from the coil.

The oscillator and its power supply are built on a $13\frac{3}{4} \times 7\frac{3}{4} \times 2$-inch chassis and are enclosed in a $7 \times 15 \times 7\frac{1}{2}$-inch cabinet. The parts layout shown in the photographs was selected chiefly from the standpoint of convenience in operating. The number of holes to be drilled is not large. Two of them, one carrying the lead from the standard condenser to the shunt switch and the other the grid lead from the tuned circuit to the 6SK7, should be insulated with ceramic grommets.

It will be noticed that on bandswitch Positions 4 and 5, Coils 3 and 2 ($L_1$) respectively, are tuned by a 35-$\mu$fd. variable. This was done to expand these parts of the range which include the 7- and 14-Mc. bands.

The standard condenser ($C_s$) should be a straight-line-capacity unit; the one used is a Cardwell ZU-140-AS. Shunts permit increasing the standard capacity to resonate coils over a wide range. The ideal method of calibration would be to use an r.f. bridge, but the ham seldom has access to this instrument. However, he can generally obtain a serviceman's capacity bridge. To obtain a reasonably accurate calibration from this instrument it is best to measure the condenser capacitance along several parts of the bridge scale. This is done by first measuring the capacitance for different dial settings with the condenser connected directly across the bridge. A graph is then drawn for this measurement. Then a capacit-

---

**Table: Frequency Ranges**

<table>
<thead>
<tr>
<th>Position</th>
<th>Coil No.</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2000 to 4400 kc.</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>3900 to 8100 kc.</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>7.1 to 15.25 Mc.</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>11.25 to 15.6 Mc.</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>6.1 to 8.3 Mc.</td>
</tr>
</tbody>
</table>

$T_1$ — Receiver-type power transformer, 250 v. each side c.t. at 50 ma., approx.

$L_1$ — No. 1 — 43 turns No. 22 s.c.e. on 1\frac{3}{4}$-inch diam. form, tapped at 10th turn from ground.

No. 2 — 18 turns No. 14 enameled, on 1\frac{3}{4}$-inch diam. form, tapped at 8th turn from ground.

No. 3 — 8 turns No. 18 d.c.e. on 1\frac{3}{4}$-inch diam. form, tapped 2\frac{3}{4} turns from ground.

---

**Fig. 1** — Circuit diagram of the grid-dip oscillator.
tance of known value is connected in parallel with the condenser to be calibrated and the capacitance values measured again. Another graph is drawn subtracting the known capacitance value from each reading. Although the serviceman's bridge may be off a little as to direct scale reading, it is generally correct in its variation along the scale. The graphs will show the condition of the bridge calibration and thus permit a better calibration of the standard condenser to be made.

Measuring Inductance

In making measurements, the coil of unknown inductance is connected to the two pin jacks indicated at J in Fig. 1. The coil is then placed in close-enough proximity to the oscillator coil to give a pronounced dip in grid current when $C_s$ is tuned to the frequency to which the oscillator is set. An oscillator frequency must be chosen at which the coil can be expected to resonate with the standard condensers in the unit; this is not hard to do because of the rather large capacitance range. The instrument will give a good dip with high-$Q$ coils at distances of several feet.

With the unknown connected and the oscillator frequency chosen and set, the standard condenser is varied until the grid-current reading dips. This indicates that the tank formed by the unknown coil and standard condenser are in resonance at the frequency of the oscillator. Knowing the frequency and the resonating capacity, it is a simple matter to transpose the resonant frequency formula and find the inductance, or it can be found from $LC$ tables or an ARRL Lightning Calculator. Actually, the value so found is the "effective" inductance at the oscillator frequency and includes the padding effect of the distributed capacitance of the coil. However, the true inductance usually differs from the measured inductance by such a small amount that the discrepancy is well within the normal errors in measurement.

When measuring coils, particularly those with small values of inductance, remember to keep the leads to the standard condensers as short as possible, since the lead inductance adds to the coil inductance and thus makes the measured value slightly high.

Other Applications

Many other uses for the instrument will be apparent. The calibrated condensers can be substituted quickly when servicing, in place of one thought bad. The oscillator can be used as a signal generator, provided a shield is placed over the coil on the unit.

Another practical use of the instrument is the determining of the resonant points of radio-frequency chokes. Each r.f. choke has distributed capacitance which resonates with its inductance at certain points, and both series and parallel resonance can occur. The choke may burn up if used at the parallel-resonant frequencies in a transmitter because of the high circulating current. At series resonance the choke presents no appreciable impedance and consequently completely fails its purpose.

The parallel resonance points can be determined by placing the choke in close proximity to the oscillator coil and varying the oscillator frequency until a pronounced dip occurs in the grid current. It must be remembered when varying the oscillator frequency over one of its ranges that the grid current also will vary across the range, but this variation is easily distinguished from the resonance dip. To determine the series resonance points it will be necessary to short the choke leads so the choke can absorb power from the oscillator with the parallel-resonant circuit shorted. The choke to be measured should not be held in the hand because body-capacity effects will change the resonant points.

The unit also provides a very quick and convenient method of checking the resonant frequencies of antennas. For example, the fundamental frequency of a half-wave center-fed antenna can be measured by lowering the antenna and tying it together at the center with a small shorting loop loosely coupled to the oscillator coil on the instrument. The oscillator frequency is varied until a dip is obtained. The frequency of the oscillator can then be measured by any of the usual means. Harmonic resonance can be similarly checked.
A MATEUR RADIO being the medium it is for the dissemination of news, it is highly improbable that anyone needs to be told that we have a new 50-Mc. DX record. It was 10 p.m. EST on January 25th when Capt. Bob Mitchell, KH6DD, Ewa, Oahu, worked J9AAK on Okinawa, but by 7:30 the following morning most of us had heard about it—and good news it was!

For some time it had been believed that the maximum usable frequency for F2 work hits its highest peaks over the vast reaches of the Pacific Ocean, but we had no positive proof, as there was little interest in 50-Mc. work in this whole great area. There were plenty of hams on the various islands, to be sure; but they were far from home, and no one could blame them if they were interested in using ham radio principally as a means of keeping in touch with their families and friends. There wasn’t much encouragement for the few who were interested in the possibility of v.h.f. DX, but KH6DD (ex-W6TZB) kept on trying.

His first success came at 1:16 p.m., Hawaiian Time, on Jan. 25th, when contact was established with W6VDG/KW6 on Wake Island, who was replying on 28 Mc. The signal of J9AAK was first heard by KH6DD at 3:07 p.m. and the first contact was made at 3:13, when J9AAK answered his CQ. Signals were S7 at peak during this QSO, which lasted until 3:40. A second QSO took place at 4:33, with signals over S9. At 4:48, W7ACS/KH6 at Pearl Harbor took over, the contact lasting until 5:07, when signals began to fade out. It is said that W7ACS/KH6, who had access to m.u.f. information, was responsible for getting things started at the right time.

The rig at J9AAK runs 68 watts to an 829, feeding a 5-element close-spaced array. KH6DD used 500 watts to VT-127-As, and a single-section “Twin-Three” rotary array. W6VDG/KW6 is expected to be on 50 Mc. soon for 2-way work, with a converted BC-522. Crossband contacts with Wake were made by KH6DD on the 26th (1:50 to 2:45) and on the 27th (1:12 to 1:35), and schedules are being kept daily.

Schedules have been arranged for daily tries with Okinawa, and interest is at fever pitch. With the ball now rolling, it is probable that many more contacts will be made throughout the Pacific islands, and there is a likelihood that work with VK, ZL, KA and even W6 is not far off.

CONDUCTED BY E. P. TILTON, WIHDQ

RECORDS

Two-Way Work

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Distance</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Mc.</td>
<td>KH6DD — J9AAK</td>
<td>4600 Miles</td>
</tr>
<tr>
<td>144 Mc.</td>
<td>W3HWN — W5MNF</td>
<td>390 Miles</td>
</tr>
<tr>
<td>225 Mc.</td>
<td>W9QAW/6 — W6QON/6</td>
<td>110 Miles</td>
</tr>
<tr>
<td>420 Mc.</td>
<td>W6FZ/6 — W6DD/6</td>
<td>170 Miles</td>
</tr>
<tr>
<td>2500 Mc.</td>
<td>W1JSM/1 — W1HL/1</td>
<td>1.6 Miles</td>
</tr>
<tr>
<td>5250 Mc.</td>
<td>W2LGF/2 — W7QF/2</td>
<td>31 Miles</td>
</tr>
<tr>
<td>10,000 Mc.</td>
<td>W4HPJ/3 — W6IE/3</td>
<td>7.65 Miles</td>
</tr>
<tr>
<td>21,000 Mc.</td>
<td>W1NFL/2 — W9SAD/2</td>
<td>800 Feet</td>
</tr>
</tbody>
</table>

As is often the case, the excitement of the occasion gave rise to countless versions of the story. Such work has historic significance and is of considerable scientific interest, so it is important that details be recorded accurately. Our thanks to KH6AR and W1PFJ for their help in getting the story straight, and our hearty congratulations to KH6DD and J9AAK for an outstanding achievement.

January proved to be slightly better than December in respect to the maximum usable frequency for the North Atlantic path, but the m.u.f. never went quite high enough to permit 50-Mc. work with Europe. Beginning about Jan. 14th the observed m.u.f. was high enough to make observations interesting, but there was little hope of any trans-Atlantic work. For several days the European television signals on 45 and 46 Mc. came through well in W1, and on the 16th, 18th and 19th, harmonics were heard up to 48 Mc. They were in and out for brief periods, however, indicating that the m.u.f. was barely up to 48 Mc. Our European observers, G6DH, PA8UN, and PA8UM, were more optimistic. They were hearing signals from the east and southeast up to 50 Mc., and they were sure that reception of amateur 50-Mc. signals would have been possible from Rumania, southern Russia, and southwestern Asia, had there been anyone active in that direction. G6DH reported reception of a Rumanian broadcast harmonic on 49.2, and a harmonic of ODD (Lebanon) near 50 Mc.

From the predictions available it would appear...
that there is a possibility of trans-Atlantic work in February and March, and the picture for Europe, Africa, Asia, and the Pacific Ocean areas is very good indeed. The path from southern Europe, western Asia, and northern Africa to South Africa should be open high enough to permit DX work even on 56 or 58 Mc., and east-west paths in the vicinity of Latitude 20, north or south, should be open up to as high as 60 Mc. during peak periods.

In the Netherlands at least three special licenses for 50-Mc. work have been issued by the very cooperative licensing authority of that country. PA5UN and PA5UM are already on the air, and PA5WJ is nearly ready. Our one hope in Asia, YI2CA, has disappeared without trace from the 28-Mc. band. He was a regular in keeping skeds, and was to have been ready, by now, with a 50-Mc. rig and automatic transmissions, but at this writing he is on the list of missing signals, on 28 as well as 50 Mc. Here's hoping he just took time out to get that 50-Mc. rig finished.

In Tanganyika, on the west coast of Africa, VQ7TOM is getting set to transmit on 50,160. He does not, as yet, have a receiver for 50 Mc., but will make crossband tests with interested parties. A signal will be provided by a station in Palestine (call not being published) during the m.u.f. peaks in February, March and April. Watch for this signal, identification of which will be obvious from the transmission content, and report reception of it at once. Tests with the station may be arranged through SU1CX on 28 Mc. — if you ever hear SU1CX!

V.h.f. DX interest is developing in the Pacific Ocean areas, with stations on for two-way or crossband work in the Hawaiian Islands, the Marshalls, the Marianas, on Wake, and Okinawa, all of them near that magic Latitude 20, where the m.u.f. is supposed to be above 50 Mc. for hours daily, KH6DD is on regularly from 2330 to 0100 GCT, aiming at W6, and from 0200 to 0300 for VK and ZL tests. He has 500 watts or more and plenty of good antennas. He is keeping skeds with J9LG on Kwajalein, W6VDG/KW6 on Wake, KG6AC on Guam, and several VK and ZL stations, as well as with the boys on Okinawa. The inter-island (Hawaiian) 'phone (scrambled speech) on 49.2 Mc. provides a good dope on the gang in Okinawa, also sent in by J9AAX/W6EFH. The J9s have an island network on 50 Mc., which includes J9s AAR, AAL, AAK, ABX, ANA and AAW, with more to come. These fellows transmit at 1930 PST for 10 minutes, and for alternate 10-minute periods there.

The 28-Mc. band is just one great international grapevine for 50-Mc. news these days. Your conductor got his first inkling of the Pacific DX by listening to ZS6DW, and over a relay route which included W7EYS, ZS6T and W1PFF, we have dope on the gang in Okinawa, also sent in by J9ABX/W6EFH. The J9s have an island network on 50 Mc., which includes J9s AAR, AAL, AAK, ABX, ANA and AAW, with more to come. These fellows transmit at 1930 PST for 10 minutes, and for alternate 10-minute periods there.

after. They are interested in DX skeds with other Pacific islands, and with the Asiatic mainland. We have persistent reports that there is activity on 50 Mc. in the Philippines, but we wonder if anyone has done much actual transmitting or listening out there, since the m.u.f. between KA and KH6 should be up around 60 Mc. these days. Through PA5UM we have the report that KA1ABA has a high-powered rig and a receiver for 50 Mc., and also that PK1AW has promised to get on.

December and January in Australia, which are like our June and July, have made sporadic-E work almost commonplace to the VKs, according to VK2NO, who has worked three states, Victoria, Queensland and South Australia, and has heard by VK7CW in Tasmania. On the evening of Jan. 8th, VK4s worked VK5s, for what is believed to be the first work between these two areas. The stations are separated by approximately 1000 miles. One of those grapevine reports says that VK5KO has heard W signals on 50 Mc., but no details have yet been obtained.

In Mexico, XE1KE and XE1GE are now active on 50 Mc., the latter being a recent convert who now has a 4-element array. Both stations work regularly on 28 Mc. and they are looking for schedules with the boys who work both 10 and 6. Situated as they are, 600 miles from Ft. Worth, 1000 miles from Douglas, and 1400 from San Diego, these fellows should be able to get in some sporadic-E work with W stations, even if the F2 m.u.f. doesn't go high enough this spring to do them any good. It will be interesting to see how E-layer work turns out that far south.

There was a smattering of sporadic-E skip during January, just to keep the record clear. On the 4th the band was open for work between the Middle West and South. W9PK reports contacts with W4EQR, Pensacola, Fla., W5HHT, New Orleans, and W5FRD, Ft. Worth. W9ZJB worked W4EQM, Langdale, Ala., W5AOK, Inglis, Texas, and W6WX at Amarillo.
The ionospheric disturbances of Jan. 24th and Jan. 25th produced some aurora effect in the Middle West, reports W9ZIB. He tells us that W9DZM, Anoka, Minn., worked W9QUV, W9PK, W9NFM, and W9IFB. W9QUN and W9DWH were also in on the Minnesota end of this party. The aurora condition was a mild one, as is customary in the midwinter period. More violent disturbances can be expected to follow the m.u.f. peaks in February and March. Watch for some good aurora sessions during the third weeks in both these months.

**What About N.F.M.?**

In prewar years a few hardy souls used f.m. on the 5-meter band, but it was wide-band f.m. and there were very few receivers capable of doing it justice. Those who had suitable receivers enjoyed good reception of the f.m. rigs, but it was far from a sensation. F.m. was wonderful for broadcast reception, but did it really pay off in amateur circles? The answer was open to considerable doubt.

Now we have a somewhat different picture. Narrow-band f.m. with crystal control has brought reception of f.m. within the capabilities of the receivers we already have. Phase-modulated crystal rigs bear little resemblance to the old reactance-modulated VFO jobs, the signal from which sounded like a bad case of a.c. hum and overmodulation troubles on any selective receiver. N.f.m. can just about hold its own in competition with a.m., when received on the conventional receivers, and when equipment especially designed for it is available it outshines all other forms of modulation in providing high intelligibility under difficult conditions, as has been demonstrated in actual tests. Use of n.f.m. in crowded city areas has shown that it is the long-sought-for cure for the broadcast-interference problem, thus opening up the use of the 50-Mc. band to many apartment-house dwellers who have not dared to operate on the band with a.m.

The chief deterrent to the use of n.f.m. has been the segregation of f.m. transmissions to the frequencies above 52.5 Mc. The few who have tried f.m. on 6 have ample proof that it is practically impossible to get contacts while operating in that range. In this day of beam antennas and sharp receivers it simply is not possible to cover both ends of the band, so everyone tunes the end where the stations are operating, and the f.m. user is left out on a very long limb. The result has been the receipt of numerous letters and petitions asking that the entire 50-Mc. band be opened to n.f.m. operation.

This is, of course, a matter for the next ARRL Board meeting, to be held in May. Now is the time to make up our minds as to what we want in this connection, and inform our directors of our wishes. Looking at the matter from the technical considerations only, there is no logical reason why n.f.m. should not operate alongside a.m. in the entire band, since it has been demonstrated that properly-controlled n.f.m. need occupy no more territory than a properly-operated a.m. station of the same power. It may, actually, use less.

There are other considerations, however. It occurs to the writer that n.f.m. might be used as a lever to encourage use of more of the band, and the suggestion is advanced that n.f.m. be extended to 51 Mc., and that all other forms of emission be permitted above 52.5 Mc. The use of n.f.m. between 51 and 52 Mc. would impose no hardship on the experimenter, and it would tend to populate that portion of the band, since many potential users of n.f.m. are holding back at present. Duplex operation should be permitted, and encouraged, in the high end of the band, since this would provide a good opportunity for crossband work with 11-meter stations, where duplex is also legal. Let's think it over, in any event, and don't forget — your ARRL director wants to know how you feel about it!

**Here and There on 6**

Our published reports of commercial harmonics heard on 50 Mc. have never failed to bring a response from someone who was able to give us more information. In this category is WEDI, reported heard during the trans-Atlantic opening on November 24th by G5BY. O. L. Rairdon and W3KZS came forward with the fact that WEDI is the S.S. America, formerly the troop transport West Point. All we need to know now is where the America was at 10:17 A.M. EST on the morning of November 24th. Some months back we reported reception by G5BY of KOE, which is now identified as the call of an aircraft on an international flight. Actually, the call is KHDOE, the HD in which is dropped by international agreement. This would seem to rule out this reception as a DX possibility, as the signal heard was apparently an 8th harmonic, and the plane was probably over or near the English coast at the time of reception. Our thanks to W2OLU for this information.

How many states will we work on 50 Mc. this year? The 1946 record of 27, made by W1LLL and W9ZIB, should be topped by a wide margin in 1947, but there are still states in which no activity has yet been reported on 50 Mc. These include South Carolina, Mississippi, Tennessee, Arkansas, Nebraska, Colorado, New Mexico, Wyoming, Montana, Utah and Nevada; a total of 11. There have been promises from several of these, but what we want are active stations! Who will get going in these and other hard-to-get states? Several which were missing last year are now taken care of: Alabama is represented by W4EIQ and W4HVD, Oklahoma by W5HLD,

(Continued on page 134)
The Balloon Antenna Rides Again!

More Practical Dope on Gas-Filled Skyhooks

BY GEORGE BONADIO,* EX-W80MM

Here is good news for the ham with the condensed backstage but expanded antenna ideas. Hydrogen and helium gases are not required! Further, they are both too expensive and too cumbersome for the average enthusiast to use in putting up "Kytoons,"1 or just plain round balloons.

In spite of its low pressure, ordinary house gas brought out of the cellar with the garden hose will inflate any prewar-style meteorological balloon to bursting. Coal gas averages a specific gravity of 0.5. This means that a given balloon must be inflated about 20 per cent greater in diameter by coal gas to equal the lift of hydrogen. The surface of a balloon increases as the square of the diameter while the gas volume increases by the cube of the diameter. Hence, a natural gas of only 0.75 specific gravity could still be used for balloons with some compromise.

During the summer of 1941 I set out three vertical full-wave antennas on 160 meters. Somehow there is an immense thrill to letting a balloon up eighteen times as high as the house. It provokes a peculiar type of elation much like the first overseas contact. In each case the support was a D & A Co. balloon filled with house gas through the garden hose. The distinctive odor of house gas is lost through latex, so that the sense of smell cannot be used as a safety check on releasing the gas at disassembly times.

The first two balloons were only about 3 feet in diameter and supported just one strand of No. 26 wire in the safety of the night. Because of the nearby airport I lighted the third by two auto bulbs internally mounted through the neck gas seal and fed by two enameled wires. The wires were fed from the ground through r.f. chokes.

The third balloon was about eleven feet in diameter. It took 3 hours to inflate it with a half-million cubic inches of gas at a cost of about 85 cents. Two hundred feet of light 3-ply house twine were used in a triangular-shaped balloon net to support the wire, because the neck of the balloon was listed by the manufacturer to be safe only up to 5 pounds lift. A car battery was used for an anchor, since it was soon apparent to me that our muscles are not built for holding down the ten pounds lift which a spring scales indicated. I experienced some difficulty in getting the top of the balloon to expand under the pressure it exerted on the net. Perhaps talcum on the string would have helped. The extra stretching on the bottom might have shorted its life to eight hours in the air. With even expansion it was not rated for over 9 feet in diameter, but I went the whole hog. This was in daylight.

The effect was astounding. Crowds swarmed the neighborhood. No parking places were left on either side of the road. Mother almost fainted when she saw little children running across the road while Sunday drivers drove their cars with their heads out of the windows to look at the balloon. One carload drove in from fifteen miles away, having determined to track down this new planetoid.

Transmission and reception were equally spectacular. To start with, the HQ-120X would no longer take care of the two local broadcast stations—450 kc., apart, i.f. of receiver 455 kc.—without wavetrap. Whole states usually unheard in the daytime were heard and worked on 160 meters, with good reports both ways. Thirty watts of 'phone was used. It seemed to be a little better in all directions than my horizontal full wave was in its very best direction. The full-wave vertical seems to be a great low-frequency antenna.

* 326 Winalow Street, Watertown, N. Y.
UNTUNED KEYING MONITOR

To eliminate the need for retuning the keying monitor every time transmitter frequency is changed, the gadget shown in Fig. 1 was designed. The entire set-up is simple, noncritical, and can be built compactly, permitting its use inside the receiver cabinet. There, out of the way, it does a nice job without readjustment no matter how often you QSY.

A 1N34 crystal detector is used to provide a small rectified voltage from the r.f. signal picked up on a short antenna placed near the transmitter. This voltage is then used to overcome an initial blocking bias on an oscillator tuned to the i.f. frequency of the receiver. The signal thus created appears in the rest of the receiver the same as any other c.w. signal, beating with the b.f.o. and producing any tone or volume that the operator may desire. The r.f. stages of the receiver are killed by rewiring the stand-by switch, so that it removes B+ from them but permits the i.f. and audio stages to function normally.

Fig. 1 — An untuned keying monitor that may be installed inside the receiver cabinet.

\[ C_1 = 0.0002-\mu \text{fd. mica.} \]
\[ C_2 = 0.001-\mu \text{fd. mica.} \]
\[ C_3 = 0.01-\mu \text{fd. paper.} \]
\[ C_4 = 0.0001-\mu \text{fd. mica.} \]
\[ C_5 = 5-\mu \text{fd. mica.} \]
\[ C_6; C_7 \rightarrow \text{As required to tune inductance to i.f. frequency of receiver.} \]
\[ R_1 = 1000 \text{ ohms, } \frac{1}{2} \text{ watt.} \]
\[ R_2 = 0.47 \text{ megohm, } \frac{1}{2} \text{ watt.} \]
\[ R_3 = 1 \text{ megohm, } \frac{1}{2} \text{ watt.} \]
\[ R_4 = 20,000-\text{ohm potentiometer.} \]
\[ R_5 = 0.1 \text{ megohm, } \frac{1}{2} \text{ watt.} \]
\[ R_6 = 47,000 \text{ ohms, } \frac{1}{2} \text{ watt.} \]
\[ L = 455-\text{kc. i.f.-transformer coil, modified. (See text.)} \]

In adjusting the unit for operation, the bias on the 6J5 must be set so that the oscillation is just triggered with each keyed character and is killed between characters. This is controlled by potentiometer \( R_4 \). The output condenser is merely clipped onto the grid of the first i.f. tube. Over-coupling to the i.f. grid will produce a signal rich in harmonics that is less tiring to the ear, but may detune the i.f. stage. The location of the cathode tap on the 455-ko. i.f. coil used as the oscillator inductance should be determined experimentally. Somewhat more than the usual "one-third up from ground" will give best results, assuring sufficient feed-back to permit the oscillator to follow fast keying. A fairly high-C circuit should be used here to obtain the degree of stability desired. Some experimentation may also be required to get the correct value for \( R_1 \). Too much resistance here will result in lack of rectified voltage, too little in excessive crystal current. — Rowland C. Medler, W4ANN

INEXPENSIVE BCI CURE

HAVING about 75 midget a.c.-d.c. "cracker-box" sets in the immediate vicinity of my 250-watt 10- and 20-meter 'phone rig, I had to do something about the resulting BCI. It had to be inexpensive, yet effective. I found that by-passing one side of the heater of the combination detector/first-audio tube (usually a 12SQ7 or its equivalent) with a 0.001-\mu\text{fd.} mica condenser cured about 95 per cent of all cases when the trouble was caused by power-line pick-up. — Ted W4RDS, W4GVY/D9

MORE ON BCI

AFTER spending much time and effort, two very simple methods have been found to be effective in eliminating interference to the broadcast receivers in this neighborhood. The type of interference was the common garden variety where the listener picks up the local ham all over the dial of his receiver, and at almost any setting of the volume control. The r.f. in this case is apparently entering via the power lines, and getting into the audio circuit at the grid of the first audio tube.

In the conventional a.c. transformer sets, and in all a.c.-d.c. midgets, it was found necessary to by-pass the 110-volt a.c. leads to the chassis, and in addition to lower the value of the grid leak on the first audio tube, by-passing it at the same time with a 0.00025-\mu\text{fd.} condenser. By-passing the grid without first reducing the grid-to-ground resistance simply put a lot of hum into the set which was more objectionable than the gabbling (Continued on page 139)
Correspondence From Members-

The Publishers of QST assume no responsibility for statements made herein by correspondents.

WANTS SALARIED DIRECTORS

Editor, QST:

... I'll be darned if I can discern the slightest justification in any ham's arguments against becoming a member of the League or in any action taken by groups of hams direct with Governmental agencies instead of through ARRL. . . .
The comments about ARRL being a one-man organization (particularly here on the West Coast) and the reluctance of some fellows about joining are attributable to three things: ignorance, laziness, and the organization of the League as it exists today. My experience in amateur affairs discloses that the majority of the "bickerers" are those who attend club meetings for the express purpose of being entertained and will they accept and discharge responsibilities with any degree of tenacity. Consequently, clubs are carried solely by the perseverance of a few individuals. Similarly with ARRL. Raising the Headquarters gang and the directors, ARRL has survived and functioned, decisions being arrived at by common sense and the contact you have with the minority of fellows who have the enthusiasm and energy to express their opinions in writing to their elected representatives.

I must admit, however, that our directors are not as much in contact with their constituents as they should be. This situation largely is due to the economic problem of having to earn a living while trying to occupy the office of director.

Common sense tells you which function suffers. A director has three strikes on him before he gets up to bat, regardless of how enthusiastic he may be. The end result is that he infrequently if ever covers all the clubs in his division and is guided to a great extent by the dictation of his own common sense and by the discussions which take place at the Board meetings. It is a natural reaction that follows then, when many fellows feel that they have no voice in the actual decisions being made. What's to be done to correct this situation?
The answer which first occurs to me is that of making our directors paid full-time employees of the League with the establishment of a branch office of ARRL in each division. You kill two birds with one stone by this move. First, you have available a full-time full-coverage representative. Secondly, the branch offices bring ARRL closer to the home fronts and eliminate the prevalent feeling that "Hartford" is too far away. How to pay for the program? Assess the amateur a yearly fee? Smacks of unionism you say — but, so what? No matter what the price, organization is the only answer to achieving the demands which we may make and combating the perils of encroachment which other interests may present. . . .

— Ken Kiernan, WE6PM

FROM "PARAGON PAUL"

P.O. Box J, Upper Montclair, N. J.

Editor, QST:

My January QST arrived today and I found myself very much impressed both by your editorial, "Accomplishments Old and New," and by the well-done spread under "Twenty-Five Years Ago This Month." Both are fine examples, it seems to me, of first-class writing; and I shall have to break down and admit that, as I read the stories, all the old 1921 thrills came alive again. Please thank all the boys who participated in this work. Your gang there shows a performance record and spirit of which they should be deeply proud.

— Paul F. Godley

TAKING STOCK

Editor, QST:

I note with interest the question raised in the October issue: "Anybody any idea what we can do about it?"

It seems to me that the real problem of the Headquarters gang is one of re-examination of our basic ingredient, the ham.

When a new member of the fraternity opens his first QST, some of the impressions he gains are not very much to boast about. Our first principle of making a minimum do the same or better job as a maximum is conspicuously lacking.

Instead he finds a gruesome collection of 100- to 1000-watt rigs complete with beam antennas, bandswitching, VFO, etc. On the other hand, if he wants to find something to parallel his technical knowledge and billfold, he is faced with some utterly ridiculous article featuring a rig for about $2.70 complete with doorbell wire, a tube stolen from his receiver and embodying construction principles which are much less seen than talked about. In the receiver section, the one article of note for the entire year featured an 8-tube job which by now has passed into obscurity with many more of its class. The newcomer's other slant is obtained by looking at pictures of "model stations." He is always certain of finding an 18-tube "Sky-Skunker" sitting on top of a handsome desk. So, as far as his money goes, receivers of less than six tubes don't exist any longer, and are antiquities which went out with honeycomb coils and the '01-A.

Well then, let's make stock. Where are we headed? At our present rate and direction I'd say it isn't where some of the old-timers would like to see the gang.

If we are to judge by trends, it wouldn't be hard to predict that the commercial houses will move into the transmitter field within the next five years as they have the receiver field. Since our mainstays are the receiver and transmitter, the expression "residuend with boughten gear" should be applicable to most of the gang. This points immediately to a miserable state of affairs, since if we buy and don't build, people would have a right to question the term "amateur." In short, this wonderful hobby called amateur radio will be knocked for a loop unless it follows along the principles created on home-built, home-experimented and home-covered equipment.

We know that a 15-tube receiver can pull 'em in but with a galaxy of new and better tubes developed in the last five years, let's see what the two-to-five-tube job can do. And finally, let us 100,000 experimenters go back to our old job of feeding the manufacturers the latest developments in high-efficiency versatile gear and circuits.

Only when we've found ourselves will we have re-exchanged inertia and dollar bills for ingenuity and resourcefulness. I, as an amateur, look to QST and the League to lead the way. The sooner the better!

— Raymond Goldstein, W7QGC

"CALLING AND RETURNING"

75 Minneville St., Amsterdam, N. Y.

Editor, QST:

Your reference to the use of the word "handle" in radio-phone conversations brings to mind another inane expression which many ham 'phone ops use these days. That is the
expression "calling and returning." If a guy is calling how can he be returning? If he is returning how can he be calling? However, after all is said and done, the name will always use the expressions they like and time and tradition will keep the ones that are best.

— Jack Nelson, W5FPW

THEORIES

100 Adams St., Dorchester 22, Mass.

Editor, QST:
The exact nature of electricity, what it is, or whence it comes, has never been understood. The modern explanation, as we all have read, is supposed to be the electron theory. The definition of theory is as follows: "A proposed explanation designed to account for any phenomenon." It is my firm belief that the electric current as we know it is really a magnetic current.

The ancient Greeks discovered that when a piece of amber (which has mineral properties) was rubbed on a piece of fur it acquired attraction. Is this electricity? I say no. An electric current, as we know it, has a starting point and the brain-assimilation department does not function as well as it did in the old high school days. Rather tough at that to have to leave the Handbook, How to Become, etc., as well as many other radio publications into one corner of the basement and listen to the engineers carry on. Radio, even amateur radio, is their field, not mine.

In conclusion I want to mention that congratulations are in order for the ARRL for the fine work they are doing for the radio amateurs, not only at present but in the past. As the boys on the air say, "Fine business."

— Horace C. Dolph

W6USN

Marine Island Naval Shipyard, Vallejo, Calif.

Editor, QST:
We, the amateur radio operators of the Marine Island Amateur Club and of the electronics facility at Marine Island, wish to express in this open letter our heartfelt thanks and deep appreciation for the services rendered in the handling of the amateur radio traffic of station W6USN during the Navy Day program at Marine Island Naval Shipyard.

Much credit is to be given to the Pioneer Network, W5EBB, of Tulea, Calif.; control; the Gem Network, W7JMB; of Boise, Idaho; control; the Canadian networks in particular; station W9GIO of Santa Barbara, Calif. Credit is also to be given to all other networks and individuals who handled or relayed the traffic. We are very grateful for the interest you took and every effort you gave to help along this Navy Day program.

— L. O. Showalter, W6KIW, J. W. Clark, W6CAN

NOTE TO MR. RAPP

179 Harris Ave., Needham, Mass.

Editor, QST:
Upon reading L. E. Rapp's "The Circular Band Theorem," W2SGJ, W4GZT and I constructed receivers and transmitters to operate in the 10-meter circular band. Circular-band equipment is very expensive. The VFO, for example, cannot use a straightforward tuning condenser of, say 150 µuf., but must have one of complex capacity; i.e., 150 + j150 µuf. This, of course, is because the tuning characteristic has to be circular instead of linear.

Secondly, wide-band f.m. is impossible on a small circular band. The frequency shift due to modulation may pull the carrier all the way around the band until it's on the other side of the center frequency. The final blow, though, was when I ruined a $79.45 transmitter by quickly changing frequency while on the air. It would have been OK to QSY on a linear band, but when I hurriedly moved my frequency halfway around the circular band one night, centrifugal force pulled the carrier right off the band, and no one has been able to hear my signal since.

— Lindsey Russell, W1PCJ

(Continued on page i18)
How to Cook a Ham
A Tested Recipe

BY C. L. STONG,* W2PFM

A casual glance at the panel showed all meter readings at zero. Only two of the pilot lamps showed any color and those were green; any ham would know the rig was dead.

It seemed rather silly to install interlocks. Any­one with half a brain, even without twenty-five years of “hamming” behind him, knows that high voltage kills. Perhaps interlocks make sense to a youngster just starting in the game. But, speaking personally, a full quarter century of experience certainly has placed me above the need for automatic safety gadgets. Indeed, why not interlocks on flashlights?

So, certain that everything was “off,” I slid down behind the rack. Grasping one of the angle braces for support, I gingerly reached with the other hand for a tiny resistor buried deep in the wiring of the buffer stage.

Instantly, it struck! A horrible agony ripped through my body. Something was tearing the flesh from every bone. Yet, I could see a little. I watched the tendons in my wrists grow stiff like slender bars of steel. My fingernails doubled under as they dug into the metal.

I could even think — a little. Shake loose! Get loose ... pull ... pull! You fool! You hopeless idiot! Get loose! You're stuck fast and now you are going to DIE!

As suddenly, it ended. I dropped free.

My fifteen-year-old son had heard a low groan had yanked the main switch — just in time.

Brother! That was a close oner.

For a few seconds more thin blue smoke curled up from three black holes in my left hand. It was stinking smoke and it slowly drifted through the whole house.

Later, my kid remarked, “Gee, pop, I didn’t know you could get that kind of a burn off low voltage ... you were across only 350 volts! What would a thousand do?”

“There is no such thing as low voltage,” I shakily replied. “Say, where in heck did we put those interlocks I brought home last year?”

Lament for the Past

My love was fair as the summer breeze Kissing a night-stained sea.

My love was free as a soaring gull Blithe in his artistry.

My love was brilliant as northern lights Shimmering over the vast And mystic void of the northern nights Entombing the infinite past.

I lost my love when the moon was new, Gleaming with golden sheen Over mountain edges that melt from view Into time and the great unseen.

I lost my love to an errant witch Riding a Hertzian broom (The FCC says “witch” rhymes with “which”) She hovers about his room.

I lost my love to a carrier wave Bred of a 6L6, Who turned him into a puling slave With her sneaky seductive tricks.

My love was a being of flesh and blood In the sunny idyllic past, A structure of bone and cartilage; And as such was unsurpassed.

But now a transformer pumps his blood, That steady electron stream, Through veins of wire that guide the flood Into an aerial beam.

And as I watch in my bitter grief, His pulse keeps pounding anew, As it throbs for the witch its beat of love —

“Calling CQ, CQ . . . . .”

— Mrs. Doris C. Grautoff, XYL of W8KNU

FEED-BACK

Dana W. Atchley, jr., W1HKK, coauthor of the February QST article, “Direct-Reading Modulation Meter,” has regretfully notified us of the following errors in his manuscript: in the parts list of Fig. 1, R1 should be 1100 ohms, R2 16,000 ohms. Both resistors should be rated at 1 watt.
About DX. Practically all amateurs have at least a speaking acquaintance with DX. Who hasn't worked some at one time or another? Those yellow survey cards that you are still sending back indicate that many of us take DX as it comes, one interesting part of a great institution, Amateur Radio. While the rag-chewer group outnumbers the strictly-DX group, the radio columnists have in DX something with natural glamour. While some take their DX thrills in intermittent doses and in stride, others go crazy over DX and make it their all in amateur radio.

The ARRL Countries List was presented in QST last month. It serves for day-to-day reference of casual DXers and DX hounds alike. The DX urge is a "natural" with amateurs. Enumeration of DX by countries, likewise.

DXCC Announcement. Everyone working any DX likes to keep track of his progress. To facilitate that and provide recognition for the top specialists in the DX field we have the new DXCC Award. The Award rules are explained in detail elsewhere in this QST. ARRL is now ready to open the business of card checking for 100-countries-worked-postwar certification.

The Countries List first, DXCC Award second, and finally the DX Competition going on currently to help you work some this month! New to the gang will be the recognition available for those who keep plugging after they have achieved the basic Award for their initial 100 countries worked. For each block of ten additional countries for which written proof-of-QSO can be submitted there will be added ARRL endorsements to attach to each large postwar DXCC certificate.

On Getting 100. One hundred countries will remain the big basic achievement for the DX-minded to work toward. Of course most hams are nowhere near 100 countries worked postwar. We're for the chap just started on the road, and for making the DX available to help him have fun in getting his 100. (It's partly because, believe it or not, some DXers are almost at the century mark that ARRL had to provide immediate additional goals "beyond 100.") The tips on DX, "How's DX?" will try to give you. It will take you a lot of listening and patience. We think this DX pursuit should be a sporting proposition, operating skill and good will combined, just as it was in the days when 100 meters was the prime DX spot and countries available were numbered at only a dozen. While amateurs in certain new spots have been in much demand, leading to some regrettable ECO-pouncing and shoving around on the part of a few, it is increasingly apparent that orderly awaiting one's turn and decent courtesy in operating will pay off. The Golden Rule, when followed, will insure each operator of keeping his self-respect. Operate to inspire the good will of the foreign DX operator. He can set the pace and he should insist on rewarding those who operate with common sense and courtesy, if he will.

A DX-minded friend indicated to us not long ago his opinion that there was no special magic formula for raising DX. Required are a good rig, operating proficiency, and the expenditure of lots and lots of time listening and following up all the possibilities as they develop. Improving antennas and rigs and employing calling-working judgment as we go along, will pay off for all of us.

FMT. Like every other activity, the Frequency-Measuring Test went over the top. Hundreds more measurements than expected were made and reported. Our homework for the next fortnight will be FMT accuracy calculations. Your patience please. Each participant will get an individual report on his results. By next month we hope to have figured out who gets the Clock Awards. Of course we're glad the world has been so good to Official Observers and Members. The many, many new and surplus BC221- and LM-type frequency meters and low-frequency bars in the hands of amateurs, the high interest in practicing to reduce personal and instrument error, all augur well for an expanding ARRL O0 organization.

SECS-ECS-AEC & Preparedness. A disastrous December fire in Alaska placed a burden of communications responsibility squarely on the hams of a community. Sudden similar emergency may wreck vital facilities in your city or town. Winter's last gasp may mean blizzards, wires down, spring floods and communications emergency ... public calls may be expected on the amateur radio service.

ARRL requests every active licensed amateur who has not already done so to get an ARRL Emergency Corps blank and fill it out for his ECC, SEC or SCM. Emergency Coordinators have been asked to work out community organization...
in line with a set plan, adapted to amateur service facilities and the needs of their city or territory.

In any city where AEC radio drills are not being held, you as an individual amateur should talk up plans for a local net and outside contacts for possible emergency. Make it your business to see that the SCM has a recommendation for any needed Coordinator activity — and if plans are not being developed properly suggest to any locally-responsible ARRL officials what you think could be done, and offer your personal assistance. QST will continue to tabulate time, date, frequency, and number of members in AEC groups dedicating drills or tests to the cause of constant preparedness of amateur communication facilities, for such possible emergencies as described above.

Wanted: Official Experimental Station Applications. Some interesting new projects are coming up. If your station works at 50 Mc. or any frequency above and you are a consistent and sincere experimenter, there's a place for you in this group. Write your SCM for an application form. See the Operating an Amateur Radio Station booklet, or page 66, March 1946 QST, for complete details on OES.

FCC Active in Necessary Amateur Monitoring. We hear that a good friend is off the air with a ticket for a "drifting" signal. Now he'll have to fix it up! Reports from many sources reach us indicating consistent FCC activity in checking bad notes, unstable or creeping signals, BCI, and key thumps and chirps within our bands. In addition FCC follows up illegal or unlicensed stations, and those hams with harmonics, parasites or off-frequency effects. Next month we'll try to run some short items covering actual use of mobile FCC gear in nabbing offenders. Suffice it to say this month that "a word to the wise" is enough. To avoid citations, blue (and other color) tickets, advisory notices and what have you, monitor your own signal. Check carefully after every operating change! Even doing this we can go wrong unless our check covers a lot of territory and conditions. It's a good idea to get acquainted with the ARRL Official Observer in your city or Section. Local tests with two or three other amateurs sometimes pick up things not as surely discernible in station monitoring gear. ARRL OO reports as well as known FCC observations covering the DX Competition period will be used as a basis for the Contest Committee to use in disqualifying entries in line with standing policy. Amateur Radio must utilize such checks to maintain high operating standards. We want no complaints against the amateur radio service at the coming International Telecommunications Conference.

— F. E. H.

ATLANTA HOTEL FIRE

Upon learning of the disastrous Wmecoff Hotel fire on last December 7th, W4KV, of Atlanta, Net Control Station, alerted the Cracker Emergency Net (3995 kc.). Many messages concerning the welfare of victims were handled. Active stations included W4ZD, W4JLB, W4BIW, W4AY, W4BTI, W4BOL, W4DBM, W4GUN, W4QT, W4BA, W4FUO, W4GLX, W4VF, W4FSW, W4BYV and W9MSF. The net remained active until midnight. W4BIW operated portable gear from the Atlanta Red Cross Headquarters, furnishing replies to inquiries. W4HKA at Albany, Georgia, handled traffic concerning the Albany high-school girls caught in the fire. W4KV's XYL did yeoman service handling landline communications. W4BPT, in Hapeville, served as alternate NCS.

SCM Moss, W4HYW, writes, "The Cracker Emergency Net proved its value as a section net in emergencies. The Georgia Section has been complimented by the National and Southeastern Red Cross Headquarters for its efficient organization, and is the first to complete its organization with the Red Cross."

NORTHERN CALIFORNIA DX CLUB

Dan L. O'Brien, W6PB, Oakland, is first president of the Northern California DX Club. The purposes for which this club is organized are "to bring together radio amateurs interested in DX; to secure closer cooperation and coordination in their effort to achieve DX; to elevate the standards of practice and ethics in the use of amateur radio communication; to participate in the exchange of knowledge, methods, or any other expedient that would be mutually beneficial to the members in achieving DX accomplishments."

All members must have confirmations of two-way communication with a minimum of 25 countries, based on the ARRL Countries List. Each member must be a member of ARRL. Any person desiring to join the Northern California DX Club should apply for application through a member or the secretary. There are twelve charter members. Vice-president is Phil Caldera, W6IKQ; secretary-treasurer is Charles Henry, W6EJA, 125 Glenn Ave., Point Richmond, Calif.
CODE-PROFICIENCY AWARDS

ARRL's Code-Proficiency Program provides certificate awards for those proving ability to copy code at any of five speeds, 15 through 35 w.p.m. Endorsement stickers for the certificates are awarded later, if first qualification is at less than 35 w.p.m.

The next opportunity to qualify for a certificate or endorsement sticker is on March 17th. At 10:00 p.m. EST that date, W1AW transmits the monthly qualifying run at speeds of 15, 20, 25, 30, and 35 words per minute. Frequencies: 3555, 7145, 14150, 28060, and 52000 kc., simultaneously.

The text copied, received successfully by ear at the highest speed you can copy, should be sent to ARRL for checking. To avoid errors in recopying, send your original copy. Attach a statement certifying over your signature that the copy submitted is direct copy, made from reception of W1AW by ear, without any kind of assistance, personal or mechanical. If you qualify, you will receive your certificate or appropriate endorsement sticker for certificate you already hold. Those who qualified in the past should submit copy only if speed is higher than indicated on certificate or endorsement sticker.

Each night, Monday through Friday, at 10:00 p.m. EST, on the frequencies mentioned above, W1AW transmits practice material. References to text to be used on several of the practice runs appear below. This makes it possible to check your own copy. It also provides a means of obtaining sending practice since it permits direct comparison of one's fist and tape sending. To get sending help hook up your own key and buzzer and attempt to send right in step with the tape transmissions. Adjust your spacing in the manner indicated as necessary for self-improvement.

Subject of Practice Text from January QST

**Date**
Mar. 3rd: A New Phase-Modulation Circuit . . ., p. 11
Mar. 6th: Converting the BC-221-M to cw . . ., p. 19
Mar. 11th: A Simple Rotatable Antenna . . ., p. 22
Mar. 14th: A 16-Watt Modulator . . ., p. 28
Mar. 17th: Qualifying Run, 10:00 p.m. EST . . .
Mar. 19th: Technical Topics . . ., p. 34
Mar. 26th: A Tuned-Line Matching Transformer, p. 36
Mar. 27th: Put 'Em Push-Push!, p. 39
Mar. 31st: A World-Time Slides Rule, p. 47

**BRIEFS**

Here's a nice bit of amateur radio service. A Covington, Kentucky girl was leaving for Shanghai, China, to get married. It was necessary to start within two days to catch a ship out of Seattle, but the final necessary word from Shanghai had not arrived. Cables had gone unanswered. Could he get a message through to Shanghai? Enter W4FU (ex-W9FS) of Covington. It was known that he scheduled W8URU/C7, Peiping. Could he get a message through to Shanghai? Well, he went to work, and W8URU went to work. The next evening the answer came back, and the young lady is Shanghai-bound. The routing was W4FU to W8URU to W6JIM/C7 at Nanking via ham radio, and long distance telephone from Nanking to Shanghai. Reply was via the reverse route. This was routine business for W4FU; during December alone he handled 704 messages from W8URU/C7.

**W9RCJ**, Joliet, Illinois, advises that all former members of OSS are invited to participate in a rag-chew session on 3540 kc. Monday evenings at 7:00 p.m. CST.

---

C. W. DeRemer, W7FST, Sandy City, Utah, for five consecutive months has handled more traffic than any other amateur, according to reports to SCMs. He rates the No. 1 BPL position. Practically all operation is by voice, although all bands are used, both cw. and 'phone. Overseas traffic handling and personal radiophone contacts between G1s and relatives in the States are W7FST's specialties. Up to thirty-eight daily schedules are maintained, propagation conditions and traffic load permitting. Ten of these schedules are domestic, U. S. and Canada, seventeen with the South Pacific and South America, one each with China, South Africa and Australia, two each with the Philippines and Japan, four with Europe. If conditions make voice impractical, cw. is used. OM DeRemer has no trouble with the code, having been a Signal Corps operator on the WAR net.

W7FST is an active member of the Utah-Wyoming Section, holding appointments as PAM, ORS, OBS and OES. He is prime organizer and manager of a network of 60 stations on 3935 kc., known as the Inter-Mountain Missions Net. The tag "Missions" comes from the fact that DeRemer believes amateur radio has very definite "public-service" missions and to those the net is dedicated. W7DTB, Lewiston, Utah, is NCS, W7JHH, Ogden, Utah, NCS-2. Net members are located in Utah, Wyoming, Montana, Idaho, Nevada, New Mexico, Arizona and Colorado. Meeting time is 7:15 p.m. MST, Monday through Friday, and 8:30 a.m. MST, Sundays and holidays. Connections are maintained with many c.w. and 'phone nets throughout the country, permitting speedy and efficient traffic routing. On top of his many other activities, W7FST transmits code practice on 28 Mc.

The OM is shown at his operating position. The large certificate above the SX-28 is an early ORS appointment when he was PRICW in Corregidor, P. I. (1922-25). Left to right are seen a BC-221-M frequency meter, receiver, two speech amplifiers, and a BC-610-E transmitter, above which is a pi-network for matching each of thirteen (!) antennas to the output.

W7FST's operating efforts merit the respect of all amateurs, but become even more praiseworthy when one realizes that the operator is blind!

March 1947 67
The message had originated at WIPFJ. ZS2C1, handle a message addressed to ZSlT, Capetown. In 14-Mc. 'phone contact message and started some serious listening. After it left ZS2C1, W2KY watch for ZSIDJ there. W2KY took the was in contact with ZSlDJ in short order. The unable to get into Capetown, suggested that Capetown and the East London, South Africa, he was asked to "~ " amateur radio career, but it's the biggest moment in my life. Within ten minutes he had logged ZSIDJ signing message was delivered to ZSlT fourteen minutes later. It's a red-letter day in the life of Marine Corps Lieutenant Manning T. Jeter, jr., XUIYA. "Friends," he said as he passed the cigars, "you can quote me as saying that radio is here to stay and that not only is this the biggest moment in my life, but it's the biggest moment in my life." Anxious over failure of word to reach him regarding the expected October 25th arrival, Jeter decided to try amateur radio. Unable to reach the States with his 18-watt rig, he raised J9AAB on Okinawa and requested him to try to get a message to his wife's home in Montgomery, Alabama. J9AAB made contact with W8IHW, Cleveland, Ohio, and asked him to telephone Montgomery for information. It was only 6 A.M. in Cleveland but 10 A.M. in China and 6 P.M. on Okinawa. There was to be little sleep for Jeter that night! Within 20 minutes of the initial contact with J9AAB, the message came through: "Jeter's mother-in-law says his wife and baby doing fine. It's a boy. Weighed 8 pounds, 11 ounces. Looks like his father."
NEW DX-CENTURY-CLUB AWARD
Certificate for Amateurs Who Prove Postwar Contact with 100 Countries

We present below the rules under which the DX Century Club Award will be issued to amateurs who have worked and confirmed contact with 100 countries in the postwar period. They are effective for contacts made since November 15, 1945.

Please note that the new award does not wash out your prewar DX work. If you worked fewer than 100 countries before the war and have since worked and confirmed a sufficient number to make the 100 mark, the DXCC is still available to you. See page 74 of June 1946 QST, for complete details on how to apply for such certification.

The new award is available to any amateur who works 100 countries from November 15, 1945, and who submits satisfactory confirmations to ARRL. Prewar holders of the DXCC award and those who may have received certificates for work based on combined prewar and postwar work also may apply upon proper presentation of 100 postwar confirmations. The new certificate will be marked to differentiate it from awards previously made. Note, too, that you may now work for endorsements to certify, in steps of 10, those who may have received certificates for work with the new DXCC was published in February QST. Please refer to it and the rules published herewith to determine how you stand in working for the Postwar DXCC Award.

1) The Century Club Award Certificate for confirmed contacts with 100 or more countries is available to all amateurs everywhere in the world.

2) Confirmations must be submitted direct to ARRL headquarters for all countries claimed. Claims for a total of 100 countries must be included with first application. Confirmation from foreign contest logs may be requested in the case of the ARRL International DX Competitions only, subject to the following conditions:
   a) Sufficient confirmations of other types must be submitted so that these, plus the DX Contest confirmations, will total 100. In every case, Contest confirmations must not be requested for any countries from which the applicant has regular confirmations. That is, Contest confirmations will be granted only in the case of countries from which applicants have no regular confirmations.
   b) Look up the Contest results as published in QST to see if your man is listed in the foreign scores. If he isn't, he did not send in a log and no confirmation is possible.
   c) Give year of Contest, date and time of QSO.
   d) In future DX Contests, do not request confirmations for contacts made under different call letters in the same area (or country), if the license for all was the same.
   e) Submit forged or altered confirmations for CC credit will result in disqualification of the applicant. The eligibility of any DXCC applicant who was ever barred from DXCC to reapply, and the conditions for such application, shall be determined by the Awards Committee. Any holder of the Century Club Award submitting forged or altered confirmations must forfeit his right to be considered for further endorsements.
   f) Operating Ethics: Fair play and good sportsmanship in operating are required of all amateurs working toward the DX Century Club Award. The validity of any DXCC applicant's contact with a DXCC contact must be claimed only for contacts made under regular government-assigned call letters. No credit may be claimed for contacts with stations in any countries in which amateurs have been temporarily closed down by special government edicts where amateur licenses were formerly issued in the normal manner.
   g) All contacts in the same country or area may be utilized for credit toward the 100 mark, the DX Century Club Award. In the event of specific objections relative to continued poor operating ethics an individual may be disqualified from the DXCC by action of the ARRL Awards Committee.
   h) Confirmations submitted for CC credit will result in disqualification of the applicant. The eligibility of any DXCC applicant who was ever barred from DXCC to reapply, and the conditions for such application, shall be determined by the Awards Committee. Any holder of the Century Club Award submitting forged or altered confirmations must forfeit his right to be considered for further endorsements.
   i) Operating Ethics: Fair play and good sportsmanship in operating are required of all amateurs working toward the DX Century Club Award. The validity of any DXCC applicant's contact with a DXCC contact must be claimed only for contacts made under regular government-assigned call letters. No credit may be claimed for contacts with stations in any countries in which amateurs have been temporarily closed down by special government edicts where amateur licenses were formerly issued in the normal manner.
   j) All contacts in the same country or area may be utilized for credit toward the 100 mark, the DX Century Club Award. In the event of specific objections relative to continued poor operating ethics an individual may be disqualified from the DXCC by action of the ARRL Awards Committee.
   k) Confirmations submitted for CC credit will result in disqualification of the applicant. The eligibility of any DXCC applicant who was ever barred from DXCC to reapply, and the conditions for such application, shall be determined by the Awards Committee. Any holder of the Century Club Award submitting forged or altered confirmations must forfeit his right to be considered for further endorsements.
   l) Operating Ethics: Fair play and good sportsmanship in operating are required of all amateurs working toward the DX Century Club Award. The validity of any DXCC applicant's contact with a DXCC contact must be claimed only for contacts made under regular government-assigned call letters. No credit may be claimed for contacts with stations in any countries in which amateurs have been temporarily closed down by special government edicts where amateur licenses were formerly issued in the normal manner.
   m) All contacts in the same country or area may be utilized for credit toward the 100 mark, the DX Century Club Award. In the event of specific objections relative to continued poor operating ethics an individual may be disqualified from the DXCC by action of the ARRL Awards Committee.
   n) Confirmations submitted for CC credit will result in disqualification of the applicant. The eligibility of any DXCC applicant who was ever barred from DXCC to reapply, and the conditions for such application, shall be determined by the Awards Committee. Any holder of the Century Club Award submitting forged or altered confirmations must forfeit his right to be considered for further endorsements.
   o) Operating Ethics: Fair play and good sportsmanship in operating are required of all amateurs working toward the DX Century Club Award. The validity of any DXCC applicant's contact with a DXCC contact must be claimed only for contacts made under regular government-assigned call letters. No credit may be claimed for contacts with stations in any countries in which amateurs have been temporarily closed down by special government edicts where amateur licenses were formerly issued in the normal manner.
   p) All contacts in the same country or area may be utilized for credit toward the 100 mark, the DX Century Club Award. In the event of specific objections relative to continued poor operating ethics an individual may be disqualified from the DXCC by action of the ARRL Awards Committee.
   q) Confirmations submitted for CC credit will result in disqualification of the applicant. The eligibility of any DXCC applicant who was ever barred from DXCC to reapply, and the conditions for such application, shall be determined by the Awards Committee. Any holder of the Century Club Award submitting forged or altered confirmations must forfeit his right to be considered for further endorsements.
   r) Operating Ethics: Fair play and good sportsmanship in operating are required of all amateurs working toward the DX Century Club Award. The validity of any DXCC applicant's contact with a DXCC contact must be claimed only for contacts made under regular government-assigned call letters. No credit may be claimed for contacts with stations in any countries in which amateurs have been temporarily closed down by special government edicts where amateur licenses were formerly issued in the normal manner.
   s) All contacts in the same country or area may be utilized for credit toward the 100 mark, the DX Century Club Award. In the event of specific objections relative to continued poor operating ethics an individual may be disqualified from the DXCC by action of the ARRL Awards Committee.
   t) Confirmations submitted for CC credit will result in disqualification of the applicant. The eligibility of any DXCC applicant who was ever barred from DXCC to reapply, and the conditions for such application, shall be determined by the Awards Committee. Any holder of the Century Club Award submitting forged or altered confirmations must forfeit his right to be considered for further endorsements.
   u) Operating Ethics: Fair play and good sportsmanship in operating are required of all amateurs working toward the DX Century Club Award. The validity of any DXCC applicant's contact with a DXCC contact must be claimed only for contacts made under regular government-assigned call letters. No credit may be claimed for contacts with stations in any countries in which amateurs have been temporarily closed down by special government edicts where amateur licenses were formerly issued in the normal manner.
   v) All contacts in the same country or area may be utilized for credit toward the 100 mark, the DX Century Club Award. In the event of specific objections relative to continued poor operating ethics an individual may be disqualified from the DXCC by action of the ARRL Awards Committee.
   w) Confirmations submitted for CC credit will result in disqualification of the applicant. The eligibility of any DXCC applicant who was ever barred from DXCC to reapply, and the conditions for such application, shall be determined by the Awards Committee. Any holder of the Century Club Award submitting forged or altered confirmations must forfeit his right to be considered for further endorsements.
   x) Operating Ethics: Fair play and good sportsmanship in operating are required of all amateurs working toward the DX Century Club Award. The validity of any DXCC applicant's contact with a DXCC contact must be claimed only for contacts made under regular government-assigned call letters. No credit may be claimed for contacts with stations in any countries in which amateurs have been temporarily closed down by special government edicts where amateur licenses were formerly issued in the normal manner.
   y) All contacts in the same country or area may be utilized for credit toward the 100 mark, the DX Century Club Award. In the event of specific objections relative to continued poor operating ethics an individual may be disqualified from the DXCC by action of the ARRL Awards Committee.
   z) Confirmations submitted for CC credit will result in disqualification of the applicant. The eligibility of any DXCC applicant who was ever barred from DXCC to reapply, and the conditions for such application, shall be determined by the Awards Committee. Any holder of the Century Club Award submitting forged or altered confirmations must forfeit his right to be considered for further endorsements.

12) Operating Ethics: Fair play and good sportsmanship in operating are required of all amateurs working toward the DX Century Club Award. The validity of any DXCC applicant's contact with a DXCC contact must be claimed only for contacts made under regular government-assigned call letters. No credit may be claimed for contacts with stations in any countries in which amateurs have been temporarily closed down by special government edicts where amateur licenses were formerly issued in the normal manner.

13) All contacts in the same country or area may be utilized for credit toward the 100 mark, the DX Century Club Award. In the event of specific objections relative to continued poor operating ethics an individual may be disqualified from the DXCC by action of the ARRL Awards Committee.

14) Confirmations submitted for CC credit will result in disqualification of the applicant. The eligibility of any DXCC applicant who was ever barred from DXCC to reapply, and the conditions for such application, shall be determined by the Awards Committee. Any holder of the Century Club Award submitting forged or altered confirmations must forfeit his right to be considered for further endorsements.

15) Address all applications and confirmations to the Communications Department, ARRL, 38 La Salle Road, West Hartford 7, Conn.

BRIEF

KL7AD is a busy man when he comes on the air. The lads are standing in line to work Alaska. Such was the case on the afternoon of October 13, 1946, but one of the callers had something on his mind besides a DX contact. Ted Carnes, W9GMV, was repeating the word "urgent" at frequent intervals. KL7AD answered with a simple "K Ted." It developed that GMV had been asked by KL7AD's brother in Chicago to attempt contact and advise AD to come home at once because of a death in the family. Information was relayed back and forth, arrangements for plane reservations were made, and on the morning of the 14th AD was en route to Chicago. He was met at the airport by W9GMV and W9DO (Joliet) and their families, and spent an evening with the Joliet gang.
No, the chap on the right is not the world’s "shortest ham." However, that other lad surely must be one of the "tallest." He is Albert E. "Doc" Hayes, W3LVY, and he rises 6 feet, 9 inches in size 15 shoes! The fellow tipping slightly backward to look "Doc" in the eye is Bob Merryman, W3FBB, a gentleman of normal height. W3LVY (ex-WLIIN), now in Baltimore, Md., is ARRL. Emergency Coordinator, ORS, OBS, member of the A-1 Operator and Rag Chewers clubs, and holder of a Code Proficiency Certificate. "Doc" is 25 years old and has been licensed since 1931. It is rumored that in emergencies one end of W3LVY's skywire is supported by an upraised arm!

BRIEFS

Lieut. Colonel Frank J. Shannon, USAAF, communications officer on the Honolulu-to-Cairo Pocusan Dreamboat flight, is now on the air as W3QR/4, mostly on 14-Mc. c.w. His address is Wing Communications Officer, Hq. 311th Reconnaissance Wing, Tampa, Florida.

Communication from blizzard-isolated Greenville, Mississippi, was furnished on January 2nd by SCM WSIGW. EC W5BYX, Waco, Texas, and EC W5KTE, W5JPJ and W5KUG, New Orleans, were among those who maintained watches for two days in readiness to handle traffic from the isolated city.

QUEBEC AMATEURS AID ICE-FLOE RESCUE

On the morning of December 23, 1946, a Quebeck Airways plane left the hamlet of Godbout on the north shore of the St. Lawrence en route to the Mont Joli airport with pilot and six passengers. Almost to its destination, a Mayday call was transmitted: "Over the river. Engine trouble. Turning back to Godbout." And then silence. For the next 24 hours it was assumed the plane had nose-dived into the river. The RCAF dispatched an air-sea flying boat in search. Before noon on the 24th the pilot and five passengers were sighted on an ice floe. There was no sign of the plane or the sixth passenger. Supplies were dropped, including rubber dinghies. The pilot and two companions set the dinghies in the water while the rescue ship attempted to land nearby. It was late afternoon of that day before the three men were picked up. The other three survivors meanwhile were dangerously drifting toward the Gulf of St. Lawrence at a rate of about three miles per hour.

At 4 p.m. on December 24th, VE2RO at Petit Mecchin on the Gaspé Coast sighted the three survivors. An emergency call on 75-meter 'phone raised VE2NL, Rivière du Loup, who called the Mont Joli airport by long-distance telephone with the news. After alerting amateurs, VE2RO arranged to go on the river with a rescue party. After a few hours of trying, the party was forced to return because of darkness. On Christmas Day at 4 p.m. the party, consisting of VE2RO and five other men, again set out, driving fifty miles by truck east along the Gaspé Coast to the small settlement of Rivière a la Marte. At daybreak the three survivors were again sighted on a floe a mile and a half from shore. The party could not drag a more rugged boat across the treacherous floes so they set out in canoes. They returned 18 hours later with one survivor. The others were rescued later.

The frequencies 3800 to 3820 kc. were kept clear for handling emergency traffic. Messages were handled for the many Canadian and United States planes engaged in the search and rescue operations, for Marconi station VCC in Quebec, for the air dispatcher at Mont Joli airport, and for the S.S. Colabe, which aided in the search. Traffic was concerned with availability of aircraft, weather, landing conditions, location of the rescue parties, call for an icebreaker to rush to the scene, and incidental safety reports. Special credit is due the wife of VE2RO, who operated the station for over 24 hours, as well as the following: most of whom were on the air more than 20 hours: VE2AW, VE2NE (36 hours), VE2LA, VE2IH (50 hours), VE2DD, VE2AG, VE2DZ, VE2DY, VE2IC, VE2NL, VE2GU, VE2VX, VE2AB, VE2HL, VE2AI, and VE3GM.

QST for
RONNE ANTARCTIC RESEARCH EXPEDITION

The motor vessel Port of Beaumont, Texas, of the Ronne Antarctic Research Expedition, is authorized to communicate with radio amateurs "on frequencies above 4000 kc. on a secondary basis, when using A1 and A2 emission only ... provided no pecuniary interest is involved and no interference is caused to commercial traffic, when using A1 and A2 emission only." Scientific work and geographical explorations, is provided no pecuniary interest is involved and "01: frequencies above 4000 kc. on a secondary basis will be used extensively in communications." The expedition, which will conduct scientific work and geographical explorations, is under the auspices of the American Antarctic Association, Inc., and is led by Commander Finn Ronne, USNR. Radio operator is Lawrence DeWolfe Kelsey, W3LYK. The expedition will be of approximately 18 months' duration, with base on Palmer Island, approximately 1000 miles south of Cape Horn. It is expected that amateur communications will be used extensively in enabling staff members to keep in touch with their families. The cooperation of all amateurs is requested.

The Port of Beaumont, Texas is assigned the call W2XH. Amateurs wishing to communicate with the party should listen on the 36-meter ship frequencies immediately after W1AW's 10 P.M. EST code-practice transmissions (about 11 P.M. EST, Monday through Friday), and at 11 P.M. EST Saturday and Sunday. The ship frequencies are 8240, 8250, 8260, 8300, and 8330 kc. The operator will use the channel found to have the least interference on each night's schedule. Amateurs should reply on the 7-Mc. band. Unscheduled contacts with amateurs also will be made frequently on the 10- and 11-meter amateur bands, using the call W3LYK/MM, followed by the name of the vessel and its approximate position. Two transmitters are available for use on the marine frequencies, one capable of 200 watts output with A1 emission, the other with 100 watts, A2.

W1AW is maintaining schedule with the expedition. Operator Kelsey requests that amateurs keep posted on frequency changes and possible revision in operating schedules by following the regularly-scheduled W1AW bulletin transmissions.

EXPEDITION KON-TIKI

In early March the ethnological expedition Kon-Tiki is scheduled to leave on a 4000-mile trip by raft across the Pacific Ocean. The party will be under the leadership of Thor Heyerdahl, noted Norwegian explorer. The origin and civilization of the Polynesian islands of the mid-Pacific will be studied. The raft on which Mr. Heyerdahl and five other Norwegians will make the trip from Ilo, Peru to Polynesia will be fashioned of balsa-wood logs and fished together with native-made hemp rope. Steerage control will consist only of a small oar. Although the raft will carry radio and the most modern type of Army Air Forces protective clothing and lifesaving equipment, the mode of transportation itself will not vary from that of the ancient settlers of the Americas. "The object of the trip," according to Mr. Heyerdahl, "is to prove the feasibility of the voyage itself, not to prove that we are pre-Incas. The modern equipment which we will carry will be for research and emergency purposes and will not affect the basic aim of the expedition." The name given the expedition is explained as follows: "There are preserved in Inca legend accounts of a race of white folk, bearded and blue-eyed. These whites, whose chief was traditionally known as Kon-Tiki, meaning 'Tiki the Sun God,' were defeated in a terrible battle by the forebears of the Incas at about the time of the fall of Rome. The legend records their migration to the western part of Peru from their native Andes and their eventual disappearance into the Western Ocean."

Plans for radio operations include communication with amateurs on the 14-, 28- and 50-Mc. bands. A Norwegian experimental license with call letters LI2B has been authorized. The raft transmitter will use approximately 15 watts. Beam antennas will be used in the 28- and 50-Mc. bands. Because of the physical dimensions of the raft and low power available, frequencies below 14 Mc. will not be used.

Predictions of the Central Radio Propagation Laboratory indicate that 28 Mc. may be the best frequency for contacting the United States during the trip. Antennas will be suspended from masts located approximately in the corners of the raft, which is approximately 25 to 30 feet by 15 feet in size. Final arrangements regarding communications with possible schedule for a regular listening watch by amateurs will be announced in QST and via W1AW bulletins.

BRASS POUNDERS' LEAGUE

(December Traffic)

<table>
<thead>
<tr>
<th>Call</th>
<th>Orig.</th>
<th>Del.</th>
<th>Rel.</th>
<th>Credits</th>
<th>Extra Del.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W7FST</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1329</td>
<td>—</td>
<td>1329</td>
</tr>
<tr>
<td>W4FU</td>
<td>22</td>
<td>65</td>
<td>750</td>
<td>1329</td>
<td>—</td>
<td>1329</td>
</tr>
<tr>
<td>W6SCW</td>
<td>30</td>
<td>100</td>
<td>478</td>
<td>76</td>
<td>854</td>
<td>1028</td>
</tr>
<tr>
<td>W6FQD</td>
<td>5</td>
<td>8</td>
<td>662</td>
<td>675</td>
<td>—</td>
<td>675</td>
</tr>
<tr>
<td>W4PL</td>
<td>39</td>
<td>80</td>
<td>414</td>
<td>559</td>
<td>—</td>
<td>559</td>
</tr>
<tr>
<td>W5GWW</td>
<td>68</td>
<td>8</td>
<td>472</td>
<td>549</td>
<td>—</td>
<td>549</td>
</tr>
<tr>
<td>W3LTP</td>
<td>123</td>
<td>300</td>
<td>—</td>
<td>533</td>
<td>—</td>
<td>533</td>
</tr>
<tr>
<td>W9RCB</td>
<td>23</td>
<td>24</td>
<td>463</td>
<td>527</td>
<td>—</td>
<td>527</td>
</tr>
<tr>
<td>W3ECB</td>
<td>52</td>
<td>339</td>
<td>74</td>
<td>522</td>
<td>—</td>
<td>522</td>
</tr>
<tr>
<td>W3LKY</td>
<td>55</td>
<td>36</td>
<td>305</td>
<td>519</td>
<td>—</td>
<td>519</td>
</tr>
</tbody>
</table>

The following make the BPL with over 100 "deliveries plus extra delivery credits":

W1UE 170 W8DTL 107 V6FHP 102
W6OX 130 W6QXN 102 W9FTX 100

A message total of 500 or more, or 100 "deliveries plus extra delivery credits," will put you in line for a place in the BPL. The Brass Pounders' League listing is open to all operators who qualify for this monthly "honor roll."

March 1947
**WIAW OPERATING SCHEDULE**

**Operating-Visiting Hours**
- **Monday through Friday,** 8:30 A.M.–1:00 A.M.
- Saturday, 7:00 P.M.–2:30 A.M.
- Sunday, 3:00 P.M.–9:00 P.M.

**Official ARRL Bulletins** containing latest FCC information relating to amateur operation and reactivation, and other bulletins on matters of general amateur interest, are transmitted on regular schedules, as follows:

- **Frequencies:** 3555, 7145, 14,150, 28,060, and 52,000 kc. (Voice — 3290, 14,280, 52,000 kc.)
- **Times:** Monday through Friday, 8:00 and 11:30 P.M. EST (0100 and 0430 GCT, Tuesday through Saturday)
- Sunday, 1:00 A.M. and 8:00 P.M. EST (0600 Sun. and 0100 Mon., GCT)

Starting at the times indicated, bulletins are transmitted by telegraph simultaneously on all frequencies. Bulletins are sent at 25 w.p.m. and followed in turn, by voice transmissions on 3950 kc. and 52,000 kc. simultaneously, and then on 14,280 kc. Changes from this schedule will be announced by the operator.

**Code-Proficiency Program:** Practice transmissions at five speeds, 15 through 35 w.p.m., are made Monday through Friday on the above-listed frequencies, starting at 10:00 P.M. EST (0300 GCT, Tuesday through Saturday). Approximately ten minutes practice is given at each speed. Next certificate qualification run is scheduled for Thursday, February 13th.

**General Operation:** WIAW engages in two-way work with amateurs as follows:

**Monday through Friday,** all times EST —
- 11:00 A.M.–11:30 A.M. 32,060-ka. c.w.
- 11:30 A.M.–12 noon 29,150-ke. voice
- 1:30 P.M.–3:00 P.M. 14,280-ke. voice
- 3:30 P.M.–4:00 P.M. 14,150-ka. c.w.
- 4:30 P.M.–5:00 P.M. 3050-ke. voice
- 6:00 P.M.–7:00 P.M. 7250-ka. c.w.
- 7:00 P.M.–8:00 P.M. 3555-ka. voice
- 9:30 P.M.–10:00 P.M. 3555-ka. c.w.
- 12:15 A.M.–1:00 A.M. 7250-ka. c.w.

**Saturday and Sunday** (excepting dates of official ARRL activities)
- Saturday: Midnight–1:00 A.M. (Sun.) 3555-ka. c.w.
- Sunday: 1:45 A.M.–3:00 A.M. 7250-ka. c.w.
- 5:00 P.M.–7:00 P.M. 3555-ke. voice
- 7:00 P.M.–8:00 P.M. 7250-ka. c.w.

**F.C.C. APPREHENDS ILLEGAL OPERATORS**

"A word to the wise is sufficient," but somebody usually fails to get or heed the word! Close to 200 illegal operators have been apprehended by the FCC since V-J Day. Minor violations result in warnings and confiscation of equipment, but the law provides for a $10,000 fine, or jail for two years, or both. In addition to the FCC's extensive monitoring system, each licensed radio operator, including nearly 80,000 amateurs, should be on the alert to report any transmissions believed to originate from an unlicensed source. There is no reason for tolerance toward those who "steal" the use of our precious frequencies. Amateurs are invited to report all cases of illegal operation to the nearest FCC office.

**BRIEFS**

W5BYX reports the designation of 3520, 7040, 14,080, and 28,160 kc. as "get-together" frequencies for amateurs employed by the Civil Aeronautics Administration. "CQ CAA" is suggested when looking for other CAA hams. In signing your call, add "CAA" to identify yourself as a CAA employee. Bill Edens, W5BYX, 2608 Alexander, Waco, Texas, requests a postal or QSL card from all interested amateurs, with information on QTH, place of employment, and other data of interest. He plans to prepare a reference list to be mailed to each CAA amateur sending a stamped self-addressed envelope.

W6JHN working W1NBG mentioned that his name was "Smitty." W1NBG thought it quite a coincidence when his next contact, W6DYW, also turned out to be "Smitty." But the unusual became more so when W6DYW advised that W6JHN was his twin brother!

**A.R.R.L. ACTIVITIES CALENDAR**

**Mar. 5th:** Frequency-Measuring Test
**Mar. 7th:** Frequency-Measuring Test
**Mar. 14th-17th:** DX Competition (c.w.)
**Mar. 17th:** CP Qualifying Run
**Mar. 21st-24th:** DX Competition (phone)
**Apr. 4th-6th:** VE/W Contest
**Apr. 18th:** CP Qualifying Run
**Apr. 26th-27th:** CD QSO Party
**May 14th:** CP Qualifying Run
**May 17th:** V.H.F. Relay and QSO Party

**Jan. 16th-Dec. 15th:** 1947 V.H.F. Marathon
**Jan. 1st-Dec. 31st:** Most-States V.H.F. Contest

**First Saturday night each month:**
A.R.R.L. OFFICIALS NITE (Get-together for SCMs, RMs, SECs, ECs, PAMs, Hq. staff, Directors, Alt. and Asst. Dir.)
We often receive letters suggesting changes in our receivers. These are extremely useful to us because they serve as field reports, telling us how our equipment can be made more useful to you. We study all such comments carefully and do our best to give you what you want.

Unfortunately, all amateurs are not in agreement on the ideal receiver. The S-meter, for instance, has been a subject for lively discussion ever since it was first introduced, the main argument being "How big is an 'S'?

We have worked out an S-meter calibration which has become standard in our receivers. Listening tests indicate that there is about 40 db difference between an S-1 and an S-9 signal as defined by the ARRL. Specifically, S-1 is about 0.5 microvolt and S-9 is about 50 microvolts. Our S-meter scales are made accordingly, with 5 db per S unit starting at 0.5 microvolt for S-1.

Actual tests on the air have shown that 5000 microvolts is about the maximum that is encountered. This is 40 db above S-9 as defined above, so we have made the whole range of the S-meter about 80 db.

There are some interesting technical problems in providing such a range for an S-meter. This is because of AVC action. In general, the better the AVC action the harder it is to make an "active" spread-out scale on the meter. The reason for this is pretty obvious. The whole purpose of the AVC is to keep the signal strength constant at the second detector, and if the signal strength is constant there is no change with which to operate a meter.

As a practical matter, the AVC action is so good on National receivers that we have to use some rather tricky circuits for the S-meter, involving the use of vacuum tube bridge circuits. With these we are able to get the desired scale with good calibration stability.

Bear in mind that the S-meter is not a precision field-strength meter. You should not attempt to use one for any such purpose as calibrating the output level of a test oscillator. They can be used for measuring the front-to-back ratio of a beam antenna or for any purpose where approximate signal strength ratios are needed. For their intended purpose — reporting signal strength — they are amply accurate.

William A. Ready
All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — DWA’s family found it impossible to get passage from England until Don contacted G2AMG, who arranged everything via Pan-American Airways. RCQ and 8WDQ are interested in starting a net on 7 Mc. for Coast Station has the call MKA. GMK is getting set for the DX

EASTERN PENNSYLVANIA - SOM, Jerry Mathis, Amateur Radio Club are: OML, pres.; LXY, vice-pres.; Ware Ave., Wilkes, Penna. New officers of the Schuylkill

Atlantic City schools. If interested contact RCQ, 623 Delaware from England until Don contacted G2AMG, who is open to suggestions for an EC to handle Wayne, Pike, met every morning for eleven months straight. Frequency 150-watt rig on all bands. BXE, Section EC, states that he is open to suggestions for an EC to handle Wayne, Pike, Monroe and Counties, and another for Carlson, Lehigh, and Northampton, MAL’s XYL purchased an 8-38 Hallcrafters for his Christmas present. ITZ operates on narrow-band fm. on 28 Mc. The West Philadelphia Amateur Radio Association has the call MKM. GMK is getting set for the DX Contest. EU is looking for a Philadelphia schedule on 3.5 Mc. EZ is on 14 Mc. JMB is DXing on 7 Mc with 20 watts. All stations. W3UPR is on 3.5 Mc. EHBQ erected a 14-Mc. rotary which he is using daily, QCM is using o.c. on 3.5, 7, and 14 Mc. BAI has resumed his Class I 00 activities with a brand-new 100-kc. unit. QCM hit 85 score of 53,350. ZI heard ON4HC and 8BCXQ on 3.5 Mc. BAI maintains daily schedule with G6BY. The third annual “Old Timers’ Night,” sponsored by the DVRA, will be held Mar. 22nd. IJC is heard on 50 Mc. with the four-element parasitic beam. At the December meeting of the SJRA a complete AEC unit was won by 2EQ. BEI has resumed schedules with G8SMN. BXE worked 60 sections in SS. 8DF has 829 on 7 and 14 Mc. QOK has Triton-4 on 40 Mc mobile in his new car. SIM has 800-watt rig working on 14 Mc. QOK is constructing 1-kw. rig. Traffic: W2QWH 83, RG 38, BNX 25, OXX 22, ZI 18, ZQ 16, CFB 7, ORS 7, QCM 6, BEI 3, Roy.

WESTERN NEW YORK — SCM, Charles I. Otero, W2GCU — Section EC: BAQ. ECs: SAK, PSZ, ASQ. The

BUFFALO POLICE DEPARTMENT, gave a talk on “Police Activi­ties” for Class I 00 activities with a brand-new 100-kc.

NAVAL ACADEMY Club at Annapolis, is holding code and theory classes. The club held an informal hamfest in Bancroft Hall at the annual Christmas Dinner. MAI is on 3.5-Mc. c.w. with a ten-watt rig 4VY/J3, our 15-year-old member, is on 7-Mc. e.w. with 25 watts from his new Baltimore QTH. Despite heavy school work, ISF has a new five-band station going nicely and is getting DX. HUM is on 120 AP, along with ECP, CIZ is doing nicely after his recent operation. Two of our section stations, EDF and LYY, made BPL this month. The section net meets Sunday at 6:00 P.M. on 3705 kHz. All
d division, any member desiring to join should contact LYY.

Traffic: W3ECP 822, LYY 510, HUM 92, 18F 16, BWT 10, AKB 2.

SOUTHERN NEW JERSEY — SCM, Ray Tomlinson, W2GCU — Section EC: BAQ. ECs: SAK, PSZ, ASQ. The S.N.J. ORS net was reactivated Dec. 17th with eight ORS reporting in to ZQ, net control for the month. The net meets Tues., Thurs., and Sat. at 9:00 p.m. EST on 3700 kHz. Credit to ARS and ARRL. ORS are: RCQ, RG, ZQ, CFB, SPN, FXN, BNX, QUH, and Z1. JAG takes most of the operating time at the DVRA station. ZQ, ORS has 8S7/F6BG e.o.c. on 7 Mc. QLCL erected 3.5-Mc. sky­aire and noisemaker for the new DX. QCM is operating with 12Q on 3.5 Mc. RYB has two-element rotary with folded dipole radiator. RSP is changing rig over into a RGA de luxe streamlined cabinet. RYB will use BC221 frequency as a buffer as he is working 10-meter DX. QOK is using 14-Mc.

The Chester Radio Club meets every other week at the Chester YMCA. BNX finally received his WAC. QSLs for members of the Chester Radio Club may be sent to P. O. Box 34, Philadelphia. FUF put up a 14-Mo. rotary on the penthouse of the Hotel St. Francis. GQS has 3.5-Mc. c.w. with a ten-watt rig. 4JVJ/3, our 15-year-old

W2UPH - A team of four members of the Rochester Amateur Radio Association meet a team of four members of the Kenmore-Buffalo-Tonawanda Club at the “Quiz of Two Cities” broadcast by WHAM at Rochester and WBEN at Buffalo. It was fine publicity for both organizations and also for our section the Rochester Regional. The listening area spanned the state from Lake Erie to the mountains of Pennsylvania. The second annual “Old Timers’ Night,” sponsored by the DVRA, will be held Mar. 22nd. IJC is heard on 50 Mc. with the four-element parasitic beam. At the December meeting of the SJRA a complete AEC unit was won by 2EQ. BEI has resumed schedules with G8SMN. BXE worked 60 sections in SS. 8DF has 829 on 7 and 14 Mc. QOK has Triton-4 on 40 Mc mobile in his new car. SIM has 800-watt rig working on 14 Mc. QOK is constructing 1-kw. rig. Traffic: W2QWH 83, RG 38, BNX 25, OXX 22, ZI 18, ZQ 16, CFB 7, ORS 7, QCM 6, BEI 3, Roy.

BUFFALO POLICE DEPARTMENT, gave a talk on “Police Activi­ties” for Class I 00 activities with a brand-new 100-kc.

NAVAL ACADEMY Club at Annapolis, is holding code and theory classes. The club held an informal hamfest in Bank-
Connect up the FS-135-C in your receiver and you have a first-class frequency meter all set to go. You will have the satisfaction of knowing you are obeying F.C.C. rules and you'll get accurate signals every 100 KC's to mark the band edges or make any other checks you want.

You will find the FS-135-C is a cinch to connect and it’s so small it fits in any receiver. The ingenious circuit and a special crystal permit variation of the crystal frequency for zero beating with WWV. Once this adjustment is made you practically have a WWV junior built right in your receiver.

See the FS-135-C at your dealer's

HAMMARLUND

THE HAMMARLUND MFG. CO., INC., 460 W. 34TH ST., NEW YORK 1, N.Y.
MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT
on 28 Mc. with 100 watts and four-element rotary, and is using an HRO. PHV, New Castle, is building a higher power 144-Mc. mobile rig in a three-element beam. BKJ, one of our old fellows, has moved from Chicago back to Coleta. JMG added e.c.o. pushing 809 final and has a new S-20 receiver. VNE has resumed activity at a low ebb. The Chicago Radio Club reports the Austin Gang at a complete standstill and illness kept activity at a low ebb. The Chicago Radio Club, held an Ann Arbor meeting. Following are new officers: ENC, pres.; CSC, vice-pres.; IYD, secy.-treas. ENC operates on 3.9-Mc. phone. NFK is on 144 Mc. He is editor of the Michigan Ham News. W3TWI has 813 final on 3.5, 7 and 28 Mc. with 100 watts and four-element rotary, and is using a 28-Mc. rotary. The Cahokia Amateur Radio Club now has forty members and would like to contact any ham living in St. Louis, Madison, and Monroe Counties who at present is not a member of any club. Call or write EZX for information. UPW now works 3.5- and 7-Mc. rig in Springfield; he likes the new 28-Mc. band plan. JEA is assistance fire chief at Freeport. ERU is working on his DX for the last year. Call or write EZX for information. MWL's work is interfering with the QIN although he can still make some contacts. MJK is back handling traffic after being off c.w. for seven months. SBF and PMT received Class A licenses. ENB is working for a higher power 144-Mc. rig and is on 3.5 Mc. with ten watts to 616 at Liberty. UIA has worked his 50th county on 28 Mc. EQG has worked 290 watts on 3.5-Mc. c.w. GQG has new beam on 28 Mc.; also a new c.a. SFA. BZU is working with the new 14-Mc. phone rig. YL6, formerly from Vincennes, is 6WVU at Napa, Calif., with an a.c.o. looping a couple of 80's to 100 watts on 14-, 7-, and 3.5-Mc. c.w., where he is doing a job of which we of Indiana should be proud. KYM gave a talk at the Michiana Amateur Radio Club of South Bend. Traffic: W9RCB 627, EN6 J65, ENH 23, DHX 13, QLW 12, BJX 11, SWH 9, HUV 6, FJX 5, PMT 4. 73. Ted.

WISCONSIN — Acting SCM, R. G. Klein, W5DKH — LFK, S6L NWM, QIX, SIZ, IJQ, KCY, and HJN, are regular reporters into Wisconsin State Net, 3775 kc., 8 a.m. Monday through Friday. Ex-DSF now is K12 at De Pere and is on 3.5-Mc. c.w. Manitowoc County Radio Amateurs have organized a club to be known as the MANCORAD Club. BZU is the club operator; QLZ is the Prefix. K9 are licensed by FCC and are OK. MUX reports Europe coming through on 3.5 Mc. Sunday mornings, 0330 to 0730, 3505 to 3525 kc. DXL has new 3C-345Q receiver of which he was very pleased and had several contacts for 28 and 26 Mc. Meanwhile he is active on c.w. C07CX, of Florida, Cuba, is now on 3.9-Mc. phone and wants to get up to Western New York. Look for him in the morning. 73. CENTRAL DIVISION

ILLINOIS — SCM, Wesley E. Marriner, W9AND — Radios of all kinds are working in every corner of Illinois. The Chicago Amateur Radio Club now has forty members and would like to contact any ham living in St. Clair, Madison, and Monroe Counties who at present is not a member of any club. Call or write EZX for information. MWL's work is interfering with the QIN although he can still make some contacts. MJK is back handling traffic after being off c.w. for seven months. SBF and PMT received Class A licenses. ENB is working for a higher power 144-Mc. rig and is on 3.5 Mc. with ten watts to 616 at Liberty. UIA has worked his 50th county on 28 Mc. EQG has worked 290 watts on 3.5-Mc. c.w. GQG has new beam on 28 Mc.; also a new c.a. SFA. BZU is working with the new 14-Mc. phone rig. YL6, formerly from Vincennes, is 6WVU at Napa, Calif., with an a.c.o. looping a couple of 80's to 100 watts on 14-, 7-, and 3.5-Mc. c.w., where he is doing a job of which we of Indiana should be proud. KYM gave a talk at the Michiana Amateur Radio Club of South Bend. Traffic: W9RCB 627, EN6 J65, ENH 23, DHX 13, QLW 12, BJX 11, SWH 9, HUV 6, FJX 5, PMT 4. 73. Ted.
Here's how you can help us: Sprague Capacitors and Koolohm Resistors have never been matters of guesswork. Now, to tie them in even more closely with amateur requirements, we are conducting an extensive research. Questionnaires have already been mailed to several thousand amateurs. In them, we are asking about future building plans and needs for their rigs. If you have not already received a questionnaire, write for one today. You'll enjoy filling it out—it will be mighty helpful to us—and to repay you, we'll send a Sprague Handy Tester for only 25¢ cash or stamps to defray cost of packing and mailing.

The Handy Tester tests ac/dc voltages up to 500v; indicates r-f and parasitic oscillations; checks charge on high-voltage capacitors, distinguishes a.c. from d.c. and is a tool of dozens of other uses.

Sorry, but of course we've got to limit this offer—and the questionnaires—only to licensed amateurs.

Write today to Dept.

Due to the necessity for devoting our space to the accompanying message this month, the SPRAGUE TRADING POST feature has been omitted from this publication. It will appear again next month.

SPRAGUE PRODUCTS COMPANY
NORTH ADAMS, MASS.
list, Ex-Kenosha E2P is announcing at WOTMT and is active on 3.5-Mc, c.w. BZU is interested in 144 Mc. work and v.h.f./u.h.f. appointment. AOF and NIRJ are on 14-Mc. 'phone. Route Manager LPE is reporting into the regional coversage net QMW on 3556 kc. From Madison YPP reports RMJ and TMB are new additions to the "20ers" of the Four Lakes Amateur Radio Club. FUS has three-element resonator on 14 Mc. to go with his BC-610. RXN has been a loyal contributor to the club since he has been on 14 and 28 Mc. within 500 cycles. Ex-TEYD/9 is now at KBU at Appleton and is active on 3.9-, 14-, and 28-Mc. 'phone. RQM was QRL with holiday rush. Traffic: W6DHY 509, LFX 201, S2L 41, HU 90, NWN 25.

DAKOTA DIVISION

NORTH DAKOTA — SCM, Raymond V. Barnett, W2EVP — Two more members of the North Dakota Net have moved out of the State: LH8 to Pontiac, Mich., and PFT to Duluth, Minn. We welcome APE, of Mineot, to the net. ABB is engineer at KGCU and is building a rig. E9Q is active on 3.5 Mc., and reports new club at Jamestown becoming affiliated with ARRL. TAV, Nelson engineer, of GYV, giving interesting and helpful lectures on technical topics at each meeting of Cendak Club. P6D has been appointed Route Manager. Two PE50s have been ordered for emergency use in this chief engineer of KFYR, giving interesting and helpful lectures on technical topics at each meeting of Cendak Club. P6D has been appointed Route Manager. Two PE50s have been ordered for emergency use in this county.

SOUTH DAKOTA — SCM, P. H. Schulz, WQQY — Please get your reports to me before the fifth of each month. QVY visited ILL at Huron and ZAL at Ravins during the Christmas holidays. TI, of Milbank, is heard quite well in South Dakota. FUS has three-element omni-rig and reports KML and TMB are new additions to the "20ers" list. Ex-Kenoshian EZP is announcing at WOMT and is active on 3.9-, 14-, and 28-Mc. 'phone. KAM is QRL with holiday rush. Traffic: W6DHY 509, LFX 201, S2L 41, HU 90, NWN 25.

MINNESOTA — Acting SCM, Vernon G. Pribyl, W2OMC — Congratulate to BBL on the arrival of a new YL at his house! UWG reports that the Winona Amateur Radio Club was recently organized with 25 members; pres.: DEJ, vice­pres.; ZSA, secre­tary; and TWW, program director. LID is operating regularly on 7120 kc. but has ground a few 7-Mc. blanks and now is able to QSY with ease. He is using a new Gonsett 28-Mc. converter with its BC-610. RXN is interested in the area. W6DHY has his Class A ticket. OLB and BLK are interested in starting a South Dakota net. I will act as a clearing house for your ideas and appoint a controller for the net. Let me hear from all interested. What about a hamfest this spring? OEP is again on the air. W6DHY has been appointed Route Manager and is regular permitting general. YQR has a new Shack and is working all bands. ZHU is on the air. OLB is building a new station. OQB has been appointed Route Manager and is regular permitting general. YQR has a new Shack and is working all bands. ZHU is on the air. OLB is building a new station. OQB has been appointed Route Manager and is regular permitting general. YQR has a new Shack and is working all bands. ZHU is on the air. OLB is building a new station. OQB has been appointed Route Manager and is regular permitting general. YQR has a new Shack and is working all bands. ZHU is on the air. OLB is building a new station. OQB has been appointed Route Manager and is regular permitting general. YQR has a new Shack and is working all bands. ZHU is on the air. OLB is building a new station. OQB has been appointed Route Manager and is regular permitting general. YQR has a new Shack and is working all bands. ZHU is on the air. OLB is building a new station. OQB has been appointed Route Manager and is regular permitting general. YQR has a new Shack and is working all bands. ZHU is on the air. OLB is building a new station. OQB has been appointed Route Manager and is regular permitting general. YQR has a new Shack and is working all bands. ZHU is on the air. OLB is building a new station.
Here’s a new Eimac tetrode—the power step-up you have been asking to have added to the Eimac line.

Capable of 2-kw power output at 4000 plate volts, with less than 15 watts of grid drive, the 4-750A opens a new field of possibilities to designers of electronic equipment. A pair of these tetrodes, driven by low cost, low-power tubes, will supply more than 4-kw output.

A potential workhorse for communications and industrial use, the 4-750A has the ability to deliver its maximum power over a wide range of frequencies. Inherent characteristics include the familiar attributes of Eimac tetrodes—stability, economy, and dependability.

Complete technical data and performance characteristics will soon be available. Write now for your copy.

EITEL-McCULLOUGH, INC., 1407 San Mateo Avenue
San Bruno, California
on 3.5-Mc. c.w. 4ZLF is on 144 and 540 Mc. 4FU, with daily schedules to China, Baffin Island, etc., set a new record for operating time. A few days ago, 4ZUZ put up a new 40-foot tower topped with a four-element beam a storm took it down. He is active on 3.9 and 28 Mc. with 600 watts to a pair of 313s. 4KKG is putting up a beam in his new shack and has a new BC510 receiver. 4FR is on 3.9-Mc. phone with pair of 810s; also mobile 28-Mc. 4OBE works South Africa, Northern Rhodesia, Germany, and England with a new ground-plane antenna. He has 811 conditioners in 654 months. 4XQ wants all 28-Mc. phone men to look for D4ARN, ex-WARN, Frankfort, Germany, on 28.02 to 28.4 Mc. at 4000 watts to St. Clair. MYLK is obtaining crystals for contemplated elub on your certificates and send them in for renewal yearly.

MICHIGAN—SCM, Harold C. Bird, W5DPE—TRP sends his congratulations. UGR is having harmonic trouble. WTVJ does not use its equipment because of snow and ice. It now is building an emergency rig. FX is busy with club work and reports that BGY is rebuilding, WWSL is rebuilding but will send in measurements for the Frequency Measuring Tests. FWU renewed ORS appointment. ONK is working on the QMN Net and TLAP. DED is selling his QSL cards and other equipment and is working on 28 Mc. NOH has been busy on 27 and 28 Mc. He is building a 27 and 7-Mc. receiver. JLA and JX4 are obtaining crystals for contemplated club net. LXE is handling traffic in fine style with his shack on the banks of Lake St. Clair. MVP is obtaining crystals for contemplated club net. LXE is attending school nights at Lawrence Tech. and is working WJBR. UMI is attending Michigan State College. KEQ, former member of DMRC, is working for C&A in Evergreen. WJAV is handling traffic in fine style on a new rig and fine signal. RJC and TBP sent reports by radio. ABH is handling Early Net on QMN and sounds like a veteran. TYE is taking his turn on the Early Net and sounds good. ARP is a regular reporter in the net. TMX handles traffic for Ferndale. SCW is assistant general manager of the QMN Net and is doing a nice job. He also can be heard on TLAP. BIU finally got into the swim and is handling traffic his way. JUC can be heard plugging away on QMN Net between 6 and 7 p.m. daily except Saturday and Sunday. WET has been snowed in up his way but is doing his share to keep communications open. JFS is having trouble getting on 7 and 3.5 Mc. because of limited space in his yard for antennas. KNP dropped in during the holidays but now is making his home in Cleveland. The Oakland County Radio Club was entertained at its January 13th meeting, and the station on the SX-42 and open adapter by the courtesy of M. N. Duffy, of Detroit.

Traffic: WSSW 686, SAY 335, ONK 122, ABE 101, JUQ 88, UOK 41, FX 39, WET 33, TBP 29, TVE 29, DPE 19, DPI 19, TRP 13, QMN 11, TMN 11, NOH 5, BID 6, FWT 5, XDI 5, NDX 4, 73. BIU.

OHIO—SCM, William D. Montgomery, W8PNQ—All you follows with AIML appointments, check the dates on your certificates and send them in for renewal yearly. Recent appointments include MFV as OM, PJQJ as ORS, STZ and JFC as OBP. Monthly reports should be mailed on the 3rd or 4th of the month. CBI, who works the Buckeye Net and the Groton-Trunk Line, makes a couple of 813s. 4KKG is using until he can find a BC-610. AYES is looking for Asia to complete his WAC on 14-Mc. phone, and needs three states for WAB on 14-Mc. c.w. WAB is tickled at receiving his old call again, as well as Class A license. WDQ and 3Z5A are seeking QSL cards. WJAV is tickled to try his new shack, and new station includes TRT, QHD, QUK, and JCT. WTVJ is a veteran. TYE is taking his turn on the Early Net and sounds good. ARP is a regular reporter in the net. TMX handles traffic for Ferndale. SCW is assistant general manager of the QMN Net and is doing a nice job. He also can be heard on TLAP. BIU finally got into the swim and is handling traffic his way. JUC can be heard plugging away on QMN Net between 6 and 7 p.m. daily except Saturday and Sunday. WET has been snowed in up his way but is doing his share to keep communications open. JFS is having trouble getting on 7 and 3.5 Mc. because of limited space in his yard for antennas. KNP dropped in during the holidays but now is making his home in Cleveland. The Oakland County Radio Club was entertained at its January 13th meeting, and the station on the SX-42 and open adapter by the courtesy of M. N. Duffy, of Detroit.

Traffic: WSSW 686, SAY 335, ONK 122, ABE 101, JUQ 88, UOK 41, FX 39, WET 33, TBP 29, TVE 29, DPE 19, DPI 19, TRP 13, QMN 11, TMN 11, NOH 5, BID 6, FWT 5, XDI 5, NDX 4, 73. BIU.

NEW YORK CITY AND LONG ISLAND—SCM, Charles Ham, Jr., W2KDZ—BGO comes across as usual on time with the ARC report. He probably should be reintroduced to all at this time as the Section EC who leads the other ECs so well. Queens, Brooklyn, and Suffolk are the only counties reporting for December. Emergency Coordinators are sought for Bronx and Manhattan. BSS has added 464A, c.w. radio in its exchange and new stations include TRT, QHD, QKE, and JCT. Traffic-handling has become the rule, holiday greetings being exchanged all around. Mondays at 2100 at least eighteen stations represent the Borough of Borough. KBC visits all present and reports that the Brooklyn EC gang; he has an FB shack and equipment and reports as follows: "clocklike regularity is the watchword (Continued on page 58)"
WHEN YOU NEED A PART FOR YOUR RIG—SPECIFY MALLORY FOR DEPENDABILITY

In the Mahory line you can find exactly the control you want—and you can get it at a conveniently located Mallory distributor. That's because Mallory makes the complete line—33 stock types of correctly tapered wire wound controls, 61 stock types of correctly tapered carbon-element controls, 31 stock types in single tapped controls, 10 stock types in double tapped controls, 12 stock types in clutch type controls, 31 rectly tapered carbon-element controls, 31 wire wound controls, 61 stock types of cor-

But when you buy a Mallory control, you get more than just a replacement. Mallory is mighty fussy about quietness, tapers, resistance values. You get extra quality, closer tolerances, extra dependability.

It's easy to select the correct replacement. Recommendations will be found in the Mallory Radio Service Encyclopedia.

P. R. MALLORY & CO., Inc.
INDIANAPOLIS 6 INDIANA

MALLORY

of Monday night operation, twelve stations being the minimum guaran-tie! The Metropolitan Amateur Radio Society enrolled sixty new members but they still solicit more. PFA now is QRY P, MWA is trying narrow-band f.m. on 28 Mc. PKL is GCL happy. HY hangs the clothes on new four-ele-

(Continued from page 80)

Midwest Division

Kansas — SCM, Alvin B. Unruh, 8WAUP — The big news is the resuscitation of the Kansas Section Traffic Net. NJS is NCS- RM. The net meets Monday, Wednesday, Friday at 6:45 p.m. We need stations in Emporia, Salina, and Parsons. Get on 3610 kc. and join the fun. Write SCM for dope. Following are new OBS: EPX, NJS, KPB, YBC-7, KJ, VE1L, KSY, ZUA, TVU, OZK. New OBS: EPX. VWU is working into TL A. BPL (OO) suggests a 2.7-Mc. daytime band for Class B-C phones. BSX has his 852a on 3.5 Mc. and is doing a lot of DX but did lose his rig. M.AE has daily schedule with Minne-

Continued on page 84

sota. OTV has Lazy H with reflector on 28 Mc. JCQ has a four-element 28-Mc. beam. JFP is ex-lKZJ and is on 3.5-Mc. c.w. LRI is building p.p. 811a final for 28 Mc. LUX completed two-ele-

century starting in China. HMJ has thirty-four coun-

tries in 14-Mc. c.w. using 200 watts on 7 and 14 Mc. in c.w. bands. TEO is ex-1KZJ and is on 3.5-Mc. c.w. using HRO and 807 and half-wave end-fed antenna. VJL, ex-

SVLJ, helps operate. GUR has thirty-one countries on 14 Mc. but 'phones bother him. A kilowatt is coming up. LDR is moving to NYC-LI Net and on 144 Mc. Joe gets the dope direct from KDC; both work in Sperry's mile-square plant in Lake Success. RQG is ex-ICVL. Rays use 13 watts to a GLS on 3400 and 3680 kc. AOD deserted Floating for a month in southern California and is using a 938 transmitter on 144 Mc. CIQ is building for television, GG7 and GTX are rebuilding for 14-Mc. c.w. KCH dreams of a new rig while flying for Pan-American. KPA is active on 7 Mc. KDR is in new QTH at New Hyde Park. LGS has new receiver and a borrowed transmitter from BN on 7200 kc. OUT is on 7-Mc. c.w. and made fourteen contacts using low power. George was with WERS in Akron, Ohio. PZE is on 3.5 Mc. and is east end of Long Island operating on 28- and 14-Mc. c.w. EC was very busy handling Christmas messages, sev-

eral hundred starting in China. HMJ has thirty-four coun-

try, and all others give rum our sincere thanks for a job well done. OQI will work in as EC and all are asked to report

The Metropolitan Amateur Radio Society has been forced to resign

and all others give rum our sincere thanks for a job well done. OQI will work in as EC and all are asked to report

Continued from page 80

of Monday night operation, twelve stations being the minimum guaran-

tie! The Metropolitan Amateur Radio Society enrolled sixty new members but they still solicit more. PFA now is QRY P, MWA is trying narrow-band f.m. on 28 Mc. PKL is GCL happy. HY hangs the clothes on new four-ele-

century starting in China. HMJ has thirty-four coun-

try, and all others give rum our sincere thanks for a job well done. OQI will work in as EC and all are asked to report

(Continued from page 80)

of Monday night operation, twelve stations being the minimum guaran-

tie! The Metropolitan Amateur Radio Society enrolled sixty new members but they still solicit more. PFA now is QRY P, MWA is trying narrow-band f.m. on 28 Mc. PKL is GCL happy. HY hangs the clothes on new four-ele-

century starting in China. HMJ has thirty-four coun-

try, and all others give rum our sincere thanks for a job well done. OQI will work in as EC and all are asked to report
Trans-WORLD DX

United Electronics

John A. Callanan
Amateur Radio W9HO6

December 11, 1966

Dear W9HO6,

Soon after the amateur bands opened, I substituted a pair of DEATH tubes in place of the previously used 6B4 tubes. The final stage for the transmitter includes a 9620 tube. With the addition of this tube, the transmitter was operated with an input of 800 watts, as compared to the 500 watts input required previously.

With the addition of tubes operating on less than 1/2 average input, I have contributed to reducing the power output of my transmitter, which is now limited to 150 watts. The transmitter has been modified to operate on 600 volts. The output is now reduced to 150 watts, and the transmitter has operated for only 4 hours.

Some of the unusual activities that have taken place are the following: The radio station at Toronto Hospital has been established in a hospital on the outskirts of the city. The hospital is equipped with a radio station, which is operated by a group of amateur radio enthusiasts. The station has been in operation for only a few hours, and the operator has been busy with the installation of the equipment.

The operation of the station is supervised by a group of amateurs who have been active in the station for many years. The station is equipped with a transmitter, receiver, and a variety of test equipment.

Yours truly,

John A. Callanan, W9HO6

UNIVERSAL V-70-D graphite anode triode is now available from the manufacturer. Following are a few of the rare DX QSO's that have been established:

- VSPAS
- PKSAR
- VBBZI
- F7AE
- COZCK
- THAC
- VPSF
- DX1AS
- VOSG
- B133
- FXA4
- HZMNE
- XE1M
- XRIG
- WILGO/TP
- E1ID
- OM2UJ
- J2AFF
- X2ZA
- V2AA
- PZL
- VQ2PL
- LAYR
- G8BY
- KACL8
- J8A8
- HK3B1
- LEVE
- VQ4EE
- OZSAA
- F7AA
- M71CH
- KG6AA
- U8BNA
- VPAC
- WP9ND/KL7
- Z81L
- KACP
- XADW
- CJ2AB
- KG3FP
- G4AE
- WS8TR/V9F
- V2WS
- ELSB
- D4AQ
- KH4T
- Y44P
- HC2CC

Type V-70-D and similar type 812-H are briefly described below. See your electronics parts distributor or write us for further data.

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Plate Dissipation</th>
<th>Max. Input per Tube</th>
<th>Max. Plate Volts</th>
<th>Max. Plate Mills</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-70-D</td>
<td>85 Watts</td>
<td>300 Watts</td>
<td>1750</td>
<td>200</td>
</tr>
<tr>
<td>812-H</td>
<td>85 Watts</td>
<td>300 Watts</td>
<td>1750</td>
<td>200</td>
</tr>
</tbody>
</table>

New United Isolated Getter Trap

Keeps tube free from gas preserves filament emission

Type
V-70-D
or
812-H

$6.90

United Electronics Company
Newark, 2 New Jersey

Transmitting Tubes EXCLUSIVELY Since 1934
FOR THE GREATEST NAMES IN HAM RADIO

FAMOUS NATIONAL PARTS

NATIONAL ACN DIAL

For experimenters who "build their own" and desire direct calibration. Fine for Freq. Monitors and VFO'S. Dial bezel size 5" x 7¼". Five blank ranges for direct calibration. Employs Velvet Vernier Drive... 5 to 1 ratio... amateur net, $3.00.

NATIONAL OSCILLOSCOPE CRU WITH CRU-P PANEL

This 2" scope is an indispensable item of equipment for amateurs and electronic experimenters. Connects to any phone trans­mitter. Measures percentage modulation. Easy to interpret. Rack model, amateur net, $42.75; table model, $39.90.

NATIONAL COILS AR-2, AR-5, XR-50

The AR-2 and AR-5 coils are high Q permeability tuned RF coils. The XR-50 coil forms may be wound as desired to provide a permeability tuned coil. AR-2, amateur net, $1.71; AR-5, $1.46; XR-50, $1.01.

NATIONAL COILS AR-2, AR-5, XR-50

Forms may be wound as desired to provide a permeability tuned coil. AR-2, amateur net, $1.71; AR-5, $1.46; XR-50, $1.01.

MISSOURI — SCM, Mrs. Ietha A. Dangerfield, W80UD — ZOA, Poplar Bluff, has applied for Official Observer appointment. That will make two OOs for Missouri. The other is Y7Z, Mrs. Laura Z7V is back in the Army; he is in Jamison and has ten watts on 7 Mc. and needs traffic outlet there. He suggests a net at noon, CRM worked 236 stations on 7 Mc. in December and says hamming is a blessing for a shut-in like himself. ZVS now is working days and has opportunity for net scheduling and is doing a FB job on MON. KIK worked over power supply, now has thirty watts, and is another MON regular. ZIS made a very fine SS score, including contacts with W9HJ, WA9PAS, and G6I, in Springfield, on 14 Mc. QCJ, of b.e. station WIL, has his new call and plans 50 watts on 7-Mc. c.w. and 28-Mc. 'phone. GCL has his buffer working on 7 and 14 Mc. EYMM reports traffic only. VKY/6 between Connecticut City from his car. GBM is on 28 Mc. s.d. working from SS hang-over. ARH has new Meissner working on 3.5, 7, and 14 Mc. and has schedule with Iowa Net. Z7Y's new 28-Mc. beam works K6s but needs elements pruned. QXO tried traffic list again and manages MQN between work periods. OUD is a regular on MON. FSI and XPV, of pre-war gang, are back on the net and PK3 is a new-comer. We need more stations and more traffic. Thanks for the reports, gang. Eeyore shows coming. Traffic: W9KQX 77, OUI 17, CRM 11, KIK 7, EYMM 3, GBJ 3, ARH 2, ZZW 1, 73.

NEBRASKA — SCM, Roy E. Olmsted, W9FQB — Santa brought a mate for the BC-610 — named NC-240D. EKP is on 3.5-Mc. GUL, w/ 1/2 kw. CPU is active on 28-, 7-, and 3.9-Mc. 'phone with Meissner rig. EDY is putting 500 watts 'phone through a pair of 812s. HBB is working 3.5- and 7-Mc. c.w. YMU has new KME-43. FQJ is active on 7-Mc. CPB reports DX on 28-Mc. 'phone. P7J, age 62, is still ticklesc the only he could visit with his son, ex-WG2, now 28GQX. Ex-ZGA, now D4APN at Frankfort, is on 28,103 kc. and wants Nebraska QSOs spotted above 20 Mc. Sorry to report the death of SKYB, at Council Bluffs, on December 29th. FLO is on 7-Mc. c.w. JDJ is having fun with 14-Mc. DX. ILX is on 3.9-Mc. 'phone. In QJQ, TQD reports DX and QSOs with G5LI, G6ZO, and ON4HC on 3.5-Mc. c.w. FAM is on 3.5-Mc. c.w. and 28-Mc. 'phone. K63, age 88, is busy but needs more contacts and DX. DX is on 3.5-Mc. with his old 852. KPA divides time between his own QST traffic and building a new rig. UFR is erecting a new home on a windy hill — for antenna reasons. YOH, with CAA, has been transferred from Hayes Center to Pierre, S. D. YOD, instructor at Milford Trade School, is assembling the school ½-kw. rig; the jug was empty when MGX is building ½-kw. rig for all bands. PEA completed his 500 watts ··phone through a pair of 812s. HRB is working 3.5-Mc. c.w. on 28-Mc. FAM, of BC station WIL, has his new call and plans 50 watts on 7 Mc. and 28 Mc. He is a regular on MON. FSI and PUV, of prewar gang, are back on the net and PK3 is a new-comer. We need more stations and more traffic. Thanks for the reports, gang. Eeyore shows coming. Traffic: W9KQX 77, OUI 17, CRM 11, KIK 7, EYMM 3, GBJ 3, ARH 2, ZZW 1, 73.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Edmund R. Fraser, W1KQY — Club News: NARA — MGX reports LRT on 7 Mc. MGX is building ½-kw. rig for all bands. PBA completed his 500 watts ··phone through a pair of 812s. HRB is working 3.5-Mc. c.w. on 28-Mc. FAM, of BC station WIL, has his new call and plans 50 watts on 7 Mc. and 28 Mc. He is a regular on MON. FSI and PUV, of prewar gang, are back on the net and PK3 is a new-comer. We need more stations and more traffic. Thanks for the reports, gang. Eeyore shows coming. Traffic: W9KQX 77, OUI 17, CRM 11, KIK 7, EYMM 3, GBJ 3, ARH 2, ZZW 1, 73.
E. H. Rietzke, President of CREI, Invites You to Write for this

Free Significant Analysis of Job Opportunities in Radio-Electronics

EVERY RADIOMAN
Who Wants to Hold His Job
or Advance to a Better Job
WILL WANT TO READ
THIS LETTER!

The Story Behind This Interesting Letter
You Will Want to Read . . . Our advertising agents, realizing that vital changes are taking place in the radio industry, asked me to give them a factual report of the unprecedented job opportunities created by the almost unbelievable expansion of the radio industry.

My letter to them contains some pertinent viewpoints on the subjects of COMPETITION—INDUSTRY EXPANSION—OPPORTUNITIES. These are first-hand observations based on my own experiences . . . a great deal of time spent in the field and constant contact with leaders in the radio industry.

The immediate reaction of our agency upon reading this letter was that it contained so much inspiration and information that it should be reproduced for thousands of radiomen to read. Therefore, this unusual advertisement to invite you to send for and read this letter.

It is doubtful if many radiomen realize the actual things that are happening. That is why I think you will want to read this letter. You are invited to send for your personal copy today.

E. H. Rietzke
President, CREI

MAIL COUPON FOR FREE COPY • NO OBLIGATION

Capitol Radio Engineering Institute
16th and Park Rd., N. W., Washington 10, D. C.

Gentlemen: Please send me FREE, Mr. E. H. Rietzke's Analysis of Job Opportunities in Radio-Electronics.

NAME______________________________________AGE__________

ADDRESS_________________________________________

CITY_________________________________________STATE__________

CAPITOL RADIO
ENGINEERING INSTITUTE
16th and Park Rd., N. W., Washington 10, D. C.
Designed to meet the most exacting requirements of the modern amateur, the new Meissner Signal Shifter has built-in band-switching. No coils to change . . . six position switch. Normally equipped with five sets of coils for 10, 15, 20, 40 and 80 meter bands plus a blank strip for any additional new band. All controls placed on front panel. Reduced warm-up time. Minimum power output six watts on all bands.

Choice of built-in or separate power supply.

For complete specifications . . . write to the address below today.

EX E R T  S A L E S  D I V I S I O N
S C H E E L
I N T E R N A T I O N A L
I N C O R P O R A T E D
4237-39 N. LINCOLN AVENUE
CHICAGO 18, ILLINOIS, U.S.A.
CABLE ADDRESS
HARSCHEELE

M A G U I R E
936 N. MICHIGAN AVENUE,
requirements!

THORDARSON
Transformers

Power your new rig with Thordarson... the transformer that has been helping to make and break DX records since radio began. New Thordarson designs now available to match the newest tubes.

Ask for them at your dealers today.

ELECTRONIC DISTRIBUTOR
AND
INDUSTRIAL SALES
DEPARTMENT

INDUSTRIES, INCORPORATED

CHICAGO 11, ILLINOIS
STATION TESTED!
...an added proof of 2uality!

(Continued from page 84)

p.p. 812x working on 3.5 and 7 Mc. GC has new three-element 28-Mc. beam. MVH leads in DX with twenty-seven countries confirmed. IC and QJD are active in Netameg Net. CUX is using narrow-band f.m. EUG keeps morning schedule with 11GX in Rome on 28 Mc. General News: NJM has new shack. APA is using HRO and 250 watts to T5S. BDJ is on 144 Mc. with HY-75 and recently bought LM-14 frequency meter and converter. FSH reports Meissner 150-B working fine. TK is active on 14-Mc. 'phone with SHK. BDJ is handling traffic with XUJ and SUBU/OC. KXB completed new 900-watt 4-250-A rig bandswitching and drives from a 4-watt v.f.o. KNM is working plenty DX on 28 Mc. Traffic: WIDE 336, YB 340, DAV 184, EFW 139, IC 97, ALB 81, ORP 80, ABT 83, BKH 79, KQV 78, LOP 40, NJM 34, ZL 25, ITI 19, AMQ 16, OS 15, BDJ 12, APA 6, IQE 2, 73, Ed.

MAINE — SCM, G. C. Brown, WIAQL — TO reports that he spends about 85 per cent of his time DXing but wants his Class A and QR tickets renewed. LQK handled a little traffic this month. OIL doesn't think much of the idea of giving up part of the c.w. band for 'phone. A nice letter, in which he gives an outline of his traffic activities as 4HRN during the Miami hurricane. OUD, 7 Mc. KCT is Regional EC for New England Power Net, which is active on 3.5-Mc. e.w. The following have renewed appointments: OPS—LXQ, HUV, MRQ, LMB, DX, PZ, HOPS, CNX, HMK, KPP, COX, DBC, EBH, BGM, and DAS, vice-pres.; OLQ, secy.; and 4HGF, treas., CBH, DMC, and KOB were appointed to serve on the instruction committee. Major Brophy, consulting engineer from the U. of M., will be the next guest speaker. Traffic: WILKP 2, 73, "GG."

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, Jr., W1ALP — Following are leaders of various activities: Section EC: EVL, FAM: IN, 50 Mc.; HIL, 28 Mc.; LM, 14 Mc.; KTE, 3.9 Mc.; RHA, 3.5 Mc.; OUD, 7 Mc.; KCT is Regional EC for New England Power Net, which is active on 3.5-Mc. e.w. The following have renewed appointments: OPS—LXQ, HUV, MRQ, LMB, DX, PZ, HOPS, CNX, HMK, KPP, COX, DBC, EBH, BGM, and DAS, vice-pres.; OLQ, secy.; and 4HGF, treas., CBH, DMC, and KOB were appointed to serve on the instruction committee. Major Brophy, consulting engineer from the U. of M., will be the next guest speaker. Traffic: WILKP 2, 73, "GG."

(Continued from page 14)

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, Jr., W1ALP — Following are leaders of various activities: Section EC: EVL, FAM: IN, 50 Mc.; HIL, 28 Mc.; LM, 14 Mc.; KTE, 3.9 Mc.; RHA, 3.5 Mc.; OUD, 7 Mc.; KCT is Regional EC for New England Power Net, which is active on 3.5-Mc. e.w. The following have renewed appointments: OPS—LXQ, HUV, MRQ, LMB, DX, PZ, HOPS, CNX, HMK, KPP, COX, DBC, EBH, BGM, and DAS, vice-pres.; OLQ, secy.; and 4HGF, treas., CBH, DMC, and KOB were appointed to serve on the instruction committee. Major Brophy, consulting engineer from the U. of M., will be the next guest speaker. Traffic: WILKP 2, 73, "GG."

(Continued from page 90)

(Continued from page 84)

p.p. 812x working on 3.5 and 7 Mc. GC has new three-element 28-Mc. beam. MVH leads in DX with twenty-seven countries confirmed. IC and QJD are active in Netameg Net. CUX is using narrow-band f.m. EUG keeps morning schedule with 11GX in Rome on 28 Mc. General News: NJM has new shack. APA is using HRO and 250 watts to T5S. BDJ is on 144 Mc. with HY-75 and recently bought LM-14 frequency meter and converter. FSH reports Meissner 150-B working fine. TK is active on 14-Mc. 'phone with SHK. BDJ is handling traffic with XUJ and SUBU/OC. KXB completed new 900-watt 4-250-A rig bandswitching and drives from a 4-watt v.f.o. KNM is working plenty DX on 28 Mc. Traffic: WIDE 336, YB 340, DAV 184, EFW 139, IC 97, ALB 81, ORP 80, ABT 83, BKH 79, KQV 78, LOP 40, NJM 34, ZL 25, ITI 19, AMQ 16, OS 15, BDJ 12, APA 6, IQE 2, 73, Ed.

MAINE — SCM, G. C. Brown, WIAQL — TO reports that he spends about 85 per cent of his time DXing but wants his Class A and QR tickets renewed. LQK handled a little traffic this month. OIL doesn't think much of the idea of giving up part of the c.w. band for 'phone. A nice letter, in which he gives an outline of his traffic activities as 4HRN during the Miami hurricane. OUD, 7 Mc. KCT is Regional EC for New England Power Net, which is active on 3.5-Mc. e.w. The following have renewed appointments: OPS—LXQ, HUV, MRQ, LMB, DX, PZ, HOPS, CNX, HMK, KPP, COX, DBC, EBH, BGM, and DAS, vice-pres.; OLQ, secy.; and 4HGF, treas., CBH, DMC, and KOB were appointed to serve on the instruction committee. Major Brophy, consulting engineer from the U. of M., will be the next guest speaker. Traffic: WILKP 2, 73, "GG."

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, Jr., W1ALP — Following are leaders of various activities: Section EC: EVL, FAM: IN, 50 Mc.; HIL, 28 Mc.; LM, 14 Mc.; KTE, 3.9 Mc.; RHA, 3.5 Mc.; OUD, 7 Mc.; KCT is Regional EC for New England Power Net, which is active on 3.5-Mc. e.w. The following have renewed appointments: OPS—LXQ, HUV, MRQ, LMB, DX, PZ, HOPS, CNX, HMK, KPP, COX, DBC, EBH, BGM, and DAS, vice-pres.; OLQ, secy.; and 4HGF, treas., CBH, DMC, and KOB were appointed to serve on the instruction committee. Major Brophy, consulting engineer from the U. of M., will be the next guest speaker. Traffic: WILKP 2, 73, "GG."

(Continued from page 90)
3 Basic Ways TO IMPROVE THE EFFICIENCY AND STABILITY OF YOUR RIG

1. WARD LEONARD RELAYS
   Proper relays have many practical uses in amateur rigs. They provide convenient circuit control and greater operating efficiency. They help reduce the length of connecting leads, prevent unnecessary transfer of stray or transient currents to critical parts of the transmitter circuit. Designed and built for rugged service, WARD LEONARD Amateur Relays are available from stock in the following types: Antenna Change-Over — Antenna Grounding — Band Switching — RF Break-In — Keying — Overload — Underload — Latch-In — Remote Control — Safety — Sensitive — Time Delay.

2. WARD LEONARD RESISTORS
   The installation of VITROHM wire-wound resistors insures that extra performance you want in critical circuits. With exclusive features developed in the WARD LEONARD laboratories, these resistors meet the most rigid specifications. Fixed resistors are available in 8 stock sizes from 5 watts to 200 watts. Adjustable resistors, in 7 stock sizes from 10 watts to 200 watts. Wide range of resistance values. Stripohm, Discohm, and Plaque resistors are also available.

3. WARD LEONARD RHEOSTATS
   These Vitrohm Ring-Type units are widely used as potentiometers or rheostats, for fixed or variable close control, in commercial as well as amateur equipment. Made of highest grade ceramic materials. Resistance wire is held in place and protected by special WARD LEONARD vitreous enamel. Many other features. Available from stock in 25 watt, 50 watt, 100 watt and 150 watt sizes, in wide range of resistance values.

SEND FOR FREE CATALOGS
For helpful data and information, write for Relay Catalog No. D-111 and for Resistor-Rheostat Catalog No. D-2.
AUTHORIZED DISTRIBUTORS EVERYWHERE

WARD LEONARD RELAYS • RESISTORS • RHEOSTATS
Electric control devices since 1892
WARD LEONARD ELECTRIC CO., Radio and Electronic Distributor Division, 538 West Jackson Blvd., Chicago 4, U. S. A.
DO YOU INSIST ON THESE ESSENTIAL CHARACTERISTICS?

CHECK THIS LIST NOW!

(1) Low operating temperature
(2) Low noise level
(3) Well anchored, easily soldered leads
(4) Positive contact between resistance element and wire leads
(5) Excellent wattage dissipation
(6) Fully insulated
(7) Maximum protection against humidity
(8) Sturdy construction
(9) Light weight
(10) Compact size

When buying resistors for your rig, ask for and be sure to get IRC BT or BW Resistors...with proven excellence in all 10 of these important characteristics.

Big 8-page catalog bulletin with complete technical data on all 10 characteristics plus other valuable information about IRC BT Insulated Composition Resistors and Type BW Insulated Wire Wound Resistors. Write for Bulletin 27C now.

INTERNATIONAL RESISTANCE COMPANY

401 N. BROAD STREET
PHILADELPHIA 8, PENNSYLVANIA

In Canada: International Resistance Co., Ltd., Toronto, Licensee

WHEREVER THE CIRCUIT SAYS $L$

QSTed 300 hams on 144 Mc. The Suburban Net now is the Suburban Radio Club. RGB has built new rig for 3.5-Mc. c.w.; HUV is going strong on 50 Mc. JEC has new RME-35. AHP writes that the Fall River Radio Club’s new QTH is 233 South Main St., and they have cell ACT back. New officers are: JYB, DXH, vice-pres.; AHP, trustee. The Shoreline Radio Club, MDE, will be on 28 Mc. NRS has Class A license. Traffic: WIBDU 102, LML 123, OUD 89, EMG 42, AAL 24, JDF 32, BR 24, ODD 24, LM 29, EY 17, GOE 41, JLT 39, TY 12, AAR 11, NXY 8, AGX 6, HWS 6, MEG 5, MDU 5, OKB 5, LMB 3, MGP 3, CST 2, PJE 2, MRQ 1.

WESTERN MASSACHUSETTS — SCM, Prentiss M. Bailey, W1AD — RM; BYE, W1WI — RM. The big W1AD is pleased with good attendance and growing traffic on Western Massachusetts Net. JAH received new camera for Christmas. MZC, of Holden, recently dismantled a 40-foot windmill to move it to his QTH. Now to go darned thing up again when WX permits. The Pittsfield Radio Club recently had the honor of hearing Mr. A. R. Koch, Vacuum Tube Division, General Electric Co., on the subject of "Getting Started on 2400 Mc," JLT now has a new home, fifty-three countries postwar. You just can’t keep up with him. Bob handled some nice traffic from OX3GE, KZS is rebuilding his big rig into rack and panel job. BKG has a new beam on 28.7 Mc. He is glad to see if it will do for the ARRL frequency runs. INU baa auto-type auto keying head, hoping to start some contest transmissions and also handle Official Broadcasts. QR has moved back at WFEA, MOI now has new call, W1UD, recently. HXS has his crystal-controlled 144-Mc job running nicely, in addition to having done some demonstration work for the "phone" company on 10,000 Mc. The P.R.A, en-

(Continued from page 88)
Bigger, better-than-ever—the new Sylvania Technical Manual is available now.

The large number of tube types listed (old and new) — almost four hundred — has been made available as a result of the solution of extensive and elaborate tube engineering problems.

Contents of this descriptive manual include: Fundamental Properties of Vacuum Tubes; The Characteristic Curves; General Tube and Circuit Information; Typical Radio Receiver and Amplifier Circuits; Interchangeable Tube Chart — and many more.

We urge you to get a copy right away — because we know you'll find this volume chock-full of invaluable information.

Available from your Sylvania Tube Distributor or direct from Radio Tube Division, Emporium, Pa.
You've waited a long time for the neat little instrument pictured above. We urge you to take one for your right now. But we're not positive about that, for orders seem to come in just a bit faster than our supplies. We can, however, point out the neat wavelength to you in neutralizing, chasing porosities, for many applications, etc., etc. . . . in finding r.f. and its approximate frequency in any tank circuit. It's one of amateur radio's most useful tools. We can, however, point out the neatness, small size to get into tight places, and wide frequency coverage of Model 903.

Model 903 WaveMeter

$3.30 each

Plug-in Inductors

$.50 each

Specify #100 for 1.5-3.7 mc.; #101 for 3.5-8 mc.; #102 for 8-19 mc.; #103 for 17-40 mc.; #104 for 40-100 mc.; #105 for 100-300 mc.; #106 for 400-500 mc.

We hope next month to be able to announce that "ATOM-X" transmitters and receivers are in production, too.

Send postcard for catalog of new measuring equipment, communication receivers, transmitters, kits, parts. See them at your favorite jobber.

OVER 36 YEARS OF RADIO ENGINEERING ACHIEVEMENT

McWorld Silver Co., Inc.

1249 MAIN ST., HARTFORD, 3, CONNECTICUT

NORTHEASTERN DIVISION

ALASKA - SCM, August G. Hiebert, K7CBF - New officers of the Arctic Amateur Radio Club are AO, pres.; FU, vice-pres.; and CF, secy-treas. The club received high commendation from city officials when its members provided emergency communication following the fire that wiped out the telephone exchange. AN, ex-president of AARC, organized the network. DM, Adak, reports 7-Mc. c.w. traffic scheduled with FY and CQ. Stamps and Anchorage, respectively. GT has been called back into the Army Airways Communications System. Members of the 3940-ke. Coastwise "Phone Net are watching wooping developments between FC and a peacy LX stenographer, courtesy DB and GM, who met the stations she visited. FY has a new rig using a pair of VT-127As cathode modulated. EB files a DC-8 out of Anchorage; he also has a new 200-watt rig on the air in between times. New appointments: DB, OBS, and CF, ORS. Traffic: K7CP 22, DM 4, 73.

IDAHO - SCM, Alan K. Ross, W7WU - The following appointments are in effect: Pres:arv OBS: IEY, Postwar OBS: IVY, pres.; JMH, secy.-treas.; JMH, MM; DJY, secy., ORS. The Gem Net on 3743 kc. now meets at 6 PM Mon., Wed., Fri. Those meeting are IE,Seattle; BAA, Fireth; AMU, Casper; EMT, Kuna; GKA, Eugene; JMH, Boise; RM and NCS. IUW relieves JMH at times. Stations in North and Southeast Idaho are needed so please advise if interested. Y7 still is on 7 Mc. only. PDH, Moscow, sends in nice report of Moscow gang as follows: U of L Radio Club officers are UC, pres.; JXX, vice-pres.; FDE, secy.-treas.; and IVY, secy. and treasurer. Other Moscow stations are: FDE on 28-Mc. mobile and 4 Mc.; HIR on 28 Mc with BC-610; BVK on 28, 7, and 3.5 Mcs; GGH on 28 and 4 Mc; IJX with BC-610 on 28 and 14 Mc. PDH heard IJX, Coeur d'Alene, on 7 Mc. This station, FMV, was a big success. FMV had high score. GGH was tucked away in nice report of Moscow gang as follows: U of L Radio Club officers are UC, pres.; JXX, vice-pres.; FDE, secy.-treas.; and IVY, secy. and treasurer. Other Moscow stations are: FDE on 28-Mc. mobile and 4 Mc.; HIR on 28 Mc with BC-610; BVK on 28, 7, and 3.5 Mcs; GGH on 28 and 4 Mc; IJX with BC-610 on 28 and 14 Mc. PDH heard IJX, Coeur d'Alene, on 7 Mc. FMV, at times. New appointments: DB, OBS, and CF, ORS. Traffic: K7CP 22, DM 4, 73.

MONTANA - SCM, Albert Beck, W7EMQ - Section EC: BWH. The Helena gang organized the Capital City Radio Club, promoted by HZ with IVY, pres.; JOT, secy.-treas. EWM moved to Great Falls. Most of the Helena gang on 28-Mc. phone plan 144 Mc. activity. The Butte Amateur Radio Club held its annual inauguration banquet and dance at Rainbow Inn Jan. 4th with seventeen present. AMU, Casper; EMT, Kuna; GKA, Eugene; JMH, Boise, RM and NCS. IUW relieves JMH at times. Stations in North and Southeast Idaho are needed so please advise if interested. Y7 still is on 7 Mc. only. PDH, Moscow, sends in nice report of Moscow gang as follows: U of L Radio Club officers are UC, pres.; JXX, vice-pres.; FDE, secy.-treas.; and IVY, secy. and treasurer. Other Moscow stations are: FDE on 28-Mc. mobile and 4 Mc.; HIR on 28 Mc with BC-610; BVK on 28, 7, and 3.5 Mcs; GGH on 28 and 4 Mc; IJX with BC-610 on 28 and 14 Mc. PDH heard IJX, Coeur d'Alene, on 7 Mc. FMV, Coeur d'Alene, has 200 watts and three-element beam on 144 Mc.; also 20 watts and three-element beam is located at South Lochery and has tank rig on 3.5 and 7 Mc. He has an HRO receiver and BC-211 frequency meter. He operates a wood-working plant. Traffic: W7MCQ 3, OAB 2, EFF 17. Jerry.

WESTERN DIVISION

BC-406 on 144 Mc. KFT is a new-comer to 144 Mc. Traffic: WILWA 57, Q5 35, INU 29, DWI 14.

VERMONT - SCM, Gerald Benedict, WINDL -- MCQ has kept daily schedule on 28 Mc. with GBY for three weeks. KQG, MMV, CQP, and 2UP visited MCQ. EZ now is located in Pownall, has new 14-Mc. beam, and puts about 300 watts to an 813 final. Ex-KTB, now 8THP, is located at Lewesville, Kansas, and is on 14 and 7 Mc. JEU is located in Suffield, Conn. LYN reports a club at M.S.C. with aix new members. EBL is en route to Anchorage; he also has a new 200-watt rig on the air in between times. New appointments: DB, OBS, and CF, ORS. Traffic: K7CP 22, DM 4, 73.

WASHINGTON - Acting SCM, Lloyd Norberg. W7EBQ -- Our new postwar RM is CJ2Y, Rt. 2, Everett. He needs help in operating your trunk lines. Please contact him for further details. He has North-South Trunk going and wants extensions. CJ2Y has 1 kw. on 3.5 Mc. DGN hooks ELM after ten years holding regular traffic schedule with 90U/EBL with 45 watts. ELM is in Port Townsend on 201 Mc. with 15 watts. HAD reports ARAB still operating with six new members. EBL is on 14 Mc. with 500 watts. GWL is busy with coming ARAB Hamfest. DYM contacted (Continued on page 81)
FLAT or RISING RESPONSE

...as you need it!

No need to worry about your microphone, or even to install a filter in your speech amp ... when your choice is the Electro-Voice CARDAX. With dual frequency response and high output in this one microphone, you can use a flat response for clear channel, or rising response to cut thru QRM. Simply adjust the two-position selector switch on rear of case. When in the "out" position, the frequency response curve is wide and flat. Your voice quality is smooth, rounded and full range. In the "in" position, the curve rises 7 db at 4000 c.p.s., and your signal is sharp, clean, brilliant. Model 950 lists at $37.00.

THE Cardax
CARDIOID CRYSTAL MICROPHONE

No finer choice than
Electro-Voice

SEND FOR CATALOG No. 101

Authorized Distributors Everywhere

ELECTRO-VOICE, INC., BUCHANAN, MICHIGAN

Export Division: 13 East 40th Street, New York 16, N. Y., U. S. A. Cables: Arlaf
A FEW YEARS AGO broadcasting was born—many of the first radio men to enter that field have long since arrived at the top of their profession.

TODAY, the techniques of this New World of Electronics, war-developed and now released, offer greater opportunities than ever existed in the early days of broadcasting. Micro-wave Relay Systems, Television, FM Broadcasting, Mobile Communication Systems for trains, automobiles, buses and trucks, many industrial applications—these are only a few of the new developments and new techniques which offer无数 exciting opportunities to you who are— or who are qualified!

YOU HAVE THE OPPORTUNITY to "get in on the ground floor"—where promotion will be rapid—where you can go to the top. If you have the foundation of technical knowledge which is so vital to an understanding of the new techniques. Your first step toward success in this new world of electronics is your resolution to acquire a formal, fundamental technical knowledge. CIRE Home Study courses are planned to do that job.

Mail the coupon today!

CIRE HOME STUDY COURSES COVER THE FIELD OF RADIO-ELECTRONICS—TELEVISION, ULTRA-HIGH FREQUENCY TECHNIQUES, AM AND FM BROADCASTING, COMMUNICATIONS ENGINEERING—from single treatment of fundamentals, through preparation for FCC commercial radio operators’ license examinations, up to and including complete high level quantitative treatment of advanced radio-electronics and communications engineering. Choose the course best suited to your needs, and start with the section you are qualified to enter. You pay for only the section or sections you need. Use the "Pay-as-you-go plan" pattern after ethical, educational practice. These features are unique with Cleveland Institute, and represent the best in the modern, post-war concept of home study training.

Many CIRE students of advanced engineering courses today are broadcast chief engineers. Graduates of CIRE courses are eligible for the top jobs in radio-electronics.

Write today for free, descriptive booklet—"THIS NEW WORLD OF ELECTRONICS HOLDS OPPORTUNITY FOR YOU."
No obligation.

Cleveland Institute of Radio Electronics
Contractors to the Canadian Broadcasting Corporation
QT-3 Terminal Tower
Cleveland, Ohio

CONTINUED FROM PAGE 93

Capt. Parrott, USNR, and with two white-faced recruiter jeeps carried communications during the recent White River Valley Flood, Orchids to Capt. Parrott and the hams in USNR. Hams work 29 Mc. with 100-1-200 modulator on with BC-610. ERH is on 29 and 7 Mc. with new rig. CSN is on 3.5 and 7 Mc. EQN has new receiver, new antenna, and new transmitter. His XYL, KCV, is eagerly awaiting his return at the rig he built upon his home front in Maine for the holidays, operated on 28 Mc. FWD is on 39 Mc. FDL is on 28 Mc. DF has new 28-Mc. folded dipole. CKZ is on 27 Mc. and has new VHF152 to go on 50 Mc. ETV, in Chebula, is on with BC-3765 looking for traffic. ACF, on 3.5 Mc., yells for traffic every night of the week. JFB contemplates OPS on 3.9 Mc.; 3940 is her schedule frequency. Tl A Monday through Friday. APP, 7:30 p.m.

6MDJ, daily 8:00 p.m., 3965 and 3950 kc. IQGQ now is K9U of Seattle, PWD is trying to cure relay troubles in ECO FWR is showing Tate how to operate on 28 Mc. GWN is on 3.5 Mc. HGC is working Tl A on 3365 kc. KIL is on 3.5, 14, and 28 Mc. with T240a at W.S.C. BTV has new antenna location in west end of Tacoma. CKR built new PTP240 modulator on his 3.9-Mc. rig. GVL is operating on 28 Mc. LB has new four-element signal squitter; he climbs the roof at night to tune with a neon bulb. IMB bought new modulator meter and found out 100 per cent was half of what he was using. JTF has 600 watts on 7 and 14 Mc. DZx and DSZ have 304T4A with I6K. IDZ is new chief at KONF. GDW has more BCI with antenna 300 feet long. QRQ finally found his voice on 28 Mc. EQK schedules J6FGX to work and then, Areas 6MDJ, Vancouver, Contra, Yakima, Port Angeles, Bellingham. Traffic: W7CZ6 361, DGN 47, FWR 21, DWJ 12, DYH 4, HBC 1, HGC 1.7, Lloyd.

PACIFIC DIVISION

HAWAI'I—SCM, John Sousa, KHEEL—GP is on 14 Mc. with T40 final. E6 is on 28 Mc. with 807. GW is on 7 Mc. using 6L6. AU is busy on 7 Mc. with 807. EJ has new BC-610B and RME-69. E6 and EX finally received HJQ-140G. BTV newly received new exciter, and is a member of the Hilo Amateur Radio Club, handles code classes. K0TKA, Kauai High School, handled Christmas messages for the teachers. K6OGRK now is K6IIK. BG is rebuilding to T240a. DF rotates 28-Mc. beam without the use of crowbar. GM is using BC-312 with converter for receiving. W6WZS/K1K is modulating 45 watts on 28 Mc. E7 is an OBS. EK has 57-foot steel tower. EL is on 28 f.m. on 28 Mc. EM is on 50 Mc. with single 829. K5SDM is using NC-101X. GU is on 3.9 Mc. with BC-610 and four-element fixed beam atop 60-foot. DD made 376 contacts in SS. New officers of the Maui Amateur Radio Club are: DK, pres.; EM, vice-pres.; HH, treas.; Silva, secre. Traffic: KOTKA 92, KHE6DF 41, 73. Johnny.

NEVADA—SCM, N. Arthur Bowles, W7CX—Asst. SCM, Carroll Short, Jr., 7B2V, RM; PST; ECA: JU, TJY. Asst. ECA: OFP, KEV, OBS: JOU, OBS: TJU, JUO is on 3.9 and 14 Mc. XJH is on 7 Mc. with 6L6 oscillator and p.p. 900s in the final. KJQ is on 28-, 14-, and 7-Mc. e.w. PZY operates 200 watts on 7 Mc. IUJ increased power to 600 watts on 3.5-, 7-, and 14-Mc. e.w. SXD is running his Miller exciter on 7 Mc. EXG is serial in the Nevada Sagebrush Net (3968 kc.). BVZ is on the Mission Trail Net for Southern Nevada outlet. PGS found that a loading coil in his antenna increased his signals considerably on 7- and 3.5-Mc. e.w. PZY is on 3.9 Mc. with a 28-Mc. modulator. JWV, PWE, and RFP are on 3.9 Mc. TJY takes net control on Mission Trail one night a week. TJY is experimenting on 28 Mc. KLK has 30 watts on 3.9 Mc. 6D1C is using a MacRobey exciter. GC has 900 watts and is active on 3.5-Mc. QYK is on 3.5-Mc. e.w. Traffic: W7CZX 52, BVZ 2. 73. Art.

SANTA CLARA VALLEY—SCM, Roy E. Pinkham, WOBPT—Asst. SCM, Geoffrey Almy, 6TBK. PAM: QUP, The San Mateo Club bail in the Party at net. George Hall, attended by seventy-five. PVB plans to move his station from San Mateo to Pescadero. He reports hearing Europeans coming through very well in the morning on 7 Mc. IC now will be on with a 1-W.S.C. station. C87 has worked fifty countries. He is operating on 88.09 Mc. and is looking for his old friends in and around Boston. The following are on in Los Altos: SYW, T2K, WCT, VGO, HJP, and AEW. TUP has returned to the AAP as a master sergeant. TBK received a modulator meter for Christmas and

(Continued on page 93)
Meet the three Schweitzer brothers, from left to right... Bill — W2KG... Pete — W2MDQ... and Lou — W1MBJ. Heard over the air on ten, twenty and seventy five meters, their custom-built TEMCO Kilowatts are quickly recognized by their outstanding signals.

Say these three well known and frequently heard radio amateurs, "Our pre-war experience with TEMCO TRANSMITTERS was so extremely gratifying that when the time arrived to equip our new stations... naturally we selected TEMCO. Short skip — long skip — northern lights or what have you, our TEMCOS always get through. And for easy handling they're unsurpassed... everything's at your fingertips and everything's in one cabinet."

Discriminating amateurs, like the Schweitzers prefer TEMCO TRANSMITTERS because of their excellent DX capabilities, operational flexibility and highly efficient circuit designs. If you too want a transmitter that leaves nothing to be desired in both performance and appearance... make yours a TEMCO. Available in a range of power output ratings from 75 watts up. Write for full details and prices stating your requirements.

Work a QSO with a TEMCO KILOWATT at the IRE Show. Booth 65 B March 3rd to 6th inclusive.
**REMmARKABLE SAVINGS offered by the RADIO SHACK**

**BC-348 RECEIVER**

Acclaimed the best military receiver for amateur use, this easy-handling set covers six band-switched ranges from 200 kc to 18 mc (less BC band), with constant sensitivity on all bands. Has Xtal filter, AVC, MVC, BFO, automatic noise compensator, temperature-compensated oscillator; output at 300 or 4000 ohms; verneir tuning on all bands. Furnished with built-in dynamotor, full set of tubes, and details of conversion to 110v. a-c.

$49.50

Complete a-c conversion kit for BC-348.......$5.50

---

**SCR-522 VHF XMTR-RCVR for all-purpose work at 100-156 MC**

So good it was standard equipment on all AAF and RAF planes, this set is now yours at a small fraction of its original cost. Ten-tube crystal-controlled superhet has 3-microvolt sensitivity at 10 mw output. Seven-tube temperature-stabilized xmtr delivers 15 watts. Remote control box gives push-button tuning on four crystal-controlled send-receive channels. Dynamotor (28-volt d-c) powers entire rig. Furnished with all tubes, plugs, and detailed dope on conversion to 110-volt a-c operation. Condition — like new. Weight — about 100 lbs.

$39.95

---

**AAF XMTR BC-375-E**

For a real bargain, you can't beat these used, but in A-1 shape, BC-375's. Furnished complete with five tubes, seven tuning units covering 200 kc to 12 mc (less BC band); antenna tuning unit BC-306-A with variometer and tap switch, dynamotor PE-73-C with relay, fuses, and filter. For detailed description of this 200-pound bargain, see our Feb. QST adv.

$35.00

---

**PE-103 DYNAMOTOR New Lot, only $9.00**

Brand new, in original Signal Corps packing; delivers 160 mals at 500 volts; operates from 6 or 12 volts d-c; complete shock-mounted assembly includes breakers, switches, relays, filters, and cables.

---

**Gon-Set 10-11 Meter Converter**

Ideal for use with BC-348. Supplied with full set of tubes.

$39.95

---

**STANDARD RECEIVERS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-38</td>
<td>Complete</td>
<td>$39.50</td>
</tr>
<tr>
<td>S-40</td>
<td>Complete</td>
<td>$39.50</td>
</tr>
<tr>
<td>SX-42</td>
<td>Complete</td>
<td>$89.50</td>
</tr>
<tr>
<td>HRO-STA-1</td>
<td>Complete, 200,71</td>
<td>$200.00</td>
</tr>
<tr>
<td>NC-240D</td>
<td>With speaker 241.44</td>
<td>$241.44</td>
</tr>
<tr>
<td>NC-45</td>
<td>With speaker 107.40</td>
<td>$107.40</td>
</tr>
<tr>
<td>1-10A</td>
<td>With tubes, less speaker and power supply</td>
<td>$67.50</td>
</tr>
<tr>
<td>HQ-129X</td>
<td>Complete</td>
<td>$178.25</td>
</tr>
<tr>
<td>SP-400X</td>
<td>Complete</td>
<td>$342.00</td>
</tr>
<tr>
<td>RME</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RME-45</td>
<td>Complete</td>
<td>$198.70</td>
</tr>
<tr>
<td>RME-84</td>
<td>Complete</td>
<td>$198.70</td>
</tr>
<tr>
<td>PANADAPTER</td>
<td></td>
<td>$99.75</td>
</tr>
</tbody>
</table>

**HAMMARLUND**

HQ-129X complete...178.25
SP-400X complete...342.00
RME
RME-45 complete...198.70
RME-84 complete...198.70
PANADAPTER
Complete.............99.75

and the entire line of COLLINS EQUIPMENT
**RADIO SHACK**

RADIO SHACK is located in Boston and has no branches or affiliates elsewhere.

**BUYS in TUBES**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Price</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>872A</td>
<td>$2.25</td>
<td>304-TH Eimac $9.95</td>
</tr>
<tr>
<td>807</td>
<td>1.05</td>
<td>809</td>
</tr>
<tr>
<td>811</td>
<td>3.65</td>
<td>814</td>
</tr>
<tr>
<td>818</td>
<td>7.65</td>
<td>826</td>
</tr>
<tr>
<td>211</td>
<td>4.95</td>
<td>832A</td>
</tr>
<tr>
<td>829B</td>
<td>3.94</td>
<td>831A</td>
</tr>
<tr>
<td>829B socket</td>
<td>.69</td>
<td>2API</td>
</tr>
</tbody>
</table>

**FREQUENCY STANDARD BC-221**

This stable, heterodyne frequency meter checks up to 8th harmonic on most receivers and up to the 125th on the better ones. Fundamental ranges are 125-250 and 2000-4000 kc; stability is better than .005%; instrument works on 110 v.a.c., on vibrapack, or on batteries. You can use it for a signal generator or make it into a VFO that's a humdinger. It's complete with tubes, original crystal and calibration charts. Hardly to be told from new, this is one of the finest instruments we've yet been able to bring you from surplus stocks — it's a value you can't afford to miss. Order today!!

**SCR-274-N COMMAND SET**

This remarkable assortment of gear — with parts alone worth far more than our entire selling price — gives you

- 3 RCVRs — 190-550 kc; 3-6 and 6-9.1 mc
- 2 XMTRS — 3-4 mc; 4-5.3 mc
- 4 DYNAMOTORS — 28-v. d-c input
- 1 MODULATOR — carbon mike input
- 2 TUNING CONTROL BOXES
- 1 ANTENNA COUPLING BOX with r-f ammeter, antenna relay, and 5000-volt, 50 mmfd. WE vacuum condenser
- 29 TUBES — a complete set for each unit

Our extremely low price is possible because the equipment is slightly used — but it's in first class shape ready to give you years of service. DON'T MISS THIS BARGAIN IN USABLE GEAR!!

**XMTG CAPACITORS**

Nationally known, high-voltage, oil xmtg capacitors, all in rectangular cases, with stand-off insulators.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4 600</td>
<td>$0.71</td>
</tr>
<tr>
<td>6 600</td>
<td>.79</td>
</tr>
<tr>
<td>8 600</td>
<td>1.19</td>
</tr>
<tr>
<td>10 600</td>
<td>1.29</td>
</tr>
<tr>
<td>2 1000</td>
<td>1.71</td>
</tr>
<tr>
<td>4 1000</td>
<td>1.19</td>
</tr>
<tr>
<td>8 1000</td>
<td>1.49</td>
</tr>
<tr>
<td>10 1000</td>
<td>1.79</td>
</tr>
<tr>
<td>8 1000</td>
<td>1.49</td>
</tr>
</tbody>
</table>

Speed delivery and save C.O.D. charges — send full amount with order; 50% deposit required on all C.O.D. orders.

**See our advertisement in February QST for detailed data on all these amazing values**

---

**167 Washington St., Boston, Mass., U.S.A.**

---

The RADIO SHACK

---

97
YES EVERYTHING
THE MODERN HAM DESIRES
... all in one rack mount unit, or table top use. A VFO that is on constantly, yet signals can be copied plainly in the up-key position. An xtal control that needs no switching in or out, just insert the xtal and tune. Remove the xtal and the unit is automatically in VFO position. A VFX control that rubberises any cut xtal and permits deviation of the xtal frequency as much as 30 kc on 80 mtrs; 60 kc on 40 mtrs; 120 kc for in the XE-10 is incorporated in the

monitoring. A VFX control that rubberises
up•key position. An xtal control that
 PHONE MONITOR, for earphones, as the upper half for tuning the various
ves

and the lower half for visual position. A VFX control that rubberises the xtal frequency as much as 30 kc the unit is ·automatically in VFO po­

the xtal and tune. Remove the xtal and

the xtal is on constantly, yet signals can be copied plainly in the up-key position. An xtal control that needs no switching in or out, just insert the xtal and tune. Remove the xtal and the unit is automatically in VFO position. A VFX control that rubberises any cut xtal and permits deviation of the xtal frequency as much as 30 kc on 80 mtrs; 60 kc on 40 mtrs; 120 kc on 20 mtrs; 240 kc on 10 mtrs.

YES... there's more... it also incorporates a CW MONITOR and PHONE MONITOR, for earphones, as well as a dual tuning eye that employs the upper half for tuning the various stages and the lower half for visual monitoring.

Send for catalog or see your dealer about the VFX 680 and its companion exciter model XE-10.

(Continued from page 84)
says he is filling its carrier to about thirty per cent. CIS is doing PB with his new 813 rig, having worked GZO for a 579 on 7 Mc. DZE reports KBQUD and his XYL, KBTCCW, whose visitors in San Jose, JEB can be found handling traffic on the Mission Trails Net any evening during the week. Cecil also checks into Trunk AW when he can hear the boys on 3855 kc. He is using NBFM on 29,008 Mc, and says that the RCA on 29 Mc. is a thing of the past. JDC reports the first VHF-152 converter in the section and says it's very good. QCB operates at his QTH in Sunnyvale on week ends and attends school in Davis the rest of the week. Some may remember him as 2D1AF, who operated in Africa just after the war. PVV has her new rig completed and can be found on 3.5- or 7-Mc. c.w. Let's keep the reports coming. Traffic: W6JUB 90, ZZ 38, TBK 18, DZE 11, CIS 6, SYW 2. 73. Clubs.

EAST BAY - SCM, Horace R. Greer, W6TI - Asst. SCM, C. P. Henry, 6EJA, SEC; OJB, RM; ZM, OQ; ITH, BC; QDE, Asst. EC u.h.f.: OJU. The following officers were elected by the Oakland Radio Club for 1947: EJ, pres.; MFF, vice-pres.; MNG, secy.; OLL, treas.; 2M, director; BF, chief operator. The Mission Trail Net, on 3584 kc, 'phone, is doing a bang-up job throughout California, Oregon, Washington, Utah, and Arizona. The Richmond Radio Club elected the following officers for 1947: CTL, pres.; NJX, vice-pres.; KEK, secy.-treas.; QUL, agt. at arms. WHG is doing good job as sergeant at arms for ORC. WF blew up his power supply on large rig. Buy is hammering after 14-Mc. c.w. DX. PB is mostly on 14-Mc. c.w. chasing DX. IDY just completed FB e.o. DJU is working on new 14-Mc. beam. GY is working for DX records on 2000 Mc. GQ is on 14-Mc, c.w. UPV is working for DX records on 28-Mc, 'phone. IKQ is on with a complete new 1-kw. rig. AED is working on new 28-14 Mc. four-element beam. The Northern California DX Club, Inc., members are sporting new QSL cards. EFA reports that all Richmond traffic has been handled by PGZ. CRF is building new a.m. and N.B. f.m. rig with p.p. 387's in final and reports that the North Bay Radio Club is going along PB. Those interested may contact EUI. KEK is rebuilding 14-kw. rig. CDA expects to have narrow-band f.m. rig, three-element premax beam, and higher power. QZK's ticket has been renewed. WVK is getting to be a DX hound. EJA reports that all Richmond traffic is ·automatically in VFO position. A VFX control that rubberises any cut xtal and permits deviation of the xtal frequency as much as 30 kc on 80 mtrs; 60 kc on 40 mtrs; 120 kc on 20 mtrs; 240 kc on 10 mtrs.

YES... there's more... it also incorporates a CW MONITOR and PHONE MONITOR, for earphones, as well as a dual tuning eye that employs the upper half for tuning the various stages and the lower half for visual monitoring.

Send for catalog or see your dealer about the VFX 680 and its companion exciter model XE-10.

(Continued on page 100)
NEW!.. 152-162 Mc fm
Specifically designed for the Urban Mobile Service Band

KAAR
Radiotelephones
INSTANT
HEATING

* Improved Voice Quality
* Higher Sensitivity
* Greater Noise Rejection
* Lower Battery Drain

Tested and proved equipment specifically designed for the 152-162 Mc band is now brought you by the engineers who made instant-heating FM practical. The new KAAR FM-175X transmitter and FM-40X receiver are thoroughly engineered to do a better job in the urban mobile service band.

You will hear a startling improvement in voice quality. A special circuit boosts the low tones, rounding out the voice quality to a naturalness that actually permits recognition of the speaker's voice! Controls are reduced to a minimum, making operation almost automatic!

Service men will find that this new KAAR equipment requires a minimum of upkeep and repair. For quick checking and servicing dust covers can be removed by a quarter turn of two airlock fasteners. The entire chassis can be released simply by freeing two slide catches.

KAAR instant-heating transmitters with zero standby current eliminate the need for costly special generators or extra batteries. Only about 4% of the current used by conventional equipment is needed.

SEND FOR NEW BULLETIN

Write today for illustrated bulletin number 26-47 giving complete details of the FM-175X transmitter and FM-40X receiver. No obligation, of course. KAAR ENGINEERING CO., 605 Emerson St., Palo Alto, California.

READY TO GO...INSTANTLY!

KAAR ENGINEERING CO.
Palo Alto, California
old-timer, is back on 14 Mc. YME is a new call on the air from Tamaulipas Valley. Bob is an old-timer, however, being an experienced operator and having held several ham calls in the past. He is operating 7- and 14-Mc. cw with 100 watts to an HY69 using an NC101X receiver. The Marine Radio Club held its annual Christmas Party on Dec. 14th at the Mill Valley Golf and Country Club. A fine dinner was served and a swell evening was enjoyed. The club is pleased to have in attendance ARRIL vice-president J. L. MacCargar, EY, and family, and our new Pacific Division Director, Bill Ladley, RBQ, and wife. The following new officers were introduced and installed: JGZ, pres.; RTH, vice-president; RTH, publicity chairman. Thanks for the reports, fellows, and please get them in before the end of the month. My call has been changed to a two-letter call, W6NL. Traffic: W6RVQ 44, BIP 22, EY 11, VJO 8, Sam.

SACRAMENTO VALLEY — SCM, John R. Kinney, W6MCG — OJW has schedules with KL7UF and wants more SS Contest. DPB put up end-fed Zeppl for 7 Mc. and added new county, NycMC. WTL reports schedules with KL7F, 9AX, 2K0W, 4ERS, 4QGQ, 60Y, 6CZB, 60Y, 4UPF, and 40AP and made 2,152 points in SS Contest on ‘phone. GVM, on 28 and 14 Mc. ‘phone, is glad 48 Contest is over so that he may enjoy some DX and ragchews. AF is new OBS on 7166-ke. c.w. with 810s in his final. HIR, OBS, on 35625-ke. c.w., reports schedules with VJN and TBWD. OJW, OBS, and OJO reported eighteen stations with chirpy and poorly-filtered signals. FPB sent a photographic QSL card of his FB station with RK-20 c.w. rig with 100 watts input and Abbott TR-4B that puts out FB signals on 144 Mc. PIV keeps schedules daily with Pioneer Net on 3775 ke. and schedules working 28, 29, and 144 Mc. is working regular paring rigs for 50 and 235 Mc. GZY, OBS, is on 30698-ke. c.w. and 147-Mc. ‘phone. He reports that I0B is moving to Almeda. 9MXA now is 6Y0A. KJQ is on 28-Mc. ‘phone using an 819 in final; he also has a rhombic on 144 Mc. LME has a 28-Mc. rig in his car. YLO is a new ham on 144 Mc. The SARC, Inc., held its first annual Christmas Party on Dec. 18th attended by 125. ZT was guest speaker. EJC offered to finance the purchase of a 100-watt rig for the SARC, Inc. Traffic: (Nov.) W60JW 5, DBP 5, (Dec.) W8PJV 74, W6T 6, DBP 5, GZY 5, HIR 4, OJW 4, GVM 4, ZT 2, Jack.

SAN JOAQUIN VALLEY — SCM, James F. Wakefield, W6PSQ — UBK is on 28 Mc. and JCB is on 3.9 Mc. with an 829. KUT has sixteen postwar for ninety-one total confirmed. LTO has twenty-two postwar for sixty-five confirmed. SCM, SCM, has three-element beam for 144 Mc. MGK is building a pair of handie-talkies for 144 Mc. The Fresno gang meets nightly on 28, 1700 kc, ragchewing. HRK has a 28-Mc. rig in a local taxi under the number KX6. OHP is with KFRE in new place on 3.9 Mc. with a 980s in final; he also has a rhombic on 144 Mc. KME has a 28-Mc. rig in his car. YLO is a new ham on 144 Mc. The SARC, Inc., held its first annual Christmas Party on Dec. 18th attended by 125. ZT was guest speaker. EJC offered to finance the purchase of a 100-watt rig for the SARC, Inc. Traffic: W60JW 5, DBP 1, (Dec.) W8PJV 74, W6T 6, DBP 5, GZY 5, HIR 4, OJW 4, GVM 4, ZT 2, Jack.

ROANOKE DIVISION

NORTH CAROLINA — SCM, W. J. Wirtman, W4GB — AVT is busy on 3.5 and 7 Mc. with an 813 final. ANU has a new QTH in Richmond. VJN is active on 144 Mc. with 807. GJL runs 200 watts on 3.5-Mc. GJL is new OBS and applications are in the mail to CQI and QOP for appointments. How about some of the rest of you fellows dropping me a line? Also, reports from your district should be sent by the first of the month. 73. Jinnie.

(Continued on page 108)
COMPARISON OF OUTSTANDING TERMINAL VALUES!

**ADVANCE 1 KW.**

- **ANTENNA RELAY**
  - All-ceramic insulation, wide spacing, non-inductive contacts, DPDT. This is the famous relay hams swear by, not at 115 V. A.C. Coil.
  - Your cost each: 395

**HIGH VOLTAGE MICA CAPACITORS**

- **BAKELITE CASED**
  - 5000 Volts D.C. Working
  - .00005
  - .000072
  - .004
  - All Brand New, Best Quality!
  - Your cost each: 88c

**OIL FILLED, HIGH VOLTAGE CONDENSER**

- **10 MFD.**
  - 600 V.D.C.
  - Our best seller, because quality is tops and price is ridiculous! Brand new, made by famous condenser manufacturer! Ruggedly built for long-life, hermetically sealed!
  - Your cost each: 98c

**THORDARSON POWER TRANSFORMER**

- **Type 92R21**
  - 4.5 Volts @ 5 Amps. CT
  - 6 Volts @ 3 Amps. Your cost: 598 Brand new, fully shielded!

**KENYON CHoke**

- **6-19 Hy. -200 Mo., D.C.**
  - 5,000 volts insulation test, 160 ohms
  - D.C. resistance, Fully shielded input choke!
  - Brand new! Type 7-509.
  - Your cost: 289

**STANCOR FILAMENT TRANSFORMERS**

  - P-8540 - 5 Volts @ 8 Amps. C.T. 2,500 volts inst. Wt., 1/4 lbs.
  - P-8547 - 10 Volts @ 4 Amps. C.T. 5,000 volts inst. Wt., 5 lbs.
  - 295

**POWER TUBES JAN APPROVED!**

- 807... .105
- 811... .195
- 613... 6.75
- 614... 4.50
- 62A... 4.05
- 3E29... 3.00
- Ceramic Socket & Base Shield for 3E29... 7.95
- 073A... 2.95

**COMMENTS**

- No change in our policy. Every item we sell is fully guaranteed, regardless of its low price.
- If unable to visit our store, send us your mail orders with 25% deposit. Remit in full all orders under $5.00. Prices are F.O.B., New York.
Part One of Our
GENERAL CATALOG
Is Ready Now!
Send for Yours, FREE!

This new 16 page section of our general catalog is jam-packed with real savings for amateurs, experimenters, and servicemen. Send for yours today. Order from WRL, the only "personal service" radio parts mail order house in the nation.

LEO WOGFQ

ORDER YOUR RECEIVER FROM LEO, TODAY!

We carry all types and models, RME 45, HQ 120X, and all National models in stock for immediate delivery. Collins receivers available soon. Buy on our easy payment plan—lowest terms in the country. Liberal trade-in allowance.

WRL Globe Trotter KIT

Here's What WOPPB, Chilhowee, Mo. Says about the Globe Trotter:

"I want to thank you for bringing out such a wonderful transmitter as the Globe Trotter. For such small power it really packs a strong signal."

Says..."I want to thank you for bringing out such a wonderful ...

Tops For Performance
WRL Globe Trotter KIT

$69.95

Immediate Delivery—10 Watt Input. Cat. No. 70-300. Complete including all parts, chassis panel, streamlined cabinets, less tubes, coils, and meter. No. 70-312 same as above, wired by our engineers $79.50. 3 Set Colls., Meter, Tubes. $15.15 Extra

All prices quoted are domestic.
Write for export prices.

World Radio Laboratories, Inc.
Address Dept. G3X3
Camed Bluffs, Iowa

(Continued from page 100)

all bands. NT, on 28-Mc. 'phone, is working on kw. final. DGV has a new 28-Mc. beam. 1ZR is working on new rig with 806 final. KJS is looking for traffic schedules. AEH is on 28-Mc. 'phone. DCW is working 14-Mc. c.w. and 28-Mc. 'phone and c.w. FXU is on 3.5 Mc. LAI is working 7-Mc. c.w. and 28-Mc. 'phone. 1GJH/4 is operating 144-Mc. ridg. In car, KRR and EYE have 14 kw. on 2.9 Mc. BCZ and his XYL, KOH, are working 28-Mc. 'phone. 2RUR/4 is on 28 and 144 Mc. AEH has S31 going, 3BAG/4 is active on 7 Mc. AEH is putting in 30 ITTS for a kw. HDS is active on 3.9-Mc. and 28-Mc. 'phone. GBY is putting the last 14 round tables on 28 Mc. on nights off. EY2G is building 14 kw. for 28 Mc. COF has new 1/4 kw. on 28 Mc. New officers of Grenboro Club, GNF, are: AGD, pres.; HEB, vice-pres.; KNY, secy.; and GG, treas. MR has eighty-eight countries postwar. EL is operating on 3875 kw. HEB raised score to thirty-eight states and forty countries with his ex-cit. Traffic: WACAY 4, KJS 4, FXU 5, 73. Buck.

SOUTH CAROLINA — SCM, Ted Ferguson, W4BQE/ ANG — HMG is now 100 per cent o.w. HK, our only YL operator, is pounding 'em out on 3.5-Mc. c.w. ILP works 7 Mc. with 807 final. 8YGT/4 and 5KDW/4 are on 7-Mc. c.w. at Summerville. GCH works 3.5-Mc. c.w. HDO had 19 watts 3.5-Mc. c.w. and 22 on 28-Mc. 'phone. EBY is active on 28 Mc. FHE is turning to portable mobile gear. JEF made contact with England on 28 Mc. concerning the health of the famous Gypsy Smith, sr. BSS has a new contact in the United States. KFZ revamped his BC-375E. BMK works all bands on c.w. BZX works 3.9-Mc. 'phone. and is a chief instructor for the Palmetto Amateur Radio Club's radio school. AZT is PAM and is organizing a 3.9-Mc. "phone net. KBW/4 Mc. c.w. net is coming along nicely under the direction of CZA and FNS. BFD has completed its collection of 100 postal QSLs for Century Club. CZA is a member of the S.C. Net, Ga. Net, Rebel Net, and TCI, and is coordinating the spotting of DXC in the sections in the S.C. Net and KBW are new bands. EMT works 3.9-Mc. 'phone. HMG is sporting a new Mock T60-1 rig. CEL is on 3.9-Mc. 'phone. KGX works on 3.5- and 7-Mc. c.w. FNC spends his time on 3.9-Mc. 'phone. FAL was seen loading a BC-375E to move to his QTH. Trafiic: W4CZA 106. 73.

VIRGINIA — SCM, Walter R. Bullington, W4JHK — KAO is rebuilding a new bandswitching rig. IQQ is on 3.5, 14, and 28 Mc. and has application for WPS. At present he is using in ITU-8 and has twenty-two licensees. JDN is going to town on 7 and 14 Mc. JBY schedules 9YB at Purdue. He has an 807 and is doing fine on all bands. JLV is on again after twenty-seven months in the KTO. AGH demonstrated the effects of directors and reflectors of a three-element beam on 112 Mc. at the last meeting of the Richmond Amateur Radio Club. FJ and CYW are on 112 Mc. again after twenty-seven months in the ETO. AGH — RMG/ VANG is operating portable from Chattanooga. YCK JM schedules the "TO" net daily on 3705 kc. at 10 P.M. He is back on all bands and is issuing a report on his KT-106. HBS bas completed his equipment for his Radiant Mirror. WSL has eighty-eight countries postwar. EL is operating on 3875 kc. He has an 807 and is active on all bands. W4CAY 4, KJS 4, FXU 5, 73. Buck.

(Continued on page 109)
Bob Henry says:

**MOST MODELS IN STOCK**

FOR IMMEDIATE DELIVERY

Most models listed below are in stock... ready for immediate delivery:

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hallicrafters S38 complete</td>
<td>$47.50</td>
</tr>
<tr>
<td>Hallicrafters S40A</td>
<td>$99.50</td>
</tr>
<tr>
<td>Hallicrafters SX 42</td>
<td>$273.00</td>
</tr>
<tr>
<td>Hammarlund HQ-129X and speaker</td>
<td>$168.00</td>
</tr>
<tr>
<td>Hammarlund SP-400-X and speaker</td>
<td>$342.00</td>
</tr>
<tr>
<td>National NC-2-60D (complete with speaker)</td>
<td>$241.44</td>
</tr>
<tr>
<td>National HRO-STA1 and HRO-5RA1</td>
<td>$274.35</td>
</tr>
<tr>
<td>National NC-46</td>
<td>$97.50</td>
</tr>
<tr>
<td>National 1-10A with tubes and coils</td>
<td>$47.50</td>
</tr>
<tr>
<td>RME-45 complete</td>
<td>$198.70</td>
</tr>
<tr>
<td>RME-84 complete</td>
<td>$98.70</td>
</tr>
<tr>
<td>Piersen KP-81 complete</td>
<td>$342.00</td>
</tr>
<tr>
<td>Panoramic panadapter complete</td>
<td>$99.75</td>
</tr>
<tr>
<td>Tempo 75GA transmitters</td>
<td>$195.00</td>
</tr>
<tr>
<td>Mack 60T transmitters</td>
<td>$150.00</td>
</tr>
<tr>
<td>Millen 90800 ECO</td>
<td>$42.50</td>
</tr>
<tr>
<td>Millen 90800 exciter</td>
<td>$37.50</td>
</tr>
<tr>
<td>Millen 90281 power supply</td>
<td>$84.50</td>
</tr>
<tr>
<td>Millen 90902 scope</td>
<td>$42.50</td>
</tr>
</tbody>
</table>

The delivery situation is much improved. I can make immediate delivery of most receivers and other apparatus. Take advantage of the extra service and selection you get by dealing with me, based on my reputation as the world's largest distributor of short wave receivers. Send me your order now. Send five dollars and I will ship at once C.O.D. Or order on my 6% terms, I finance the terms myself to give you better service and save you money. Trade-ins accepted. Tell me what you have to trade, and let's make a deal.

Besides having all amateur receivers and transmitters, I also have a complete stock of all other amateur apparatus and parts, also test equipment, etc. I have real bargains in the really good war surplus such as SCR-211's, BC-610, BC-342, BC-348, BC-312, parts, etc. Write, phone, wire or visit either of my stores.

*The new Hallicrafters and Collins receivers, transmitters, VFO, etc. as fast as available. Prices subject to change.*

---

**HENRY RADIO STORES**

"WORLD'S LARGEST DISTRIBUTORS OF SHORT WAVE RECEIVERS"

Butler, Missouri

11240 W. Olympic Blvd
Los Angeles 25, Calif.

103
1915

The ocean, long a barrier to spoken communications, was conquered when Bell System engineers designed, built, and operated the transmitter which first sent the human voice across the Atlantic and Pacific.

1916

A Western Electric transmitter was used in one of the pioneer ship-to-ship radiotelephone experiments. Thirteen years later the first regular commercial service was established with Western Electric equipment.

1917

With the first airborne transmitter, Western Electric demonstrated two-way radiotelephone between a plane in flight and the ground. From this earliest experiment came commercial airline equipment in 1930.

1920

Western Electric radio became a part of the nation's telephone system when it was used to connect Catalina Island to the mainland. Seven years later, the Bell System offered commercial radiotelephone service to Europe.

1922

Western Electric manufactured and installed the first "high power" (500 W) commercial broadcast transmitter—for the Detroit News Station WWJ.

1930

Transmitter designed by Bell Laboratories first used for one-way coated with police cars. Police used Western Electric fixed station transmitters as early as 1922, and two-way mobile equipment from 1935.

1931

Flying tests of the first VHF aircraft transmitter showed relatively static-free communication at all times. Modifications of the original Bell Laboratories design were used for basic Army-Navy aircraft radiotelephony in World War II.

1935

The first single sideband transmitter was introduced for long distance point-to-point communications. The world-wide military communications network used in the war came directly from this development.

1936

A 50 kw Western Electric AM transmitter installed at WOR was the first to incorporate the Bell Laboratories-designed stabilized feedback circuit, since accepted as a broadcasting standard.

1937

The first single sideband transmitter was introduced for long distance point-to-point communications. The world-wide military communications network used in the war came directly from this development.

1938

The first 50 kw commercial broadcast transmitter, built by Western Electric, installed at WOR, Cincinnati, Ohio.

1939

A 50 kw Western Electric AM transmitter installed at WOR was the first to incorporate the Bell Laboratories-designed stabilized feedback circuit, since accepted as a broadcasting standard.

1940

The first Synchronized FM transmitter installed at WOR enabled broadcasters to put top-quality FM programs on the air and keep them on their assigned frequency.

1941

Western Electric manufactured a new type of FM transmitter to use grounded plate amplifier circuit was Western Electric 10 kw installed at WOR.

1941

The first synchronized FM transmitter installed at WOR enabled broadcasters to put top-quality FM programs on the air and keep them on their assigned frequency.

1941

The first synchronized FM transmitter installed at WOR enabled broadcasters to put top-quality FM programs on the air and keep them on their assigned frequency.

1941

Twelve talking channels adjacent to each other, available for the first time on a single radio frequency band, used to connect telephone lines on either side of Chesapeake Bay. Envelope feedback developed by Bell Telephone Laboratories and applied to the carrier technique in radio telephony made this possible.

QUALITY COUNTS—
The experience gained during the war, when the Bell Laboratories-Western Electric team was the largest supplier of communications equipment, added greatly to the skill and knowledge acquired through 30 years of transmitter development.

This background, plus unequalled research and manufacturing facilities, provides assurance that there are no finer transmitters than those designed by Bell Telephone Laboratories and built by Western Electric—whether for AM or FM broadcasting, point-to-point radiotelephony, or any type of communication or mobile service.

1943. The ARC-1, a crystal-controlled ten frequency transceiver used by the Navy's fighter planes during the war, has been accepted as standard VHF equipment by U.S. airlines. Provides nine plane-to-ground frequencies and one plane-to-plane frequency.

1947. The Western Electric 238-
type mobile radiotelephone system is providing dependable Bell System service between vehicles and any wire telephone in a growing number of cities and along trunk highways.

1947. The new TRANSVIEW design FM transmitter, being produced in 1, 3 and 10 kw units, for the first time provides the operator with an unobstructed view of all tubes while in operation. Incorporates Bell Laboratories-developed synchronized frequency control.
LIST YOUR NEEDS ON A PENNY POST CARD TONIGHT AND DROP IT IN THE MAIL TO US (DEPT. M. O.) IN THE MORNING.

YOUR ORDER WILL BE FILLED AND BACK IN THE MAIL, ENROUTE TO YOU, WITHIN FIVE HOURS AFTER BEING RECEIVED BY OUR STORE.

A FEW OF OUR LINES ARE LISTED BELOW AND ALL ITEMS ARE AT NATIONALLY ADVERTISED PRICES. YOU MAY SEND CASH OR WE WILL SEND MERCHANDISE C.O.D. VIA PARCEL POST.

☆ NATIONAL UTC ☆
☆ JOHNSON B & W ☆
☆ MALLORY BILLEY ☆
☆ MILLEN TURNER ☆
☆ SHURE BUD ☆
☆ AMPHENOL NATIONAL UNION ☆
☆ EMAC HAMMARLUND ☆
☆ HYTRON SPEED-X ☆
☆ THORDARSON SYLVANIA ☆
☆ TRIPLET RM E ☆
☆ OHMITE CARDWELL ☆

MAIL ORDERS OUR SPECIALTY!

KIERULFF'S HAM SHACK
828 W. OLYMPIC BLVD.
LOS ANGELES 15, CALIF.

(Continued from page 108)

ROCKY MOUNTAIN DIVISION

COLORADO - SCM, Glen Bond, W9QY - We hope that the New Year will bring you more pleasure operating your rig and stations, whether 80-Mc. or a kilowatt. W9O has rebuilt 150 watts to a T55. IQZ and 8WO are having their own DX contest. IQZ heard Greely on short skip. CND reports a 28-Mc. mobile rig in his car, WILCO transceiver and Gonset converter. The Elecstep Club Emergency Net held its second drill Jan. 6th at 8:00 p.m. on 28 Mc. with four mobile rigs and six home stations. The net plans to drill each Monday evening on 28, 144, or 7-Mc. o.w. Anyone interested in joining, please contact JBI, ed listen for call at 8:30 p.m. from JBI, net control station. DRB, in Canon City, has dismantled and secured his station. Clay is leaving Colorado for a while but hopes to be back in a year. The WERS gang remembers KFV has a new HQ-129X receiver. Chics is now out of the Army and is SSA in Oakland, Calil. He has a half-kw. rig on 28 Mc. Give him a call on short skip. We now have a new director and he is anxious to serve you. Write him your views. Let's all mail him a card. MGX, from Grand Junction was a visitor in Denver recently. Herb still misses 160 meters. Traffic: W9WAP 79, DBG 30, JBI 30, IQZ 14, 73, Glen.

UTAH-WYOMING - SCM, Victor Drabble, WYLL - FTE is a new HRO. LE has Meltron 150B transmitter and HQ-120 receiver. JTIU has an HQ-129X and a 816-807 rig running about 60 watts on 7-Mc. o.w. JOF works at least one station each day on 28-, 144-, or 7-Mc. o.w. JXJ has a new SCR and has been working 29 Mc. Go, IR has a new HQ-129X receiver. KFV has an 815 on 7-Mc. o.w. also a crystal-controlled 144-Mc. transmitter and a super-heterodyne 144-Mc. receiver. JQV has a new 8-40 receiver. TAB is building on a pair of 815's. MAY is putting on a pair of 815's. SCA is putting on a pair of 815's. MQL is organizing the AEC program in this area. He is experimenting on wave propagation with LLH and Millen exciter. The OBS schedule for TMK is at 2 p.m. on Mondays and Wednesdays and 1:30 p.m. Fridays. All on 14 Mc. JZC is building a low power rig with 807 in the final. DLR is remodeling his SCR-221-AH frequency-meter and is putting on a pair of 815's. He is building doublers and 807 final as companion unit. FST conducts a code class on 29,000 kc., 9 to 10:30 a.m. daily, except Sundays and holidays. KIT is ORS and EC. MGX is experimenting with wave propagation with LLH and Millen exciter. The OBS schedule for TMK is at 2 p.m. 73.

SOUTHEASTERN DIVISION

ALABAMA - SCM, Lawrence J. Smyth, W4GBV - I am very glad to see Anniston, Birmingham, Sheffield, Mobile, Dothan and Montgomery interested in getting clubs organized. If there is any other club started that is not listed, please drop me a line. Hope you have a good New Year. Larry Bond has been working 28-Mc. 'phone. IRI has a new HQ-129X receiver. KFV has an 813 on 7-Mc. c.w.; also a crystal-controlled 144-Mc. transmitter and a super-heterodyne 144-Mc. receiver. JQV has a new 8-40 receiver. TAB is building on a pair of 815's. MAY is putting on a pair of 815's. MQL is organizing the AEC program in this area. He is experimenting on wave propagation with LLH and Millen exciter. The OBS schedule for TMK is at 2 p.m. on Mondays and Wednesdays and 1:30 p.m. Fridays. All on 14 Mc. JZC is building a low power rig with 807 in the final. DLR is remodeling his SCR-221-AH frequency-meter and is building doublers and 807 final as companion unit. FST conducts a code class on 29,000 kc., 9 to 10:30 a.m. daily, except Sundays and holidays. KIT is ORS and EC. MGX is organizing the AEC program in this area. He is experimenting on wave propagation with LLH and Millen exciter. The OBS schedule for TMK is at 2 p.m. 73.

EASTERN FLORIDA - SCM, Robert B. Murphy, W4IP - ARB has been down Mexico way, D00 has a new ORS certificate. He watched DUV work CM22EJ on 7 Mc. with a tank set in his car, 60Q/4 is experimenting on wave propagation with LLH and Millen exciter. The OBS schedule for TMK is at 2 p.m. on Mondays and Wednesdays and 1:30 p.m. Fridays. All on 14 Mc. JZC is building a low power rig with 807 in the final. DLR is remodeling his SCR-221-AH frequency-meter and is building doublers and 807 final as companion unit. FST conducts a code class on 29,000 kc., 9 to 10:30 a.m. daily, except Sundays and holidays. KIT is ORS and EC. MGX is organizing the AEC program in this area. He is experimenting on wave propagation with LLH and Millen exciter. The OBS schedule for TMK is at 2 p.m. 73.
It's here!...the new Collins ham transmitter! 500 watts input on CW, 375 watts on phone. The 30K combines the desires and dreams of hams with brass in their blood and also those who want only a push-to-talk button. It was designed by engineers to whom CQ is a cherished and friendly sound. Every detail has been worked out carefully to provide efficient economical operation. Select quality components are used throughout to assure long trouble-free life.

Look at these features:
- fully metered
- push-to-talk
- vfo controlled
- band switching
- 80, 40, 20, 15, 11, 10 meters
- speech clipper
- 115 v. d.c. power source
- 3 pairs antenna terminals
- break-in operation
- 100% modulation

The 310A Exciter Unit for the 30K sits right on the operating desk. With vfo control, you can vary frequency several kc. up or down without retuning the final.

Harvey has the 30K with the 310A Exciter.

$1250

Harvey's HITS OF THE MONTH
Harvey has 20 meter crystals for a buck! Mounted in holder with 1/2" pin spacing. Also 40 and 80 meter and 6 and 13 mc bands at the same low price .................. $1.00
Special 8 mc. xtal for 2 meter xtal control, only .......... $1.50
Also in stock complete line of Bliley AX-2 xtal.

Include 10¢ postage with your crystal order.

Harvey's HAMFESTIVAL OF VALUES
The best value this month is the 30K Collins xmittr but you'll also like these:
- LS-7 Speaker in steel case with weatherproof louvre. Complete with self-contained 4000 ohm to voice coil transformer. With PL55 plug and 5 ft. heavy duty cable. Mounting clamp may be removed if desired. Packed with drying agent . . . . Harvey Special Price ......... $3.95
- Shure T-178 Hand Mike with M-367 weatherproof cover, switch in handle, heavy duty cable and PL-68 plug. Ideal for portable use . . . Harvey Special Price ...... $1.45
- Sylvania IN21-B Crystal Rectifiers, 3 for $1.00

Note: All prices F.O.B. New York and subject to change without notice.
SAVE 30%!

SAVINGS PASSED ON TO YOU
Through Our Big-Lot Purchase!

TYPE A
ENCLOSED RELAY RACK

$19.95 NET, F. O. B. LOUISVILLE

Regular List $47.50

CABINET
16½ x 22 x 42"

PANEL SPACE
19 x 36½"

FRONT INSIDE
Width: 17½"  

REAR INSIDE
Width: 18½"

CLEAR INSIDE
Depth: 14½"

Ideal for your next Transmitter or P. A.

Attractive in price and appearance, the ER-213 Relay Rack is fabricated from sturdy rolled steel. Panel mounting angles of 1/8" steel are accurately drilled and tapped for 10/32 machine screws. Panels fit into recess, with edges concealed. Side and screen section louvers provide ample ventilation. Rear door opens dependable loose-joint hinges, with flush snap catch. Shipped knocked-down, the money-saving ER-213 is easily assembled. The supply is limited, so—

- ORDER TODAY!

UNIVERSAL
RADIO SUPPLY COMPANY, Inc.,
715 S. 7th St., Louisville 3, Kentucky

(Continued from page 106)

foreigners to his credit. BF put 200 watts, IUJ, vice-president of the club, QSOed GPPV and it looks like a record for 50 Mc. BRB is president of the club and ran away with the SS Contest. The club transmitter is H.A.W and is on all bands. FYR is having fun on 20-Mc. phone. FNR has some fun on 15-Mc. phone. FNR continued via WPB for A.T.&T. Co. LTS is visiting us for the winter. RGG is having trouble getting his 807 working. The WPB Club is planning a hamfest for June. Your SCM's new address is listed on page 6 of QST. I am trying to stay on the high end of the 7-Mc. band. Give me a call. Traffic: W4-

DQW 117, DTW 59, BYF 30, GIP 30, BNR 23, IP 10, ACZ 8, EXL 5, 73. Mer.

WESTERN FLORIDA -- SCM, J. Comdr. Edward J. Collins, W4MS -- EQR has been giving 50 Mc. a whirl. EQR and MIS had their first 144-Mc. QSO. EGN has new three-element beam. BCC has his new ART-13 war surplus transmitter working. DAO is the proud possessor of a VPW-2, AXP is active on the Rebel Net. APJ is active on 7 Mc. HIZ is on 144 Mc. crystal-controlled with vertical polarization. KFPF also is on 144 Mc. JZJ is the proud owner of an RME-64X. KIK has three-element beam all set to go 144 Mc. AKI erected 60-foot tower for his two-element 28-Mc. beams. FQHX has a new steel tower. ACB is working on his 28-Mc. mobile job. GAA has been putting his 5KXM/4 is keeping 4 Mc. hot with 500 watts. KAS is heard on 28 and 14 Mc. and has new 8X-28, IIY, 5ZV, and 5DAS gave the boys a 28-Mc. mobile demonstration. 73. GEOGE -- SCM, Thomas M. Moss, W4AYW -- can now report organization of his first postwar section traffic net. The Cracker Waves Net is in operation on 3022-ke. c.w. at 2100 EST on Fridays. JBMI is NCS and HVY is AHCS. Present net members are: MA, EYK, the GGD, AAY, CZA, and IAO. All are ORS. Preswar ORS are urged to renew appointments and take part in net activities. In addition to this net, present ORS are: VX, AQL, RVA, HXW, GYV, & DXI, FLI, YC, FKE, KV, and TO, with FWV as PAM. ORS are as follows: B1W, BQZ, EEE, EYW, FWD, HXW YC, and TO. Listen for their transmissions. Cub and school stations are urged to participate in these section traffic activities. Additional to the Cracker Emergency Net are: AJ, CEL, CBB, GZF, RM, VP, AIS, AZT, and FLS. BOL is the net's PAM, BOL, KV, and OK are members of the Rebel Net on 3825-ke. c.w. at 2030 EST nightly. SIGW is NCS and BOL is AHCS. ORS are AAY, BOL, the Gulf Coast States. JRQ is our second section member to become an Old Timers Club member. Ultra-high interest is increasing, and you on the ultra highs are urged to inquire as to ORS appointment. New officers of Atlanta Radio Club are: EFS, pres.; HZG, vice-pres.; IEO, secy.; FKN, treas.; HDC, act. mgr. Thanks for all the cooperation during my first year as SCM. Traffic: W4KV 107, BOL 50, HXW 46. JBMI 34, AQL 19, PKE 23, MIS 15, PKI 19, MA 1, 73. Tom.

WEST INDIES -- Acting SCM, E. W. Mayer, KPIK 4D -- AM annexed a Sola constant voltage transformer. BE holds daily schedule with CE on 28-Mc. 'phone with 15 watts. !UJ, vice-pres.; HZG, secy.; FKN, treas.; HDC, act. mgr. West Indies Amateur Radio Club is planning a hamfest for June. Your SCM's new ad-

(Continued on page 110)

SOUTHWESTERN DIVISION

LOS ANGELES -- SCM, Ben W. Ostensen, W6QW, -- The meeting of the Southwestern Division Council of Radio Clubs, held January 6, 1947, was attended by our new Director, Rudy Jesenik, W6KEI. Delegations were present from the Inglewood Amateur Radio Club, the Los Angeles Section, the Metropolitan Radio Club, the Santa Ana Radio Club, the Tri-County Radio Club, the Footkill Radio Club, the Pasadena Short Wave Club, the Southeast

(Continued on page 110)
Outstanding Performance...

PRAISED BY AMERICA'S FOREMOST YL

Dorothy D. Hall, W2IXY, of Springfield, N. Y., who began her amateur radio career in 1934, today holds the distinction of being the most outstanding lady OP in "Hamdom." Her Shack boasts of four transmitters, eleven receivers, four recorders, and other modern installations... and is, of course, a veritable amateur's paradise.

"My D-104's," says Dorothy, "are my pride and joy. Their high output level and ideal voice characteristics get me through the most severe QRM. Personally, the D-104 is my favorite." Amateurs the world over are loud in their praise of Astatic Microphones. Such praise must be justified.

For Astatic's complete line of electronic products, see your Radio Parts Jobber or write for Catalog.
Radio Club, the Midcities Radio Club, the Associated Radio Amateurs, the United Radio Amateurs, the San Fernando Valley Radio Club, the Glendale Amateur Radio Club, the Valley Radio Society, the El Monte Park Radio Society, the Santa Monicas Mike and Key Club, and the Santa Barbara Radio Club. The president of the council, ANN, extends an invitation to all clubs in the Southwestern Division to send two delegates to the next meeting which will be held at the San Marino City Hall, April 7th, 8:00 P.M. Please bring a certified count of ARRL members in your club and be prepared to vote on matters of importance to the amateur. The AEC now has a majority of its nets on 60 Mc. Among them are Los Angeles, Inglewood, Santa Monica, Santa Barbara, and Los Angeles, Glendale, Inglewood, and Covina are on 144 Mc. The AEC net in San Fernando Valley is to be called the Golden State Net and is operating on 3055 kc. HOB is now on 5615 kc, along with LDD, VGF, L2V, HDB, JYP, SBJ, AIT, UYE, BHH, FDW, and KBI sitting in. OLO is their 50-Mc. tie-in, SQO and RIU are in the Naval Reserve at Santa Monica, setting up a station for ham use in the new Army. Any of you ex-hams who would like more information on the Naval Reserve, write to Naval Reserve Armory, 350 Lila Terrace, Los Angeles, or Lt. Watson, Naval Reserve Armory, Santa Barbara. The Mike and Key Club will hold meetings at the Frank Dyne Plant, 33rd and Pico, In Santa Monica, every other Thursday beginning March 13th. JQB is new Asst. SCM for Owens Valley area and reports the following: CUX is getting ready to return to the air, as is KMC. COQ is running a big rig on 5/4- and 14-Mc. phone, L2V, in Independence, has heard several times working some pretty note 7-Mc. DX. The City of Los Angeles Bureau of Power and Light Net meetings are held every Saturday at 9:00 A.M. on 1717 kc. with regular turnouts. NS moved into Lone Pine, 2821 S. Santa Fe, waiting for a 6 call. M and K new, ASW is on 28-Mc., 'phone with p.p. 290th, BHA is back on 3.9 Mc., 'phone. DIO is the MK Club's photographer. BSR has 5- and 10-meter converters in his car. JPD is on 28-Mc., n.w. with all directional rhombics on the desert at Yermo. NCS is trustee for the MK station. VB. NSM reports BDX DX in Arizona. QWL worked a 3L with 7 watt on a Signal Shifter with an antenna 6 ft. high. SQO is building 350-watt all-band rig. TVK is on 28 Mc., PCD now is K2AK, AO4 is 7-Mc. RM. The Mission Trail Net is going strong on 3.9-Mc., 'phone. BKY now is NY. Members of the Inglewood 50-Mc. net are VJS, SJF, GNH, KM, RNN, NAW, QIL, EK7, REE, RZK, VST, UXN, and SEZ. Traffic: W6OIO 305, CMN 181, AOA 41, OGM 39, EMJ 34, TZD 13, ERT 9, MTO 7, NY 7, ASW 6, MEF 6, AM 4, IUI 2, BUK 2, AAE 2, 73.

ARIZONA—SCM, Gladden C. Elliott, W7MLL—KOL visited Tucson hams; he now is 3L1Y in Philadelphia. QJL has a new XYL, Ruby LaRue has Class A ticket, OIF and MDD are increasing power on 3.9-Mc. phone. DDX, KYQ, and YAZ are sporadic wales, for the time being, promoting a fishing trip for hams to Mexico, MAE and NEL are working regularly on 3515 kc. MLL won the first round of the Arizona QSO Contest and SBN was second. The Phoenix Club meets twice a month. New officers of the 25 Club are: SMZ, pres.; JFG, vice-pres.; MLL, secy. UPY has a new YL. The Phoenix Club has challenged the Tucson clubs to a donkey baseball game. UAF has an 80-40-20 handwrench rig. PMJ is going on 3.9 Mc. to save phone bugg. JDZ has a new 8-40 receiver. 9UKO/7 bought RNB's BC-610 and a new SX-42 so as to be the high power man in Tucson on 28 Mc. JVM formerly was 9MIJ. Carl Clemente now is K70 in Tucson. FCK has 28 Mc. in Tucson. KEM is working on 3965 kc. JMC is moving to Japan. JEC works 7 and 144 Mc. at Cholord. JSL is Dick Smith at Yuma. JBB has fifty-one counties on 28 Mc. JGK operates from a trailer in Phoenix. JRP is getting a new DXE. KDF reports working the Society and LAYL. KAS has a 60-foot tower. JMQ is mobile on 28 Mc. See you in the state QSO contest, 73, Gladden.

SAN DIEGO—SCM, Ralph R. Culbertson, W6CHY—MKW reports that YDE is new station at Borrego at Camp Pendleton active on 14 and 28 Mc. VXJ has been operating portable with MBF rig on 50 Mc. at Balboa. In Orange ADT has rig going on 14 Mc. and NVX is on 3.9 Mc. CTP is on 9.3 Mc. at Fullerton, where 7JY occasionally shows up on 9.9 Mc. JZ is on 28 Mc. and K9G and 39 Mc. as fixed portable from Yacht Marquesa. YEW is new call in Santa Ana. URU is on with 35Ts using cathode modulation with good results, mainly on 3.9 Mc. New officers (Continued on page 118)
Efficient VHF radio communications is a must in modern railroading. Used to expedite freight and express service, it is cutting hours from schedules, and eliminating waste time and money in switching operations.

Designed principally for use in the 152-162 mc band by railroads for "train-to-fixed-station" and "end-to-end" communications, the new Ground Plane Antenna illustrated is foremost among many new VHF radio components and accessories perfected by Amphenol engineers.

Providing maximum power radiation at low initial cost, this extremely rugged antenna consistently out-performs other antennas under normal and extreme conditions. It is easily and quickly installed, and has been thoroughly tested in main-line railroad installations.

Danger from lightning or contact with power lines is eliminated, as this antenna is at ground potential. The nature of its radiation pattern insures uninterrupted service during sharp "U" or "S" turns.

The Amphenol Ground Plane Antenna is also widely used by police and fire departments, by forestry, geophysical, power and petroleum field crews, in marine installations, and many others. It is available with Ground Plane Skirt, as shown, for installations where a large metallic mounting surface is not available.

Write today for complete technical data on the Ground Plane Antenna, or for engineering aid in solving your VHF radio communications problems.
THE NEWEST dials in transmission. Flipping chain to radiating element. A new design for those who want to preserve accurate line-spacing changes from tank to radiating element. No radical improvement in line-spacing changes.

Built for QRO. Type 2900 has 50-60 cycle.

AC or DC voltage on request. Write for free catalog.

$4.35 each

Any spacing down to 2".
Order Your Communications Receiver from ALLIED!

IMMEDIATE DELIVERY on most models

Time Payments  Trade-Ins Accepted

- **IMMEDIATE** THE RME-45 DELIVERY! Net, with Speaker... $198.70
- **IMMEDIATE** NATIONAL HRO DELIVERY! Net, less Speaker... $274.35
- **IMMEDIATE** THE RME-84 DELIVERY! Net, with Speaker... $98.70

**RELAY RACK SPECIAL**
Standard ParMetal Type ER-213 heavy-duty enclosed type cabinet. 42" high, with 36½" panel space. Has full-length door in rear. Handsome, all-steel construction, in rich, black wrinkle finish. Brand new, in overseas packing case. Shpg. wt., 100 lbs. Regular selling price, $29.95. **ALLIED SPECIAL, ONLY... $1995**

**SPECIAL! NEW 2-METER TRANSCEIVER KIT!**
Uses 6N4 as mod.-osc. for transmitting, and as super-regen. det. for receiving; 7C5 as mod. in transmitting, and as power audio in receiving. Supplies current for carbon mike; with output transformer for coupling to speaker or 'phones. Requires 250 v. at 75 ma., 6.3 v. at .65 amp. Kit includes all necessary parts and tubes (less mike, speaker and power supply). No. 83-220. NET... $18.95

**Power Supply Kit. Includes all parts necessary to build power supply for transceiver. No. 83-371. NET... $10.25**

---

ALLIED RADIO CORP., D. L. Warner, W91BC
833 W. Jackson Blvd., Dept. 27-C-7
Chicago 7, Illinois

- Enter order for...
- Enclosed $........ [Full Payment □ Part Payment (Balance C.O.D.)]
- Send Literature on Receivers and Time Payment Plan.
- Send FREE Catalog.

Name...........................................
Address...........................................
City............................................ Zone........ State...........
CONNECTICUT AND MASSACHUSETTS HAM STORES

H & Y has an eye for Government Releases that are double-checked for usefulness and value. Look to your nearest Hatry & Young store for the latest and best Government surplus buys.

CONNECTICUT: Hartford, New Haven, Bridgeport, New London, Stamford, Waterbury. MASSACHUSETTS: Boston and Lawrence

HATRY & YOUNG
The Elect in Electronics

RECEIVING SENDING SPEED without strain

CHAMPIONS ENDORSE CANDLER WAY
Get skill, accuracy, speed with the highly endorsed Candler System. Learn to send and receive by telegraph or radio code. Government service and commerce need thousands of better trained operators. Air commerce, mail, freight, etc., demand expert, reliable operators. Good pay. Get the Candler System. It makes money. It makes you a good operator. It makes you a maker of championships. It teaches you the "knack" of sound sense, alertness, speediness sending and receiving without strain. Adventure—good pay. Learn at home or wherever you are. Rush name today for free book.

CANDLER SYSTEM CO.

(Continued from page 118)
SUPREME TRANSMITTER Model AF-100, 6-Band, 100 Watt (output) Desk Type Transmitter. Embodies ALL the features most desired by the majority of the amateurs. Designed to cover the amateur bands most frequently used: 10, 11, 15, 20, 40 and 80 meters for CW, ICW, AM and FM Phone transmission. This is the very first transmitter offered to the amateur which has the new feature of Frequency Modulation in the band of frequencies assigned for this purpose, namely 27.185 to 27.455 and 29 to 29.7 megacycles. Model AF-100 is continuously tunable throughout the range of each of the amateur bands. A highly stable variable oscillator followed by slug-tuned buffer and doubler stages which are ganged to the oscillator dial simplifies the problem of working through severe QRM and further enhances the pleasures of easily establishing and retaining QSOs. Band changing is easily accomplished in the exciter by a band selector switch and in the final by the plugging in of a coil for the particular band selected. This unit is one of the simplest to operate—and highly efficient on all bands, for all types of emission.

Front Panel Controls: Oscillator Dial; Final Amplifier Dial; Oscillator Selector Dial; Modulation Selector Dial; Microphone Gain Control; Band Selector Switch; Filament Power Switch; Plate Power Switch; Emission Selector Switch; Standby Control.

Metering: PA Plate Current; PA Grid Current; Modulator Plate Current.

**TUBE COMPLEMENT**

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-6AC7</td>
<td>Reactance Tube Modulator</td>
</tr>
<tr>
<td>1-6L5</td>
<td>Variable Frequency</td>
</tr>
<tr>
<td>1-6AC7</td>
<td>&quot;A&quot; Amplifier or Crystal Oscillator</td>
</tr>
<tr>
<td>1-6L6</td>
<td>80 meter Buffer or 40 meter Doubler, or 30 meter Tripler</td>
</tr>
<tr>
<td>1-6L6</td>
<td>20 meter Doubler</td>
</tr>
<tr>
<td>1-6L6</td>
<td>15 meter Doubler</td>
</tr>
<tr>
<td>1-6L6</td>
<td>10 meter Doubler</td>
</tr>
<tr>
<td>1-3D23</td>
<td>Final Amplifier</td>
</tr>
<tr>
<td>2-807</td>
<td>Class AB, Modulators</td>
</tr>
<tr>
<td>1-615</td>
<td>Modulator Driver</td>
</tr>
<tr>
<td>1-6SA7</td>
<td>Speech Amplifier</td>
</tr>
<tr>
<td>1-866A</td>
<td>High Voltage Rectifiers</td>
</tr>
<tr>
<td>1-5R4G</td>
<td>Low Voltage Rectifier</td>
</tr>
<tr>
<td>1-5R4G</td>
<td>Modulator Rectifier</td>
</tr>
<tr>
<td>1-80</td>
<td>Speech Rectifier</td>
</tr>
<tr>
<td>1-615GT</td>
<td>Bias Rectifier</td>
</tr>
<tr>
<td>1-VR150</td>
<td>Voltage Regulator</td>
</tr>
<tr>
<td>1-6SN7GT</td>
<td>Audio Oscillator</td>
</tr>
</tbody>
</table>

**ELECTRICAL CHARACTERISTICS**

- **Amateur Bands:** 10, 11, 15, 20, 40, 80 meters
- **Output Power:** 100 watts on CW, ICW and Frequency Modulation
- **AM Modulation:** 100%
- **FM Modulation:** 100% ±75 kilocycles (variable from 0 to 75 kc)
- **Input Audio Source:** High Impedance Crystal or Dynamic Microphone. Level 60 DB down
- **Audio Frequency Response:** AM-±2DB, 200 to 6000 cps
- **Noise Level:** AM—Minus 45DB below 100% modulation
- **Audio Frequency Distortion:** AM—5% at 85% modulation for 100 watt output
- **Frequency Control Elements:** Stabilized Variable Frequency Oscillator or two (2) crystal controlled positions


COMPLETE: The only items needed to get "on the air" are a key, a mike and two crystals.

INEXPENSIVE: A WONDERFUL VALUE!

Write for detailed information and catalog

DESIGNERS AND BUILDERS OF BROADCAST STATION EQUIPMENT, 250 WATTS to 50 KW — AM and FM

SUPREME TRANSMITTER CORPORATION
280 NINTH AVENUE, NEW YORK 1, N. Y.
Going Places?
Keeping posted away from home?
Attending hamfests?
Tuning a beam or a television antenna?
Talking back from that vacation spot just right for v.h.f.?

HANDY-TALKY
HT-144
• Completely telescoping antenna actuates on-off switch.
• Press-to-talk single hand control.
• Economy with efficiency; B battery lasts 75 hrs. reception 45 hrs. trans. A battery 10 hrs.
• Rapid change thru snap bottom. 6C4 and 1S4 tubes.
• 10¾" x 2½" x 2¼" wgt. 4 lbs. with batts.
• 10¾' tubes and batts slightly higher in weet.

Immediate Delivery!

RADIO TRANSCEIVER LABORATORIES
116-23 Jamaica Avenue Richmond Hill 18, N. Y.
Modern functionally designed capacitors. Metal ferrules are soldered to silver bands fused to each end of heavy-walled glass tubes. This vacuum tight assembly is fungus-proof and passes Signal Corps, Air Corps and Navy thermal cycle and immersion tests.

From 600 to over 30,000 Volts

Extreme Temperature Range
from Minus 60°C to Plus 125°C

PLASTICON* ASG Silicone-Filled GLASSMIKES

FOR HIGHER VOLTAGES

Announcing an illustrated technical booklet on uses of PLASTICON* Glassmikes.

Contains the following subjects:

- Glassmike characteristics and design data
- Comparison of Glassmikes and Mica Capacitors
- Uses of Glassmikes for improved RF and Audio bypassing
- Use in Audio and RF coupling
- Glassmikes in television power supplies
- Video coupling
- Vibrator buffer applications
- Geiger Counter Capacitors
- Instrument capacitors
- and many other applications

Write for above free booklet on your firm letterhead or give your call letters

Condenser Products Company
1375 NORTH BRANCH STREET - CHICAGO 22, ILLINOIS
Ten Crystal Frequencies

Controlled Faster than Counting

Plug into a standard 5-prong tube socket on the front of your Xmitter. By rotating the Deka-Xtal any one of the ten crystals is switched into the circuit.

Write for folder and prices on the Deka-Xtal and other precision crystal products by SCIENTIFIC... or see your distributor.

SCIENTIFIC RADIO PRODUCTS COMPANY
738½ W. Broadway - Telephone 3-1412
COUNCIL BLUFFS, IOWA
Manufacturers of Piezo Electric Crystals and Associated Products
Know What Band You're In... 
Avoid "Pink Ticket" Trouble

Brand New! — A band switching, tuned absorption type frequency meter covering five amateur bands. Incorporates the new germanium crystal and a DC Milliammeter indicator for greater sensitivity. Direct calibration on panel—no coils to change. Switching permits instantaneous band change. Audio jack, another new feature, provides for monitoring of phone signals. Calibration is in megacycles in the following bands: 3.5-4; 7-7.3; 14-14.4; 21.5-20; 28-30. By removing plug-in coils other frequencies may be covered.

Use This New Unit for Checking:
1. Fundamental frequency of oscillating circuits.
2. Presence, order and amplitude of harmonics.
3. For parasitic oscillations.
4. The neutralization of R.F. amplifiers.
5. Standing wave ratio on transmission lines.
6. The presence of undesirable R.F.
7. For small quantities of R.F.
8. Monitoring of phone signals.

Model 3256 is fully shielded, highly sensitive, compact—invaluable for use in restricted spaces.

MODEL 666H
Volt-Ohm-Milliammeter

The handiest tester of all. A.C. and D.C. Volts at 1000 Ohms per Volt 0-10-50-250-1000-5000 (compensated copper-oxide rectifier provides for A.C. measurements); D.C. Milliamperes 0-10-100-500; Resistance 0-200 Ohms; 10 Ohms reading at center scale; 0-250,000 Ohms.
U.H.F. RESONATOR CO.

3 E L E M E N T AND
5 E L E M E N T TEN METER BEAMS
3 E L E M E N T 20 METER BEAM

Having delivered nearly one hundred of our 20 meter beams, many of you are in, as follows: "Having my 20 meter beam up and working, I want to take this opportunity to tell you it is 'terric.' In the past two weeks I have worked everything I can hear. This includes innumerable ZS, VQ, EI, CN, D, G, E, HB, EC, PZ, LIL, PV, HE, VE, CE, K156, etc. The percentage of come-backs to calls made has been excellent and all of my reports have been very good also. Sincerely, W3MCH, Frederick Hamburger, 1301 Rutaw Place, Bilt, Md."

The strength of our 20 meter beam is attributed to the following, "Dear Bill, . . . on the night of Dec. 26th a real blizzard hit Winnipeg and tore the beam off the pole. I thought that was the end of my 20 meter beam but believe it or not nothing was broken. If anyone wants to know about the strength of the beam let them write to me — that beam will stand any storm if it is securely fastened. Sincerely, John Gordon, VE1ZK."

Amateur net prices: 10-meter beam, 3 el. beam, length 15 ft., weight 30 lb., $215, 4 el. beam, length 20 ft., weight 35 lb., $350. 3 el. beam, length 20 ft., weight 25 lb., $265. 3 el. 20-meter beam, 3 ft. long, 39 lb., $180, for shipping prepaid anywhere in U.S.A. or Canada add $10 deposit on strong wood box. Refund on return of box, less outgoing shipping charges. Beams available for all amateur bands from 14 m.c. up, including 15 and 3 element beams for hoppers. Send for literature A, 10 and 20 B, 30 m.c. and up P, Rotator and mast. Our beam mounts, rotating mast, foot mast, rotator with indicator, are now available, making a complete installation.

U.H.F. RESONATOR CO.
W. F. Holsington, 2 BAV
GUION ROAD, RYE, N. Y.  • Telephone Rye 2030
Factory at Portchester, N. Y.

<table>
<thead>
<tr>
<th>TUBES</th>
<th>Price</th>
<th>Special Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>59c</td>
<td>98c</td>
<td>$1.79</td>
</tr>
<tr>
<td>964</td>
<td>603</td>
<td>$1.95</td>
</tr>
<tr>
<td>6X4</td>
<td>676</td>
<td>$2.79</td>
</tr>
<tr>
<td>69c</td>
<td>3A4</td>
<td>$2.19</td>
</tr>
<tr>
<td>955</td>
<td>1616</td>
<td>$2.19</td>
</tr>
<tr>
<td>1012</td>
<td>1619</td>
<td>$2.79</td>
</tr>
<tr>
<td>1625</td>
<td>E1145</td>
<td>$2.79</td>
</tr>
<tr>
<td>1829</td>
<td>6C4</td>
<td>$2.79</td>
</tr>
<tr>
<td>59c</td>
<td>616</td>
<td>$2.95</td>
</tr>
<tr>
<td>9005</td>
<td>6AG5</td>
<td>$2.95</td>
</tr>
<tr>
<td>9006</td>
<td>5R4Y</td>
<td>$2.95</td>
</tr>
<tr>
<td>VR105</td>
<td>885</td>
<td>$2.95</td>
</tr>
<tr>
<td>VR155</td>
<td>5R4Y</td>
<td>$2.95</td>
</tr>
<tr>
<td>59c</td>
<td>6A15</td>
<td>$2.95</td>
</tr>
<tr>
<td>856b</td>
<td>806A</td>
<td>$2.95</td>
</tr>
<tr>
<td>855</td>
<td>8012</td>
<td>$2.95</td>
</tr>
</tbody>
</table>

All tubes individually baled

Prices FOB New York City. State tax not included. Send 25% with order. Write Dept. QS

There are many other causes of improper ham phone operation and they, as well as the few mentioned here, are well covered in detail in most radio handbooks. But judging by the bandwidth required by many of our ham 'phones some of us must use the books for door stops or to raise Junior to table level in his high chair.

About the Author

- William R. Marks, WIDEF, is a 'phone man around the clock. During working hours he's master control operator in the studios of the BCL 50-kw. WTIC, and on his own time he operates WIDEF a la voice. But Bill's not so one-sided as to neglect the c.w. art — he has a second-class radiotelegraph ticket to go with his amateur Class A and first-class radiotelephone licenses. WIDEF has been on the air since 1931 "without distinction — not even an FCC citation," he complains!

Rotten 'Phones

(Continued from page 49) considerable importance it alone is not the only cause of trouble; in fact, in many cases a fair-sized departure from specifications may not be as harmful as supposed. This latter point is mentioned only to relieve the poor old "match" from being blamed for nearly all Class B ailments. Now about the only place left for trouble is the grid circuit, and it is here that many difficulties exist. As good audio regulation as possible should be provided in the plate circuit of the driver tubes; this may be easily obtained by using Class A low-µ power triodes working into a properly-designed Class B driver transformer. Since this transformer is a power device and therefore subject to regulation difficulties, don't use a "bargain" and remember the manufacturer didn't just guess at the recommended step-down ratio. Zero-bias Class B tubes are to be preferred over low-µ triodes that require relatively high grid bias, because the zero-bias tubes start to draw grid current with the first application of signal voltage and thereby reflect a more constant load on the driver tubes; this contributes to better driver regulation. The bias required on some tubes is the source of trouble for many an unsuspecting ham because ordinary batteries are generally unsuited for long-time operation and many home-designed bias supplies are of far too great internal resistance for the degree of regulation necessary. Connect a voltmeter across your Class B bias supply and observe its operation during transmission.
**STEPHENS TRU-SONIC COAXIAL SPEAKERS**

New series 52 TRU-SONIC Coaxial Speakers. Combines Low Frequency cone type unit and High Frequency multicellular type unit in single assembly with complimentary 2-channel Dividing Network. Ideal for AM-FM reception, broadcast station monitoring and sound motion picture reproduction. Specifications: power input—20 watts; input impedance—! 6 ohms; frequency response—5 db. or - from 50 to 10,000 CPS. O.D. 15½", Weight 30 lbs. STEPHENS MODEL P-52A TRU-SONIC P.M. SPEAKER, COMPLETE $123.00

**BC-306B TUNING UNIT**

Antenna tuning unit used in BC-375 Liaison Transmitter. Contains Antenna variometer, heavy duty variometer switch, high voltage mica condenser, insulators, etc. Black crackled finish metal cabinet. COMPLETE $3.45

**BC-223A TRANSMITTER**

6.35 to 8 Mc. E.C.O. or Xtal. Used in Hallicrafters HT-4 (BC-610E) transmitters and in the new McElroy Exciter Kits. EACH $2.50 SPECIAL $6.95

**GP-7 TRANSMITTER**


**K-7 GUN MOUNT**

Excellent geared rotary beam mount. Tach shaft drive. 40 to 1 ratio. Adaptable for either manual or motor drive. MODEL KE-10 $39.45

**HANDBY-TALKY HT-144**


**G.E. POWER TRANSFORMER**

New surplus G.E. 60G684 transformer. Fully shielded. 4" x 4" x 5". Wt. 9 lbs. 115 V. primary. Secondary 450-0-450 @ 250 Ma. 5 V. @ 3 Amp. 6.3 V. @ 5 Amp. SPECIAL $5.95

**PUSH BUTTON TUNER**

Shaft can rotate to 10 preset positions; one variable condenser rotates with shaft. Two groups of 10 SPST switches (each button closes 2 switches) and 10 APC type silver plated variable condensers connected to one group of switches. A real Surplus bargain! EACH $3.50

**SONAR F-M EXCITER**

Narrow band (2-3 Kc. deviation). Use with any CW or phone transmitter. Eliminates BCI. Penetrates ORM. Greater signal to noise ratio. Use with any Amateur receiver. More output from your final amplifier. Self contained power supply, 110 V, 60 cycle. MODEL XE-10 $39.45

**TU-52 TUNING UNIT**

Excellent geared rotary beam mount. Tach shaft drive. 40 to 1 ratio. Adaptable for either manual or motor drive.

**VIBRATOR POWER SUPPLY**

Dual Unit. 540 Volts D.C. @ 150 Ma. 6 V. D.C. input. Contains two vibrators, two power transformers, two OZ4A tubes. Complete with filters, wired, ready to operate. LIMITED QUANTITY $16.95

WRITE FOR OUR SURPLUS BARGAIN FLYER!

We carry in stock all standard brands. Regular shipments are being received of communications receivers:

- MILLEN
- CARDWELL
- HALLICRAFTERS
- PIERRSON
- NATIONAL
- HAMMARLUND

--- and all other major lines. Orders filled promptly.

Broadcasters: We carry a full line of Cannon "X," "XL," and "P" Plugs and Receptacles.

**Write for our Surplus Bargain Flyer!**

We carry in stock all standard brands. Regular shipments are being received of communications receivers:

- MILLEN
- CARDWELL
- HALLICRAFTERS
- PIERRSON
- NATIONAL
- HAMMARLUND

--- and all other major lines. Orders filled promptly.

Broadcasters: We carry a full line of Cannon "X," "XL," and "P" Plugs and Receptacles.

**VIBRATOR POWER SUPPLY**

Dual Unit. 540 Volts D.C. @ 150 Ma. 6 V. D.C. input. Contains two vibrators, two power transformers, two OZ4A tubes. Complete with filters, wired, ready to operate. LIMITED QUANTITY $16.95

**RADIO SPECIALTIES COMPANY**

1956 S. FIGUEROA ST. • PROSPECT 7271 • LOS ANGELES 7, CALIF.

COMPLETE EXPORT FACILITIES. CABLE "RASPEC"

Please Ship: Cash: C.O.D.

<table>
<thead>
<tr>
<th>Stephens Tru-Sonic Speaker</th>
<th>HT-144 Handy Talky</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sonar FM Exciter</td>
<td>BC-223A Transmitter</td>
</tr>
<tr>
<td>GP-7 Transmitter</td>
<td>G.E. Power Transformer</td>
</tr>
<tr>
<td>Vibration Power Supply</td>
<td>TU-52 Tuning Unit</td>
</tr>
<tr>
<td>BC-306B Tuning Unit</td>
<td>Push Button Tuner</td>
</tr>
</tbody>
</table>

NAME:
ADDRESS:
CITY:
STATE:
ZONE:

RADIO SPECIALTIES COMPANY
1956 S. FIGUEROA ST. • PROSPECT 7271 • LOS ANGELES 7, CALIF.

COMPLETE EXPORT FACILITIES. CABLE "RASPEC"
THE CLARKSTAN REMACO
4 Element — T Match

BEAM-ANTENNA

TUNABLE
6 to 10 meters

A 15-LB., easily assembled all metal directional antenna incorporating the best in electrical and mechanical design. Has popular "T Match" feed system for convenient impedance match to any standard feed line. Has four elements with 1 wave length spacing. Can be tuned and accurately adjusted before erecting. Fits any rotating mechanism. Assembly instructions and tuning charts furnished plus all parts - supporting cross-arm, "T Match" assembly and hardware.

Order your Clarkstan Remaco Antenna today, through your local distributor or send check for 20%, balance C.O.D. Model 4-6-10, 4 element, 6 to 10 meters, complete with "T Match" assembly. List price $87.50. Write for complete catalog on antennas for all amateur bands.

25 Years Ago
(Continued from page 68)

broadcast-listener element with which to contend. Already there has been talk of restricting our early-evening operation. Let the Board of Direction know your club's thoughts!

Boyd Phelps, 9ZT, writes far sightedly of "Radio Below 200 Meters" as the answer to this pile-up. The low-wavelength performance of antennas, vacuum tubes and receivers is discussed optimistically by "Beep." He envisions 100 meters as a practical ham frequency! Streaming bold-face type rallies our traffic handlers to the cause of the Governors'-President's Relay, scheduled for this month. "We must make a strong impression on our President. . . ."

S.P.W.'s "And It Came to Pass," a parable of a c.w. ham and his landlord, contributes much to the lighter side of this issue. Station descriptions take us behind the scenes at 8LP, the phenomenal c.w. performer at Crafton, Pa., and 9MC, the prominent spark at Roodhouse, Ill. Strays report notable transcontinental reception in both directions. . . . Edwin C. Adams, QST's advertising manager, has turned Benedict. . . . The optimists at Headquarters have dusted off the world globe in a search for new conquests — 12,000 miles shapes up as a potential maximum for our DX efforts!

Foreign Notes
(Continued from page 58)
each of the previous two years, respectively, and nearly parallels the U. S. situation of doubling membership in the full year since V-J Day.

British amateurs are now back on all Cairo bands plus several new microwave assignments, and need only channels in the 60-500-Mc. region to complete the basic principle of "sample" portions of all parts of the radio spectrum available for amateur use. Several important operating privileges were obtained, including the elimination of "guard" or "buffer" bands, permission to use CQ as a call of inquiry (instead of TEST), and the elimination of most restrictions on the length and height of antenna structures. Portable operation privileges were granted with the use of the identification suffix /P, and operation from an alternate address with the identification suffix /A. Perhaps most important of all is the fact that licenses are now issued on an amateur, instead of an experimental, basis.

Although plans to increase the size of the Bulletin have been hampered by paper restrictions, the society has been able to publish a "how-to-become" booklet entitled, The Transmitting Licence, designed to indoctrinate the beginner with the fundamentals of amateur radio.

MISCELLANY

South Africa is issuing new licenses, "temporary" until after the next world conference. For new operators, the first year must be spent on

(Continued on page 14)
## WAR SURPLUS TRANSMITTING and SPECIAL PURPOSE TUBES

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Type</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Westinghouse</td>
<td>Rectifier Type AC VOLTMETER</td>
<td>What a buy! Model NC-25, standard, sturdy 3½&quot; x 2 Voltmeter, 2000 ohms per volt, 3 scale readings. Red, bakelite case. Made to sell for $17.00. A steal at this price!</td>
<td>$3.95</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Type</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardwell</td>
<td>Xmitting Condenser</td>
<td>$3.00 Value! Brand new type NUV 130-5s. .078 gap, 150 mmfd. Mycalex insulation. While quantities last, only</td>
<td>$149</td>
</tr>
</tbody>
</table>

### STANDARD RECEIVERS

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Type</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>HALLCRAFTERS</td>
<td>S-38 complete</td>
<td>$47.50</td>
<td></td>
</tr>
<tr>
<td>S-40A complete</td>
<td>$</td>
<td>89.50</td>
<td></td>
</tr>
<tr>
<td>SX-42</td>
<td></td>
<td>275.00</td>
<td></td>
</tr>
<tr>
<td>NATIONAL</td>
<td>H-RO-Star complete</td>
<td>$526.71</td>
<td></td>
</tr>
<tr>
<td>NC-2400 with speaker</td>
<td>$495.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-10A, less speaker and power supply</td>
<td>$495.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAMMARLUND</td>
<td>HG-120 complete</td>
<td>$173.25</td>
<td></td>
</tr>
<tr>
<td>SP-400X complete</td>
<td>$</td>
<td>342.00</td>
<td></td>
</tr>
<tr>
<td>BME-4S complete</td>
<td>$</td>
<td>198.70</td>
<td></td>
</tr>
<tr>
<td>BME-64 complete</td>
<td>$</td>
<td>272.00</td>
<td></td>
</tr>
<tr>
<td>Panadap</td>
<td>$</td>
<td>99.90</td>
<td></td>
</tr>
<tr>
<td>T-50 75 GA XTR</td>
<td>$</td>
<td>55.00</td>
<td></td>
</tr>
<tr>
<td>Mack Transmitters</td>
<td>$</td>
<td>150.00</td>
<td></td>
</tr>
<tr>
<td>Mode 14-AF-100 (for complete specs see mfr's ad in this issue)</td>
<td>$</td>
<td>450.00</td>
<td></td>
</tr>
</tbody>
</table>

### ALL BRAND NEW GUARANTEED AT FRACTION OF ORIGINAL COST

Immediate Delivery! A finely built rig.

- **SONAR VFX-680 EXCITER**
  - Functions as Variable Frequency Crystal-Controlled (or straight ECO) Oscillator.
  - Frequency shift keying provisions self contained.
  - Frequency shift keying provisions self contained.
  - Works CW or Break-in Operation.
  - Mail orders filled promptly FOB New York or Chicago. Send 20% deposit with order. Prices subject to change.

Mail orders filled promptly FOB New York or Chicago. Send 20% deposit with order. Prices subject to change.

If you have any specific questions or need further assistance, please let me know!
BARGAIN SPECIAL

JOHNSON VARIABLE
Dual section, 200 mmfd per section, 2000 volt breakdown. Spacing .045".
Type 200FD20. List $10. Stock No. 18A510. Each $2.95

Johnson variable, dual section, 304 mmfd per section. Spacing .050". Type 300ED20.
List $9.95. Stock No. 18A509. Each $3.45

OIL FILLED HIGH VOLTAGE CONDENSERS

10 mfd 1000 volts C.D. Dykemol TU List $12.00. Stock No. 17A288. Each $2.95

5 mfd 600 volts Sprague CR list $7.00. Stock No. 18A366. Each 95c

KEN-RAD 829 B. Brand new in original packing. Signal corps inspected.
Reg. $14.75. No. 20A666. Ex. $4.95

HAM VALUES AT BA
Order now from this ad while these hot bargains are available. Many more outstanding values in big BA catalog. Write if you do not receive it.

BURSTEIN-APPLEBEE CO.
1012 McGee, Kansas City 6, Mo.

50 Mc.

(Continued from page 69)

Louisiana by W5HHT, Idaho by W7ACD, and possibilities are reported for most of the rest. Our 1947 winner should have at least 35 states under his belt, perhaps more.

The whole of W5 was hard for some of us last year, a condition which is to be remedied, according to W5LIU, who reports that W5s JDL, EYZ, CVW, GVZ, and LIU will be helping W5FRD to keep things going around Fort Worth. These fellows have only W5AJG in Dallas to work, and would like skeds with others within a 200-mile radius. How about it, W5AOK, W5LOW, and others?

There are many who still feel that paths of 100 miles or so cannot be negotiated on a regular schedule unless the path in question is over fairly open country. True, signals are much lower during the winter months, but a 100-mile hop over rough country can be made, even under the difficult conditions imposed by a New England winter. Proof of this is being furnished by W2GYV, Schenectady, N. Y., who has been working W2AMJ, Bergenfield, N. J., 140 miles, and W1LLL and your conductor, 100 miles, regularly. Signals are plenty weak at times and c.w. is often necessary, but he makes it right along. Examination of the contour maps for the intervening country will show that this is something for the book. Jeff has copied W1A W on 52 Mc. almost nightly for months. A 4-element array and 450 watts started things rolling for W2GYV. Watch for him on 51.45 when things are good.

Another long haul that is being covered regularly is the Richmond-Washington, D. C. path. W4CYW and W4FJ in Richmond have worked W1KMZ/3 at Washington almost nightly, and they hear W2BYM, Lakehurst, N. J. occasionally.

Final Results, 1946 Marathon

The scores listed in the Marathon box in this issue are the final results for the 1946 Contest, which ran from May through December of last year. (Continued on page 166)
**GET ON THE AIR NOW**  
With This SUPREME 100 WATT TRANSMITTER

- 100W output on 6 bands: 10, 11, 15, 20, 40, 80.  
- Modulation either AM or FM.  
- FM deviation adjusted from zero + 75 kc.  
- Stabilized VFO or xtal controlled position.  
- Provides for break-in operation.  
- Completely AC operated from 115V source.  

**Sonar Exciter VFX-680**  
Variable frequency xtal controlled (or ECO) voltage regulated oscillator on 80 meters. One range: 1650 to 2000 kc, of which multiples fall into range; 1650 to 2000 kc. With 160 meters, frequency variation is 15 kc; 120 kc on 80; 60 kc on 40; 120 kc on 20; 240 kc on 10; 500 kc on 6 meters.  

**Price Coaxial Antenna Transfer Relay**  
"Buck" Stretcher brings you something new in relays. It's a low-loss method of electrically switching a low impedance coaxial line from xmr to receiver and vice-versa. Handles up to 750W RF. Can operate voltage from 6V AC. Internal relay contacts SPD.  

**Send for HERE'S ANOTHER GREAT BUCK STRETCHIN' COLLECTION OF TRANSFORMER VALUES!**

<table>
<thead>
<tr>
<th>Type</th>
<th>Sec.</th>
<th>Voltage</th>
<th>DC Volts</th>
<th>DCMA</th>
<th>Weight lbs. ozs.</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-668</td>
<td>1000/750-0-</td>
<td>750/1000</td>
<td>500/750</td>
<td>300</td>
<td>12, 6</td>
<td>9.12</td>
</tr>
<tr>
<td>T-659</td>
<td>1400/1100-0-</td>
<td>1100/1460</td>
<td>1000/1250</td>
<td>19, 2</td>
<td>14.67</td>
<td></td>
</tr>
<tr>
<td>T-671</td>
<td>1180/1460</td>
<td>1180/1460</td>
<td>1000/1250</td>
<td>500</td>
<td>31, 9</td>
<td>20.19</td>
</tr>
</tbody>
</table>

**Send for complete descriptive literature.**

---

**SUN RADIO & ELECTRONICS CO., Inc.**  
Established 1922  
122-124 DUANE ST. - NEW YORK 7, N. Y. - Barclay 7-1840  

**Dear Buck:**  
Please send me your flyer as soon as it is printed.  

- Name  
- Call  
- Address  
- City  
- Zone  
- State  

---

**SHIPMENT OUTED TO AWS:**  
**GET ON THE AIR NOW**  
With This SUPREME 100 WATT TRANSMITTER  
- 100W output on 6 bands: 10, 11, 15, 20, 40, 80.  
- Modulation either AM or FM.  
- FM deviation adjusted from zero + 75 kc.  
- Stabilized VFO or xtal controlled position.  
- Provides for break-in operation.  
- Completely AC operated from 115V source.  

---

**NARROW BAND FM FROM 6 TO 80 METERS!**

- Variable frequency xtal controlled (or ECO) voltage regulated oscillator on 80 meters. One range: 1650 to 2000 kc, of which multiples fall into range; 1650 to 2000 kc. With 160 meters, frequency variation is 15 kc; 120 kc on 80; 60 kc on 40; 120 kc on 20; 240 kc on 10; 500 kc on 6 meters.  

---

**Buck's Feature Line of the Month**  
Buck's Stretchin' Collection of Transformer Values  

**Price Coaxial Antenna Transfer Relay**  
"Buck" Stretcher brings you something new in relays. It's a low-loss method of electrically switching a low impedance coaxial line from xmr to receiver and vice-versa. Handles up to 750W RF. Can operate voltage from 6V AC. Internal relay contacts SPD.  

**Your cost $750**  
With auxiliary contacts, one normally open, one normally closed.  

**Send for complete descriptive literature.**
V.H.F. Marathon

Contacts Through December - States Worked
50 Mc. 144 Mc. 220 Mc. Score 40 Mc.144 Mc.

<table>
<thead>
<tr>
<th>Call</th>
<th>States Worked</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1BCT</td>
<td>265 2 1197 6</td>
</tr>
<tr>
<td>W1G6Y</td>
<td>40 374 15</td>
</tr>
<tr>
<td>W1E8B</td>
<td>62 278 4</td>
</tr>
<tr>
<td>W1HDQ</td>
<td>122 130 2277 25 7</td>
</tr>
<tr>
<td>W2KLE*</td>
<td>127 775 5</td>
</tr>
<tr>
<td>W1LLI*</td>
<td>113 1310 27 4</td>
</tr>
<tr>
<td>W1LMU</td>
<td>176 738 4</td>
</tr>
<tr>
<td>W1FPP*</td>
<td>137 1333 25</td>
</tr>
<tr>
<td>W2AMJ*</td>
<td>104 1109 24 4</td>
</tr>
<tr>
<td>W2AUF</td>
<td>202 708 4</td>
</tr>
<tr>
<td>W2ODK</td>
<td>66 652 18</td>
</tr>
<tr>
<td>W2BYM</td>
<td>133 1182 23</td>
</tr>
<tr>
<td>W3DOT</td>
<td>37 385 7 2</td>
</tr>
<tr>
<td>W3DZA</td>
<td>235 9 1044 8 8</td>
</tr>
<tr>
<td>W2QVH*</td>
<td>23 327 1615 3 8</td>
</tr>
<tr>
<td>W2AP0*</td>
<td>6 71 591 3 3</td>
</tr>
<tr>
<td>W3QKP</td>
<td>128 952 6</td>
</tr>
<tr>
<td>W28HN*</td>
<td>211 2192 9</td>
</tr>
<tr>
<td>W2KIE</td>
<td>146 431 6</td>
</tr>
<tr>
<td>W2RUG*</td>
<td>36 32 665 19 1</td>
</tr>
<tr>
<td>W4CDJ*</td>
<td>9 175 25</td>
</tr>
<tr>
<td>W6B6G</td>
<td>76 25 273 2</td>
</tr>
<tr>
<td>W93GE*</td>
<td>150 389 5</td>
</tr>
<tr>
<td>W6TJ*</td>
<td>104 1505 5 1</td>
</tr>
<tr>
<td>W6GWY*</td>
<td>12 17 1028 8 8</td>
</tr>
<tr>
<td>W6GQ*</td>
<td>61 641 9</td>
</tr>
<tr>
<td>W6TYG</td>
<td>54 159 1</td>
</tr>
<tr>
<td>W6WNN</td>
<td>36 249 3</td>
</tr>
<tr>
<td>W7RAD</td>
<td>85 1322 10</td>
</tr>
<tr>
<td>W7QAP</td>
<td>37 643 11</td>
</tr>
<tr>
<td>W8AB</td>
<td>16 111 9</td>
</tr>
<tr>
<td>W9ALU</td>
<td>17 133 7</td>
</tr>
<tr>
<td>W9F3X</td>
<td>23 1052 21</td>
</tr>
<tr>
<td>W3YQC</td>
<td>73 1274 22 2</td>
</tr>
<tr>
<td>W3ZBE</td>
<td>105 1082 27 3</td>
</tr>
</tbody>
</table>

Incomplete reports were received from: W1AEP*, W1BDI/1, W1DXL, W1NXX, W1MBS, W2JFW*, W2LXO, W2QXL, W2FPW, W3WRB, W3BP, W3CQV, W4QEG, W5KN, W4HYY*, W5TV, W4SLO/L, W4ANN, W5MBS, W5NX, W5WLE, W6ALL, W6ONS, W9UN, W6ZBB, W6PKD.

*Certificate award - highest in his ARRL Section.
**Ineligible for award.
**December winner: W3HWN with 152 points.

year, the delayed release date of the 50-Mc. band preventing the usual year-long contest. For the first time in the history of the Marathon, the national high score was made on 144 Mc., W3HWN, Mechanicsburg, Pa., piling up the impressive total of 2192 points, winning the Section award for Eastern Pennsylvania and the medalion award for the high scorer on his band for the entire country. Never, in the years since the Marathon became a v.h.f. institution, has an award been more richly deserved. With all that is representative of the best in v.h.f. techniques, a 16-element electrically-driven rotary beam, a crystal-controlled 250-watt transmitter, a beautifully-performing superhet receiver, and a consistent record of alert activity on the band, Paul H. Hertzler, W3HWN, certainly rates his position at the top of the list! For those who think of 144 Mc. as backyard stuff, let it be noted that Paul worked six different stations more than 250 miles distant and no less than 10 beyond the 200-mile mark.

Top man in the 50-Mc. competition was Vince (Continued on page 168)
<table>
<thead>
<tr>
<th>Number</th>
<th>Price</th>
<th>Number</th>
<th>Price</th>
<th>Number</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>074</td>
<td>1.45</td>
<td>67</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1A7</td>
<td>1.88</td>
<td>678</td>
<td>1.10</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1B7</td>
<td>1.80</td>
<td>678b</td>
<td>1.10</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1C7</td>
<td>1.80</td>
<td>678c</td>
<td>1.10</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1CSGT</td>
<td>1.00</td>
<td>669</td>
<td>1.20</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1D7</td>
<td>1.10</td>
<td>669</td>
<td>1.20</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1E7</td>
<td>1.00</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1F7</td>
<td>0.90</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1F4</td>
<td>0.86</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1F7</td>
<td>0.90</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1G7</td>
<td>0.80</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1H7</td>
<td>0.75</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1I7</td>
<td>0.75</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>1J7</td>
<td>0.75</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>147</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>148</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>149</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>159</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>159</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>169</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>179</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>179</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>159</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>159</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>169</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>179</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>159</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>159</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>169</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>179</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
<tr>
<td>159</td>
<td>1.50</td>
<td>69</td>
<td>1.30</td>
<td>1287GT</td>
<td>1.10</td>
</tr>
</tbody>
</table>

**R. F. TUNING UNIT**

Comes in a beautiful black crackled aluminum cabinet with two Variable Transmitting Condensers and two Varietal dials, one heavy duty ceramic four position wafer switch, two or more mica condensers 2,500 Working Volts and coils wound on porcelain ribbon forms.

Yours for only... **$3.89**

- **No. TUSB** 1500 to 3000 KC
- **No. TUSB** 3000 to 4500 KC
- **No. TUSC** 4500 to 7500 KC
- **No. TUSD** 6200 to 7700 KC
- **No. TUDB** 10,000 to 12,500 KC

Please specify model

**RHOMBIC Receiving Antennae**

Complete with all accessories including 2200 feet of No. 14 copper weld wire, 50 feet of heavy twin X lead 72 ohm good up to 2 KW, dozens of insulators, pulleys, neon lightning arresters, ground rod, less poles, only... **$24.95**

**HALLICRAFTER SP44 PANORAMIC ADAPTER**

For immediate delivery. Easily installed in any set. Shipping charges prepaid in full to your home... **$99.50**

**F. M. TRANSMITTER** BC-684. The BC-684 Transmitter provides 35-watt output, 10 channel push button, crystal control, employing NONLINEAR MODULATING COIL, complete with 8 tubes, Frequency 27 to 38.9 mc. Complete with tubes, less power supplies and crystals. Excellent 10 meter band for "Ham" and police. Your Cost... **$24.95**

**SPERRY AMPLIFIER**

Contains four tubes, 2 mica condensers, dozens of 56V resistors, 3 bathtub condensers, 2 dual, and 1-4 section, 3 sealed transformers, 2 wafer switches, 1 volume control, 4 octal sockets, new, with tubes... **$3.95**

- **All items F.O.B., Washington, D. C. All orders $30.00 or less cash with order, above $20.00, 20 percent with order, balance C.O.D. Foreign orders cash with all orders plus exchange rate.**

**SUN RADIO OF WASHINGTON, D. C.**

938 F Street, N. W., Wash., 4, D. C.
Dawson, WØZJB, Gashland, Missouri. Vince could work in all directions from his "Heart-of-America" location, but the most distant stations were still inside the 10-point limit. No 1500-mile 50-point contacts for WØZJB, but by riding the band for all it was worth he managed QSOs with 113 different 50-Mc. stations, for a total score of 1625, second only to W3HWN. Vince also was tied for the lead in number of states worked on 50 Mc. His only competition was from W1LLL, who ran up the impressive total of 27 different states on 50 Mc. in the nine months competition. Not bad for a fellow in an ordinary city location on the East Coast.

Leader on 235 Mc. was Alex Knights, W2DZA, of Teaneck, N. J., who worked 9 stations for a total of 90 points. The states-worked award for 235 Mc. was declared "no competition" since only one state was worked by any contestant reporting operation on that band.

The states-worked award for 144 Mc. was won by Edward F. Schwinge, W2JWO, who corralled 10 different states on the 2-meter band during the year. Ed also employed crystal control, a superhet receiver, and a beam antenna, to work every state on the Atlantic Seaboard from New Hampshire to Virginia. He beat out W3HWN by the scant margin of his New Hampshire contact.

High scorers for each month, each awarded a certificate, were as follows: May - W6NNJ, 314 points; June - WØZJB, 706 points; July - W7KAD (then W5JGV/7), 822 points; August - W2JWO, 298 points; September - W3HWN, 600 points; October - WØYUQ, 295 points; November - W3KIE, 532 points; December - W3HWN, 152 points.

Winners of the certificate awards for the highest score in each ARRL section are indicated with an asterisk in the Marathon score summary.

2-Meter News

A reader (one of our leading 144-Mc. workers) writes that he looks in vain to this department for information he thinks many 2-meter men would like to have. He says that DX work via inversions and other abnormal conditions is very interesting, but what does John Ham do when the band is not open? What is his normal working range? How many nights a week can he work an associate 60 miles away? What does he do to start working 100 miles consistently instead of 50? How does he organize his DX efforts to keep his reliable range moving farther out? What results, in working-range extension, does he get when he raises his power from 60 watts to 600? Good questions, all - but you know where the answers must come from. What appears in this department is what you, the serious 144-Mc. workers of the country send in, and if what you see here is not what you want, be sure to tell us, just as did Sam Harris, W8UKS, in the questions raised above. Here are some of his answers:

(Continued from page 180)

(Continued on page 182)
Top trade-in allowances? Right, OM! In the well-over-20-years of our business history, allowances have never been so big, nor the eager takers so many! No wonder the hams are talking about it!

TRANSFORMER AND CHOKE SPECIALS

Thordarson Heavy Duty Broadcast Type Plate Transformer, 115 or 230 V pri., 1500-0-1500 V @ .5 A sec, tapped at 1330 and 1230 V, easily worth 3 times our low price $39.50

Thordarson Heavy Duty Swinging Choke, 500 mill, 5-16 Hy 7300 V RMS, rated at 500 mills continuous. Intermittent (Ham) use should be much higher. Ideal companion to 2 KVA Amertran, listed at bottom. $11.85

Surplus Filament Transformer—110 V AC pri., sec. 6.3 V @ 3.6 A, 6.3 V @ .6 A. $1.18

Surplus Filament Transformer—110 V AC pri., sec. 6.3 V @ 3 A. $1.08

Thordarson Smoothing Choke, 200 Mills, 12 Hy. $3.50

Midget Transceiver Transformer, Mike to Grid, Plate to Voice Coil. 74¢

Sonar FM Exciter, model XE-10, price less crystal. $39.45

Astatic R-3 Microphone—economy type for PA and home recording. Our special bargain price. $4.95

Type FT Crystal Holder with new ½" pin spacing. 25¢

REVERSIBLE MOTOR

½ to 2 RPM, with conversion instructions for rotary beam drive. Has 50 in. lbs. torque. $4.95

Ham Type Surplus Condensers, 110 mmfd. max., 15 mmfd. min., 2500 V peak, reg. $3.69... $1.95

AMERTRAN PLATE TRANSFORMER $39.95

Rated at 2 KVA, Pri. 105-110-115, 60 cycle, Sec. 3100-0-3100, full voltage across sec. 6200 V @ 700 Ma. Free delivery anywhere in Continental U. S. A.

WRITE FOR BIG FREE CATALOG

RADIO CO. WØYD WØLD WØPGI WØTGF WØZIP WØULH

Walter Ashe

1125 Pine St., St. Louis, Mo.
IN STOCK
For Immediate Delivery!
THE ULTRAPHONE
144-148 MC Xmitter-Receiver
Designed for portable, mobile or fixed station use
Look at These Features:
- Newly designed 6AK5 detector circuit.
- Expanded band spread and increased sensitivity.
- Transmitter will handle 30 watts of input.
- Operating capabilities up to 250 mc.
- Transmitter uses the Taylor TUF-20.

Comes complete with matched set of tubes, but less power supply. Will operate from 6 volt vibrator pack or AC power supply.

$75 NET
F.O.B. OAKLAND, CALIFORNIA

W. D. BRILL CO.
198 TENTH ST • OAKLAND 7, CALIFORNIA
WGKLO W6SSN W6FJX

COMMERCIAL RADIO INSTITUTE
A RADIO TRAINING CENTER FOR 26 YEARS
Resident Courses Only • Broadcast, Service, Aeronautical, Television, U.J.F., Preparatory Course, Frequency Modulation and Marine telegraphy classes now forming for July 1. Entrance Exams, June 16. Literature upon request. Veteran training
Dept. B, 38 West Biddle Street, Baltimore 1, Maryland

Sending Made Easier!
Genuine Easy-Working
SEMI-AUTOMATIC RADIO KEY

VIBROPLEX
Reg. Trade Marks: Vibroplex, Lightning Bug, Bug
"Original" Deluxe Model

WITH PATENTED JEWEL MOVEMENT

$19.50

PATENTED JEWEL MOVEMENT is an exclusive Vibroplex feature — a feature that has so completely eliminated tiring sending effort that sending is no longer a task, but astonishingly easy. No special skill required. Polished chromium base and parts. DIE CUT contacts and main spring. Colorful red switch knob, finger and thumb piece. 3/16th contacts. Circuit closer, end and wide. Deluxe finish. Also available in "BLUE RACER" and "LIGHTNING BUG" models. Get a Deluxe JEWELED movement Vibroplex NOW! Money order or registered mail. FREE catalog.

THE VIBROPLEX CO., Inc.
833 Broadway
New York 3, N. Y.

(Continued from page 128)

The rig at W8UKS runs 600 watts to a pair of VT-127 As, crystal-controlled. Two corner-reflector arrays are used, one backed up an extended double-Zepp with directors, and the other employing two half-waves in phase for the radiating portion. A four-way turnstile is used for general coverage. The receiver is a converted SCR-524, with a two-stage grounded-grid preselector. The front end feeds into sharp or broad i.f. amplifiers.

The best DX yet worked was W2RPO, Buffalo, nearly 200 miles, when conditions were favorable. Consistent work is done with W3QKI, Erie, Pa., 100 miles distant. W8LIO, Andover, Ohio, is worked at 75 miles, though W8LIO has only 6 watts. He has a square-corner array 70 feet up. W8UB, Port Clinton, 65 miles away, is another regular contact, with power running at 10 watts and his antenna a 3-element array up about 40 feet.

Sam finds that running 600 watts has its good points when the going is rough, but ordinarily 50 watts seems all that is worth while. He raised his antennas until he could see no improvement in signals from beyond the horizon, and his three arrays are at 65, 75, and 90 feet respectively. He has worked extensively with both vertical and horizontal arrays, but has standardized on horizontal because of the improved signal-to-noise ratio. With vertical systems, the signal from W3QKI would be buried in noise most evenings, whereas with horizontal it is consistently readable. He believes that work with the Pittsburgh area will be feasible just as soon as someone gets on there with crystal control and horizontal polarization. Surely this is good dope — how about more of the same from the rest of the 2-meter gang?

We have similar information from W3QKI, who passes along all the dope on the gang around Erie. This group includes: W3GG, who has a 260-watt crystal rig in the works; W3KKJ, who is listening with a converter feeding a communications receiver, and will be on with a 522 transmitter soon; W3RWN, with a 522 transmitter and receiver, and 4 half-waves in phase with reflectors, which can be used either vertical or horizontal; W3NBV, with 50 watts to an 815 (described in QST some time back), and a superarray (24 elements, horizontal) soon to go up; W3WBM, with 50 watts to an 815, a home-built superhet receiver, and a 4-element vertical array; and W3QKI, with 50 watts to an 829B. The array at W3QKI satisfies the addicts in both polarization camps. It has four driven elements, one set vertical and the other horizontal, on either side of a flat screen reflector. Gain of this array is estimated at about 12 db. over a dipole. Consistent work is done with W8UKS and W8WJC, both an even 100 miles distant. There are plenty of stations, but the trouble is (and this is a universal complaint among the serious workers in every area) that "there are too many
The War Assets Administration has appointed a representative group of competent well established distributors to help dispose of war-surplus electronic tubes and equipment. We suggest that you get in touch with the distributor nearest you. He will know the items available and how they can aid in solving your electronic problems.

Here is an up-to-date list of WAA approved distributors.

BOSTON, MASS.
Technical Apparatus Co.
122 Brookline Ave.
165 Washington St.

BUCHANAN, MICH.
Electro-Voice, Inc.
Carroll & Cecil Sts.

CANTON, MASS.
Toke Deutschmann Corp.
863 Washington St.

CHICAGO, ILL.
American Condenser Co.
Majestic Radio & Television Corp.
4410 Ravenswood Ave.
125 W. Ohio St.

EMPORIUM, PENN.
Sylvania Electric Products, Inc.

FORT WAYNE, IND.
Essex Wire Corp.
1601 Wolf St.

LOS ANGELES, CALIF.
Cole Instrument Co.
Hoffman Radio Corp.
1230 S. Grand Ave.
3761 S. Hill St.

NEWARK, N. J.
Standard Arcutrus Corp.
Tung-Sol Lamp Works, Inc.
99 Sussex Ave.
93—8th Ave.

NEW YORK, N. Y.
Communication Measurements Laboratory
Electronic Corp. of America
Emerson Radio & Phonograph Corp.
Hammarlund Mfg. Co., Inc.
Newark Electric Co., Inc.
Raytheon Mfg. Co.
Smith-McKeeer Engineering Co.
120 Greenwich St.
335 W. 40th St.
76—9th Ave.
460 W. 35th St.
242 W. 55th St.
60 E. 42nd St.
120 Barclay St.

SALEM, MASS.
Hytron Radio & Electronics Corp.
76 Lafayette St.

Schenectady, N. Y.
General Electric Co.
Bldg. 267, 1 River Rd.

WASEC, MINN.
E. F. Johnson Co.
206—2nd Ave., S. W.
Here Today... And Here TOMORROW!

Are you an Electronic Equipment Manufacturer looking for a highly satisfactory—and, above all else, stable source of transformers?

Kenyon, for over 20 years, has served and pleased people just like you. And will continue to serve and please indefinitely. So if you are having "here today and gone tomorrow" trouble on transformer supply—come to Kenyon!

KENYON TRANSFORMER CO., Inc.
840 BARRY ST., NEW YORK, N. Y.

W8GFK

Aluminum Call Plates

and polished ¼" letters. Plate size 2½" by 3¾". 3 styles: P for panel mounting, L for car license and D for desk use. $1.75 each, postpaid.

P & H SALES CO.
619 Jasper St.
Kalamazoo 31, Michigan

RADIO TELEPHONY
RADIO TELEGRAPHY

Courses ranging in length from 7 to 12 months. Dormitory accommodations on campus. Advanced students eligible for practical training at KPAC, 1 KW broadcast station owned and operated by Port Arthur College. New students accepted monthly. If interested in radio training necessary to pass F.C.C. examinations for first-class telephone and second-class telegraph licenses, write for details.

PORT ARTHUR COLLEGE
FORT ARTHUR
TEXAS
Approved for G.I. training

unstable oscillators and blooper receivers, fed by dipoles hanging on the wall. If these fellows would spend half the time and money on 2 that they do on 75, if they would replace their antiquated gear with a crystal rig and a superbet and put up a good antenna system, they’d be amazed to find that 2 is like 75, but without the continual QRM!”

Herb feels that there is at least some possibility of work with East Coast stations under favorable conditions, if the more progressive stations can get lined up on some sort of schedule. He suggests that 75 might be used for liaison to get the thing rolling. Erie stations operate above 145 Mc., to keep the low end clear for the reception of crystal-controlled DX stations. Some frequencies: W3NBV — 145,030; W3KQI — 145,085; W3LTN — 145,100; W3WBM — 146,300.

The Boston area is going for stabilization in a big way. More and more crystal-controlled and MOPA signals are appearing, until now the use of a fairly-sharp receiver is practical. Occupancy of the band demands the employment of advanced techniques, if operation on 2 is to amount to anything more than a medium for exchange of backyard gossip. W1OJT takes issue with those who still believe that crystal control is difficult.

He got on with three tubes, using the 6L6-807 exciter described in November, 1940, QST, driving an 829 tripler. An 8-Mc. crystal, and the necessary plug-in coil changes are all that are required. At 60 watts input the 829 tripler produces a very respectable signal on 144 Mc. W11PE and W1LJT are also using similar arrangements with good results. Several of the gang in this area are getting improved receiver performance using coaxial tank circuits in r.f. stages and superregenerative detector circuits. WICTW reports working 15 crystal-controlled and 9 MOPA stations during December.

Work over long paths in California has been principally a matter of mobile and portable work, but the boys are finding that good antennas and improved gear are making possible some mighty interesting DX from seemingly poor home locations. Work between W6OVK, Rodwood City, and W6BVK and W6YLO at Sacramento continues with solid signals and practically no fading. W6OVK has also worked W6CZB at Grassly Flats, east of Sacramento. The Sacramento stations are hearing W6JPU at Fresno, a hop of 160 miles, and are being heard by W6UID at Porterville, a distance of more than 220 miles.

Dr. Jeffers, W6SX, is at Mt. Hamilton, a 4000-foot elevation, and is working over a wide area.

420 Mc. and Higher

Belief that gear for 420 Mc. is either costly or difficult to build is refuted by W6ULE, Glendale, Cal. He and W6UXC are having a lot of fun with a couple of transceivers using 955 acorn tubes. The tuned circuit is a ½-inch coil tuned with a round tuning vane of aluminum. Chokes are 25
The LATEST EDITION of THE RADIO AMATEUR'S HANDBOOK is postwar in content, containing the kind of information which has made the HANDBOOK world-famous. To maintain the high standard of practical usefulness set by previous editions, a new treatment of the constructional sections of the HANDBOOK has been accomplished. The theory and design sections cover every subject encountered in practical radio communication. Completely sectionalized by topics with abundant cross-referencing, and fully indexed. The HANDBOOK continues to be the world's most valuable and widely-used radio book.

POSTPAID IN
U. S. A. PROPER
$1.25

BUCKRAM BOUND
$2.00 ELSEWHERE
$2.50 in U. S. A.
$3.00 ELSEWHERE

AMERICAN RADIO RELAY LEAGUE
» » » » » » » » »
WEST HARTFORD 7
CONNECTICUT
A ham friend took us to task recently. "Sure we're interested in your Co-Ax Cable Connector and all the other new B & W developments — but what about those 25-watt B & W Baby Air Inductors? Do you still make them?"

Sure we do! But only lately has production reached a point where "Babies" were again generally available through B & W distributors. Look 'em over — or write for our Baby Air Inductor Data Sheet X100.

These husky little coils are the finest, best-looking 25-watters ever made. 7 types cover from 10 to 160 meters. 5-prong bases permit easy 'band changing. Windings are perfectly spaced and B & W Air-Wound design puts an absolute minimum of insulating material in the coil field.

A WORLD WIDE FAVORITE FOR QUALITY REPORTS

The Turner VT-73 Crystal Desk Microphone

Praised by thousands of amateurs for its crisp, clear results, the Turner VT-73 is an efficient precision unit. Engineered especially for quality speech recording, public address, and amateur work. Rising curvature of response between 500-4000 c.p.s. increases intelligibility at effective voice frequencies without over-modulation. Crystal circuit utilizes corrosive resistant diaphragm and high quality moisture sealed crystal. Output: 52db below 1 volt/dyne/sq. cm. Response: 50-7000 c.p.s. Attractively finished in black crinkle and chrome. Complete with ball swivel head, stand, and 7 ft. cable. Ask your dealer or write:

THE TURNER COMPANY
917 17th STREET, N. E. • • • CEDAR RAPIDS, IOWA

Microphones BY TURNER

We are Factory Authorized Distributors for the top quality manufacturers and we now have in stock lots more new, latest improved production Ham gear! Visit our stores today, for everything you need. We promise you fresh, clean material—quicker—at the lowest current prices—and, above all, our sincere desire to be of friendly, helpful service.

As one of the world's largest distributors of Communications Equipment, we are delivering plenty—right now! ALL MAKES—practically all models. If you want yours in the quickest possible time send your order to HARRISON!

Send in your parts orders, too—if it's new, if it's good, if it's made by a leading manufacturer—

**Harrison Has It!**

### RECEIVERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collins 7SA-1</td>
<td>$375.00</td>
</tr>
<tr>
<td>Hallicrafters SX-42</td>
<td>$275.00</td>
</tr>
<tr>
<td>S-36A, FM-AM-CW 27-8-143 mc</td>
<td>$307.50</td>
</tr>
<tr>
<td>S-37, FM AM 120-210 mc</td>
<td>$91.75</td>
</tr>
<tr>
<td>S-40</td>
<td>$89.50</td>
</tr>
<tr>
<td>S-38</td>
<td>$47.50</td>
</tr>
<tr>
<td>Harmarlund HQ-129X, with speaker in cabinet</td>
<td>$173.25</td>
</tr>
</tbody>
</table>

### TRANSMITTERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collins 500A</td>
<td>$1800.00</td>
</tr>
<tr>
<td>Abbott TR-48, new 2-meter transmitter</td>
<td>$59.80</td>
</tr>
<tr>
<td>Meck 60T</td>
<td>$150.00</td>
</tr>
<tr>
<td>Temco 75GA</td>
<td>$495.99</td>
</tr>
</tbody>
</table>

[Other models and makes will be carried in stock as they become available.]

### Harrison Select Surplus

Read our ads—past and future—for real values in selected surplus material. Reasonably priced—honestly described—guaranteed perfect! You don't "take a chance" when you buy Harrison Select Surplus!

Complete stock—quicker deliveries—lowest prices—top trade-in allowances—easy 6% Budget Plan, if desired—and my personal attention to your wishes, all insure your complete and lasting satisfaction with every transaction. I guarantee you'll like doing business with me!

Send me your order, today. A small deposit (you name it) will bring you your new equipment. Balance C.O.D., or tell me what Budget Plan terms you want. Twenty-two years of experience serving Amateurs in all parts of the world is at your command.

Vy 73 de

Bil Harrison, W2AVA

---

**Harrison Radio Corporation**

Since 1925!
We wish to correct an error in the reporting of the 2450-Mc. work in the January column. The station working with W6SUD in this crossband work between Mt. Wilson and Pasadena was W6BQ, not W6BO as reported. W6SUD says that they burned up quite a few 2C38s before they found out that the dissipation fins must be covered with a shroud, and a force draft blown laterally through the horizontal section of the fins for long tube life.

W1BBM has enlisted the cooperation of several stations in getting things started on 1250 Mc. W1MNF at East Orleans, W1GBC and W1VL at Chatham, W1ARC, West Harwich, W1DJK, Dennisport, and W1BCN, Hyannis, are ready to help. Being an incurable optimist, W1BBM also has W2BAV, Rye, N. Y., lined up for tests when the atmospheric-duct weather rolls around. Don't scoff, you occupants of the "D. C. Bands"—these fellows might fool you. They have the right spot, out there on Cape Cod!

Hints and Kinks
(Continued from page 81)

of the local ham.

The first audio tube in most sets encountered was a dual tube acting as both detector and first audio. The grid of the triode audio section is usually left floating about 5 or 10 megohms above ground, which makes the set very susceptible to outside interference of many sorts. Lowering the value of this resistor to 1 megohm does not materially affect the gain of the stage, nor does it make any appreciable change in the quality of reception, yet it makes by-passing possible and practical. It would seem advisable to use 2 or 3 megohms in this circuit, provided that it permits by-passing without adding to the hum level of the set.

All sets given the above-described treatment have responded very nicely, with no casualties reported to date. — James W. Brannin, W60VK

Surplus savings:
From ex-W5RO comes a wrinkle on refurbishing crackle-finish cabinets which will make that surplus receiver or transmitter look factory-new. Fitz cleans the marred off-color surface with gasoline (outside the house), and then retouches with ordinary liquid stove polish.

COMPLETE RADIO TRAINING!
Prepare now to accept a responsible position in Commercial Radio. New developments will demand technicians with thorough basic training, plus a knowledge of new techniques discovered during the war. Training open to high school graduates or those with high school equivalency. Courses 6 to 18 months duration in RADIO AND ELECTRONICS. Approved Veteran training in Radio. Write for particulars.

VALPARAISO TECHNICAL INSTITUTE
Dept. TN
Valparaiso, Ind.
ANTENNA SYSTEMS for USERS of PRIVATE BRANDS.

We manufacture the following, under private labels and trademarks:

**AUTOMOBILE ANTENNAS** . . . every variety, including types that can be raised and lowered from inside the car.

**RESIDENTIAL ANTENNAS** . . . AM and FM, for homes, stores and multi-family buildings. Complete lines of noise-reducing systems incorporating latest patented developments of coupling transformers.

**FM, AM and TELEVISION** . . . Dipoles with or without reflectors, folded dipoles, turnstile, radiating types and other combinations for roof, sidewall and other mountings.

**MARINE ANTENNAS** . . . Collapsible and transmitting types for every purpose.

For POLICE and other mobile units . . . roof-top antennas for ultra-high frequencies.

WE INVITE INQUIRIES AND CONSULTATIONS.

L. S. BRACH MFG. CORP.
200 CENTRAL AVENUE NEWARK, 4 N. J.

WORLD'S OLDEST AND LARGEST MANUFACTURERS OF RADIO ANTENNAS AND ACCESSORIES

---

EASY TO LEARN CODE

It is easy and pleasant to learn or increase speed the modern way — with an Instructograph Code Teacher. Excellent for the beginner or advanced student. A quick, practical and dependable method. Available tapes from beginner's alphabet to typical messages on all subjects. Speed range 5 to 40 WPM. Always ready, no QRM, beats having someone send to you.

ENDORSED BY THOUSANDS!
The Instructograph Code Teacher literally takes the place of an operator-instructor and enables anyone to learn and master code without further assistance. Thousands of successful operators have "acquired the code" with the Instructograph System. Write today for full particulars and convenient rental plans.

INSTRUCTOGRAPH COMPANY
4799 SHERIDAN ROAD, CHICAGO 48, ILLINOIS

---

AMATEURS EXPERIMENTERS SUPPLIES & EQUIPMENT Leading Brands

Headquarters for HALLICRAFTERS NATIONAL HAMMARLUND
RADIO PARTS DISTRIBUTING CO.
128 W. Olney Road NORFOLK, VA.
The RADIO AMATEUR'S LIBRARY

THESE are the publications which every amateur needs. They form a complete reference library for the amateur radio field; are authoritative, accurate and up to date.

<table>
<thead>
<tr>
<th>Title</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>QST</td>
<td>$2.50 per year*</td>
</tr>
<tr>
<td>Operating an Amateur Radio Station—</td>
<td></td>
</tr>
<tr>
<td>Free to members; to others . . . . . . . . .</td>
<td>10c</td>
</tr>
<tr>
<td>The Radio Amateur's Handbook,</td>
<td>$1.25**</td>
</tr>
<tr>
<td>The Log . . . . . . . . . . . . . . . . . . .</td>
<td>35c each</td>
</tr>
<tr>
<td>How to Become a Radio Amateur . . . . . . .</td>
<td>25c</td>
</tr>
<tr>
<td>The Radio Amateur's License Manual . . . . .</td>
<td>25c</td>
</tr>
<tr>
<td>Hints &amp; Kinks for the Radio Amateur . . . .</td>
<td>50c</td>
</tr>
<tr>
<td>Lightning Calculators:</td>
<td></td>
</tr>
<tr>
<td>a. Radio (Type A) . . . . . . . . . . . . .</td>
<td>$1.00</td>
</tr>
<tr>
<td>b. Ohm's Law (Type B) . . . . . . . . . . .</td>
<td>$1.00</td>
</tr>
<tr>
<td>A.R.R.L. Antenna Book . . . . . . . . . . .</td>
<td>50c</td>
</tr>
<tr>
<td>The Minilog . . . . . . . . . . . . . . . . .</td>
<td>25c</td>
</tr>
<tr>
<td>Learning the Radiotelegraph Code 25c</td>
<td></td>
</tr>
<tr>
<td>A Course in Radio Fundamentals . . . . . .</td>
<td>50c</td>
</tr>
</tbody>
</table>

*Subscription rate in United States and Possessions, $2.50 per year, postpaid; $3.00 in the Dominion of Canada, $4.00 in all other countries. Single copies, 35 cents.

**Postpaid in U.S.A. Proper—$2.00, postpaid, elsewhere. (No stamps, please.)

---

Correspondence (Continued from page 83)

INSURANCE

24 Grove St., Bangor, Me.

Editor, QST:

Was pleased to note W2OMM's letter in the December issue stressing the advantages of adequate liability and fire insurance coverages for amateur equipment, as I am in that type of business. However, what holds true "insurance-wise" in New York state may not always be the case in other states, as each is governed by its own insurance regulations. For instance, we feel that in Maine the form covering household and personal property against fire and attached to the policy is broad enough to cover amateur equipment without specific mention. As W2OMM says, it is an excellent idea to check this point, for in those states that require specific mention, the agent or broker may not always have been aware that radio transmitting equipment was involved.

Protection against windstorm is not afforded by a fire policy alone. Specific windstorm insurance or extended coverage endorsement to fire policy is required. —Al Lancaster, W10GQ

AIN'T SCIENCE WONDERFUL?

2121 Santa Clara Ave., Alameda, Calif.

Editor, QST:

Regarding contrapolar frequencies, there is one application of interest to the radio amateur who is also interested in photography. In my experiments with contrapolar frequencies to darken my kitchen so it could be used as a dark room during the daytime, I found that if I took just 250 negative watts to balance the daylight when I increased the negative illumination to 500 watts, instead of my films developing as negatives they came out as positive transparencies.

My next experiments were with color photography. I found that if I process Kodacolor film in this negative illumination, instead of producing a negative in complimentary colors I got a color transparency. I found also that if I process Kodachrome film I got as a result the same complimentary-colored negative that would result from processing Kodacolor film by the orthodox method. I expect that this will revolutionize color photography. There will be no need to have two kinds of color film. The color photographer needs only to buy Kodacolor film and process it normally if he wants colored photographs, and under properly balanced negative light if he wants color transparencies. . . .

—J. A. Young, W6AQN

Strays

Surplus savings:

W7NRI says there's lots of salvage in surplus 1625s and 1626s (12-volt equivalents of the 807 and 6J5), especially if you have a power transformer in the junk box that did duty back in the days of Type '10 and '50 tubes. These transformers have filament windings of 7.5, 5 and 2.5 volts, together with a high-voltage winding which will deliver from 500 to 600 volts after filtering. Artic the 7.5- and 5-volt windings in series for the 12-volt heaters, and uses the 2.5-volt winding for the filters of a pair of 816 or 806 Jr. rectifiers.
**Mobile Antennas**

*Police, Emergency Vehicle and Portable Unit Equipment*

Tested and tried under the most exacting war and peacetime conditions, Premax Mobile Antennas and Mountings have proven themselves outstanding for endurance, ability to withstand shock and uniformly excellent radio reception. If your problem is a suitable mobile antenna, your Premax jobber can supply you.

**Premax Products**

Division Chisholm-Ryder Co., Inc.

4715 Highland Ave.

Niagara Falls, N. Y.

---

**W A T E R M A N**

**DOES IT AGAIN!**

**A NEW PORTABLE INDUSTRIAL AND TELEVISION**

**POCKETSCOPE**

MODEL S-11-A

**LIGHT...COMPACT EFFICIENT**

W A T E R M A N P R O D U C T S

A 3-inch oscilloscope for measuring AC and DC... Amplifiers for vertical and horizontal deflection as well as intensity... Linear time sweep from 4 cycles to 50 kc with blanking of return trace...

Sensitivity up to 100 mv/in... Fidelity up to 350 kc through amplifiers... Attenuators for AC as well as for DC... Push-pull amplifiers... Anti-astigmatic centering controls... Trace expansion for detail observations.

Direct connections to deflecting plates and intensity grids accessible from rear...

Retractable light shield... Detachable graph screen... Handle... Functional layout of controls.

Light weight: 8½ lbs. $99

F. O. B. PHILA.

...and the GENERAL PURPOSE

**POCKETSCOPE**

MODEL S-10-A

Widely known, widely used by engineers, industry, amateurs and laboratories for convenient, efficient and accurate testing and measuring requirements... an instrument of versatile application and dependable performance.

$66 F. O. B. PHILA.
HAM-ADS

(1) Advertising shall pertain to radio and shall be of such a nature as to interest the general public and such as shall tend to the general welfare.

(2) Only one advertisement per member, regardless of class, shall be allowed.

(3) Closing date for HAM-Ads is the 25th of the second month preceding publication date.

(4) Representatives of persons appearing in advertisements shall be allowed.

(5) Closing date for advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League, $1.00 for each 10 words below 100 words. (Each additional 10 words shall cost $0.10.)

(6) An advertisement in HAM-ADS may be composed of bona fide surplus equipment owned, and for sale by an individual or firm, provided the same is strictly for the purpose of selling for special equipment, if by a member of the American Radio Relay League, the rate is 1¢ per word. An attempt to deal in apparatus in quantity for profit, even by an individual, is commercial and all advertising by him shall take the 10¢ rate. Provisions of paragraphs (1), (4), (5), and (6) apply to all advertising in this column regardless of which rate may apply.

(7) Because error is more easily avoided, it is requested that signatures and addresses be printed plainly.

(8) No advertiser may use more than 75 words in any one issue.

Having made no investigation of the advertisers in the classified columns, the publishers of QST are unable to vouch for the integrity of the character of the products or services advertised.

QUARTZ -- Direct importers from Brazil of best quality pure quartz suitable for making piezo-electric crystals. Diamond Drill Company, New York, N. Y.

CRYSTALS: Precision low drift units. Type 100A in 80, 40, and 20 meter bands. Two units plug in one octal socket. One dollar each. Throaty, 249 S. LaSalle St., Chicago, Ill.

OSLs in color. Stamp for samples, Glenn Griffith, W3PSW, 1012 Pine Heights Ave., Baltimore 29, Md.

COMMUTER, 1000 watt mark, on appearance examination, questions-and-answers, one dollar per element. G. C. Weller, WassAT, 6640 E. Washington Blvd., Los Angeles, Calif.

METERS repaired and converted, Correspondence invited. Haledon Electrical Instrument Co., 519 Belmont Ave., Haledon, N. J.


WANTED: "Wireless" apparatus prior to 1953; early books, catalogs, magazines, etc., Franklin Wisgard, Rock Island, Ill.

AMATEURS, experimenters, industrial and export accounts write for catalog and monthly billings. Buy the "TB" guaranteed way and save. TAB, Dept. Z, 6 Church St., New York, N. Y.

DIKA-XAL: New 850A crystal unit for standard Sprague socket. Looks and operates like a di-knob. Plug it in and turn to suit your convenience. Box 5, Sprague, Conn. Also other low TC ham crystals in PT cases to fit octal sockets. 80 and 40 as 1K, $1.25; 25-4K, $3.50. Scientific Radio Products Co., 1397 E. 116th St., Cleveland, Ohio.

AMATEUR radio licenses. Complete code or theory preparation for passing amateur radio examination. Home study and resident courses, American Radio Institute, 101 W 63rd Street, New York, N. Y.

REMTK, all aluminum. High efficiency with minimum weight and torque. 2 to 20 meters. Write for information. Housekeeper, W2ECG, 412 W 109th St., New York, N. Y.

OSLA, Samples for stamp, Scarfow, W3GKL, Lincoln Printing Co., 305 W Wells St., Milwaukee, Wis.

SELL: meters, kilowatts, power supplies, electric drills, hundreds other parts. Free list, Marks, 97 South 8, Brooklyn, N. Y.

WANTED: Back copies of Proceedings of IRE, Electronics, RCA Review and JVT; also binders and textbooks. State price and condition, Box 440, Forrest City, Ark.

IN STOCK: now and used Hallenurters, Hammarlund, National, Perion, RMI, Collins, Murray, etc. Also other amateur parts. Trade-In accepted. Terms financed by me. Write: Henry Radio, Butler, Mo. and IP, Columbus, Ohio.

SELL: SX-28A, like new, with spkr, $225. Lyle Dunlap, 806 No. Leavenworth, Kansas City, Mo.


SELL 60 watt airline power supply, cardiac tube and stand, four metal projectors with 2 Jensen and 2 RCA lZ" dynamic units, 1200 RPM beam drive. Motor, geara, reversing relays in weather proof housing. $7.95, also HQ-120, $6.50. Rohun Radio, Sheboygan, Wis.

SELL: QSTs, complete from Jan. 1944 through Sept. 1945, $1.60. Also 1946 through 14th Editions Handbook, $1 ea., W3VNF, 839 So. 146th St., Milwaukee, Wis.

WANTED: A.C. or D.C. power supply, 150 watt, 1500 Kc. $12.95. 1500 Kc., 1.5 watt, $18.50. Also HQ-120, $12.50.

FOR sale: 300 watt phone or CW xmt, used one month, also 100 watt phone or CW xmt, brand new. Both plate modulated. W3LT, Box 146, Manistee, Mich.

CHEST MIKE with 3 magnet. $20.50. No price is the main consideration, demand Ridlon crystals. Five commercial units for Aircraft, Police and Geophysical. Deal directly with manufacturer, fully guaranteed and strong in output. Over a decade of satisfaction and fast service. Send for our new L-6 catalog. Edison Electronics Co., Temple 5, Los Angeles 3, Calif.

COMPLETE Superhet 10, 20, 40, 80, $35; 50 Ma., DC, 200 Ma., $39.50. In stock. AC power supplies, $10 to $150. $5; two 12 volt 1000 watt, used 1500 volt 3000 watt. $1 ea., also stirps, stacks, chokes, tubes, etc. Moxey, W3ESL, 525 Wadsworth St., Providence, R. I.

TCS transmitters and receivers, less power supplies, $169, both types complete. Two tubes, $27. Conquistador 12 volt VHF trans., $139.50. Mallory 12 volt Vibrosonic, $149.50. 2 volt in 300 Ma. out. $149.50. ZS-221, $199.50. TS-221, $299.50. For further information, write: W3DR, 115 Sutter St., San Francisco, Calif. 4.

FOR sale: 300 watt phone-CW xmt, complete. Best offer takes it. Also Vibroplex Champton, $10. Never used. Write: Harold Hicks, W2PHD, Presque Isle, Me.

FOR sale: DC-434, 25 watt phone-CW xmt, pair 100th final, condition B. $25. Also Vibroplex Champton, $10. Never used. W2EC, 52 Buckingham Rd., Hempstead, L. I., N. Y.

140 RPM beam drive. Motor, geara, reversing relays, weather proof housing. $7.50, Also HQ-120, $12.50. E. Harris, 6748 No. Ashland, Chicago, Ill.

SELL: R-300, s/w recvr, complete. $250. Also T-100, s/w recvr, complete. $275, both modulated. W9VXF, 3819 15th St., Washington 6, D. C.

V-101, portable xmt-recvr, 25 watt, complete. Best offer takes it. Also Vibroplex Champton, $10. Never used. W2EC, 52 Buckingham Rd., Hempstead, L. I., N. Y.

FOR sale: 300 watt phone-CW xmt, complete. Best offer takes it. Also Vibroplex Champton, $10. Never used. W2EC, 52 Buckingham Rd., Hempstead, L. I., N. Y.

FOR sale: 300 watt phone-CW xmt, complete. Best offer takes it. Also Vibroplex Champton, $10. Never used. W2EC, 52 Buckingham Rd., Hempstead, L. I., N. Y.

FOR sale: 300 watt phone-CW xmt, complete. Best offer takes it. Also Vibroplex Champton, $10. Never used. W2EC, 52 Buckingham Rd., Hempstead, L. I., N. Y.

FOR sale: 300 watt phone-CW xmt, complete. Best offer takes it. Also Vibroplex Champton, $10. Never used. W2EC, 52 Buckingham Rd., Hempstead, L. I., N. Y.

FOR sale: 300 watt phone-CW xmt, complete. Best offer takes it. Also Vibroplex Champton, $10. Never used. W2EC, 52 Buckingham Rd., Hempstead, L. I., N. Y.

FOR sale: 300 watt phone-CW xmt, complete. Best offer takes it. Also Vibroplex Champton, $10. Never used. W2EC, 52 Buckingham Rd., Hempstead, L. I., N. Y.
BLILLEY state. half price. Write for details. W1KJ.

RC-375E xmt, 7 tuning units, 24 valve, 1000 v, 15Mc., tubes, instruction book and AC conversion data, $50; Melameter 14 tube kit, $65; Sensilizer 80 in good condition. First $100, Victor Vega, 244 Lebanon St., Little Falls, N. Y.

SALE: New SX-28A, $100; pair new $80, $75, master Teleplex AM receiver, with 8 tubes, $80; SACRIFICE: OM-103, $85. Purchased for experiments. Will sell power supply of 1200 volts to 300 ma. on 17 tubes, $100; OM-105, $80; or 10 tubes, $30. Used in teleplex AM receiver, Priced for the amateur. Write for Bulletin T-101. Sky Products, 1516 E. 6th St., Lexington, Ky.


FIRST $150 takes my Super Pro, Japanese 5-10 meter auto plane receiver and ross, originally new. Will sell separately. Uses 4 octal and 3 standard 6-prong tubes. Japanese tubes included, all in excellent condition. First $100, Victor Vega, 244 Lebanon St., Little Falls, N. Y.

FOR sale: Instruction Code Instructor, Electric model coming. Morris, $20; Instructoscope, with 10 tapes, oscillator unit, tube, prism, key, bunhead, battery and book of instructions. Useless less than a week. Like new. First $50, Will take $30. Also have model Turner dynamo, like new, on table stand, $20, or best offer. Billy Gant, $916 Charlotte Pike, Nashville 9, Tenn.

WANTED: Philco push-button test oscillator, $40. Price must be firm. W9JLL, P. O. Box 1023, Manchester, N. H.

FOR sale: 10-meter excitation unit with power supply, 1952 preselect, 6AK5 mixer, 955 sec. vacuum diode, $20. Want to buy 45-watt P.A. input, 575 milliam. $15.

WANTED: Howard "490" Swaim, 1902 Hawthorne, Waterloo, Iowa.

FOR sale: 10-meter excitation unit with power supply, 1952 preselect, 6AK5 mixer, 955 sec. vacuum diode, $20. Want to buy 45-watt P.A. input, 575 milliam. $15.
The No. 43000 Air Wound Inductors and Accessories

Plug-in air wound inductors, coil forms, jack bars and sockets that have been "Designed for Application." The sockets are of the "straight line," type, facilitating symmetrical circuit arrangements and avoiding the undesirable socket-plug arrangements are used. Illustrated herewith are units from the small 75 watt or 43000 series. Two larger groups, the 44000 rated at 50 watts and the 42000 rated at 500 watts are also regularly available from your distributor of Millen radio products.

JAMES MILLEN MFG. CO., INC.
MAIN OFFICE AND FACTORY
MAVDEN MASSACHUSETTS

Index to Advertisers

Page

Advance Electric Relay Co. 113
Allied Radio Corporation 114
American Phenolic Corporation 111
American Radio Institute 115
Aube Radio Co., Walter 120
Atlantic Corporation, Inc. 109
Barker & Williamson 134
Birnbach Radio Co. 128
Bouch Manufacturing Co. 130
Brill Co., W. D. 129
Burstein-Applebee Co. 124
Canada Radio Co. 130
Candler System Company 141
Capitol Radio Engineering Institute. 135
Cedarcrest Corporation 136
Cleveland Inst. of Radio Electronics 142
Collins Radio Co. 130
Commercial Radio Institute 130
Condenser Products Co. 130
Continental Sales Co. 128
Drake Electric Co. 88
Eitel-McCullough, Inc. 79
Electro-Voice 93
Fabricated Lightmetals Co. 118
General Electric Co. 123
Gressel Co. 124
Hallštatters, Co. The 4, 5
Hammann Mfg. Co., Inc., The 75
Harrison Radio Co. 125
Harvey Radio Co. 135
Harry & Young 114
Hoff-Radio Stores 100
Hytron Radio & Electronic Corp. 8
Instructograph Co. 137
International Resistance Co. 138
Jensen Mfg. Co. 81
Kear Engineering Co. 92
Kalthoff Instrument Co. 132
Kerr & Son, The 133
Klattic Co., Jemmy 92
Maguire Industries 36, 87
Mallory & Co., R. P. 82
Maw Radio & Television 116
Melville Radio Institute 116
Millen Mfg. Co., Jas. 134
Munger, Co., Rex 110
National Co., Inc. 73, Cov. III
Newark Electric Co. 123
Onan & Sons, D. W. 112
P & H Sales Co. 142
Peerless Radio Distributors 120
Petersen Radio Co. 121
Port Arthur College 142
Premax Products Co. 139
Radio Electric Ser., Co. of Pema. 100
Radio Manufacturing Engineers 132
Radio Parts Distrib. Co. 147
Radio Shack Corp. 96, 97
Radio Specialties Co. 112
Radio Transceiver Labs. 116
RCA Institutes, Inc. 131
RCA Mfg. Co. 133, Cov. IV
Richardson Labs., Kenneth 136
Silver Co., McMurdo 110
Sonar Radio Corporation 93
Sprague Products Co. 117
Standard Rad. & Elec. Products Co. 116
Standard Transformer Corp. 124
Steinberg's, Inc. 126
Sun Radio & Electronics Corp. 139
Sun Radio Co. of Washington 126
Surome Transmitters 2, 91
Sylvania Electric Products Co. 2, 91
Terminal Radio Co. 101
Transmitter Equip., Mfg. Co. 95
Trippett Elec. Inst. Co. 119
Turner Co., The. 134
U.H.F. Resonator 120
United Electronics 130
United Transformer Corp. 130
Universal Radio Supply Co. 108
Valparasio Tech. Institute 126
Vibroplex, Co. The 130
War Assets Administration 131
Ward Leonard Elec. Co. 89
Waterman Products Co. 139
Western Electric Co. 104, 105
Wills, Eugene, C. 136
World Radio Labs. 102
Being a ham, you've often wished for a portable receiver. The RME 84 was engineered with this in mind and is equipped with a special socket connection on the rear of the chassis apron making possible connections to either a B battery and an A battery supply or a similar source of power such as an external vibrapack.

Because of its modern loctal tubes, the RME 84 will operate at full power on 135 volts of B and 6 volts of A battery. Drain on the B battery is only 22 milliamperes at 135 volts and the 6 volt A battery provides 1.5 amps, including the two dial lights. Disconnecting the dial lights reduces the A battery drain to but 1.2 amps.

For those many field days, for mobile use or for home use, this modestly priced, 8-tube communications receiver is an outstanding value because of its high quality, precision construction.

Write for Illustrated Folder

Self Contained Shock Mounted 5" PM Speaker
Four tuning ranges .54 to 44 MC
One Preselector Stage
Smooth Vernier Tuning Control
Bandspread, positively geared to main tuning control for accurate logging—no backlash!
Automatic Noise Limiter
Beat Frequency Oscillator—continuously variable by panel control
Headphone Jack
Antenna Input Terminals, provision for doublet or single wire
Eight tube superheterodyne circuit
Wherever the Collins 75A receiver is shown—ham­

fests, fairs, club meetings—the band-lighted dial

wins enthusiastic endorsement from all who can

crowd close enough to see it. And no wonder! It’s

so easy to use, both visually and mechanically, that

once you’ve used it you’ll see why it ranks high

among the many new features of this receiver.

Here’s how it works. The dial amply covers six

amateur bands—80, 40, 20, 15, 11 and 10 meters.

When you turn on the filament supply, the dial

lights are turned on. But only the band selected

for use is lighted! There’s no band pointer to get

out of adjustment, no feeling for the detent action,

and no scanning the dial to see where the fre­

quency indicator is! With only one band lighted

at a time you just naturally read the correct figures

at first glance.

The vernier dial, which gives you directly the

exact frequency to within 1 kc (2 kc on 11 and 10

meters), works the same way. Only the band you’re

listening to is lighted. The frequency shown in the

photograph is 14,394 kc.

The band-lighted dial is further proof of Collins

interest in amateurs. In every equipment designed

and built for amateurs by Collins, you’ll find engi­

neering that advances the art of amateur radio.

FOR RESULTS IN AMATEUR RADIO, IT’S . . .

COLLINS RADIO COMPANY, CEDAR RAPIDS, IOWA

11 W. 42nd St., New York 18, N. Y. 458 S. Spring St., Los Angeles 13, Calif.
The NC-173 is the wholly new product of months of post-war research, prompted by war-time advances in radio technique.

The new "Double Diode" noise limiter and the new AVC system are effective on both phone and CW. The voltage-regulated oscillator circuits are extremely stable. The frequency range includes the 6-meter amateur band, (0.54 to 31 and 48 to 56 Mc.)

The NC-173 offers all the features you expect in a fine receiver. A glance at the illustration below will suggest the versatility of its adjustments and the handiness of its controls, but only a trial will prove its thoroughbred qualities. Study the advanced design of its 13 tube circuit, appraise its modern styling and challenge its performance with the toughest conditions that crowded amateur bands can offer.

Here is a receiver a man can be proud to own. See it at your dealer's within the next 30 days.

NATIONAL COMPANY, INCORPORATED
MAIDEN, MASS

THE MOST DISTINCTIVE NAME IN RADIO COMMUNICATIONS
Here's why you'll want to use the new RCA-2E26 for 6 and 2 meters...

RCA gave you a very-high-power version of the 6L6—the justly popular 807. Now RCA brings you the 2E26—a very-high-frequency version of the 6L6. It's destined to become the hottest VHF final in the field for these reasons:

1. Economy: Because of its small size, high power sensitivity, and high efficiency, the RCA-2E26 makes an excellent final amplifier for a compact, inexpensive VHF transmitter operated from a simple low-voltage power supply.

2. High Power: A single RCA-2E26 operated at its ICAS ratings will take an input of 33 watts at 500 plate volts in class C telegraphy at frequencies as high as 150 Mc., and 40 watts at 600 volts at 54 Mc. It will take an input of 22.5 watts at 415 plate volts in class C telephony at frequencies as high as 150 Mc., and 27 watts at 500 volts at 54 Mc.

3. Low Drive: At 144 Mc., about 2 watts of RF must be delivered to the grid circuit. A 6V6-GT is a satisfactory driver tube.

4. Features: The 2E26 has short internal leads, a rugged button stem fitted to an octal base having a low-loss micanol insert and metal sleeve, excellent internal shielding, and double-ended construction for isolation of grid and plate circuits.

5. Application: The 2E26 is an excellent medium-power final amplifier for 6 and 2 meters. As a doubler, it will supply more than adequate power to drive an 829-B or 815. It will deliver 15 watts of 2-meter RF as a TPTG oscillator.

RATINGS AND CHARACTERISTICS

<table>
<thead>
<tr>
<th>Table</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Volts</td>
<td>6.3</td>
</tr>
<tr>
<td>Heater Amps</td>
<td>0.8</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances, muf</td>
<td>0.20</td>
</tr>
<tr>
<td>Grid to Plate (maximum)</td>
<td>7.0</td>
</tr>
<tr>
<td>Input</td>
<td>13.0</td>
</tr>
<tr>
<td>Output</td>
<td></td>
</tr>
</tbody>
</table>

CLASS C TELEGRAPHY

<table>
<thead>
<tr>
<th>Frequencies At up to 125 Mc. at 160 Mc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Volts</td>
</tr>
<tr>
<td>Plate Input, Watts</td>
</tr>
<tr>
<td>Plate Current, ma.</td>
</tr>
<tr>
<td>Plate Dissipation, Watts</td>
</tr>
</tbody>
</table>

TYPICAL OPERATION

| DC Plate Volts | 600 |
| DC Grid No. 2 Volts | 185 |
| DC Grid No. 1 Volts | 45 |
| Peak RF Grid No. 1 Volts | 57 |
| DC Plate Current, ma. | 66 |
| DC Grid No. 2 Current, ma. | 10 |
| DC Grid No. 1 Current, ma. | 3 |
| Power Output, Watts (Approx.) | 27 |

For further information, see your local RCA Tube Distributor or write RCA, Commercial Engineering, Section M-54C, Harrison, N. J.

Have you seen HAM TIPS?
Get a copy from your local RCA Tube Distributor
Should We Have a Class D License?

(Continued from page 18)

as the present Class B or C license except for the omission of the code test.

III. Stations of Class D licensees would have a distinctive type of call.

IV. Class D licensees would not be entitled to voting membership or the holding of elective office in the League.

I — The Frequencies

Below our 2-meter band we have assignments near 200 and 400 Mc. to which the same general techniques are applicable as we use on lower frequencies. We don't need help there. Then we have a long gap, a big jump up to 1215 Mc. Here the new world begins, where conventional equipment will not work and where new techniques must be employed. The field of the Class D licensee would begin here and would be confined to these wavelengths of 25 cm. and shorter. It is therefore not a popular field and it offers no present opportunity for dabblers, WERS permit-holders, dilettantes with handle-talkies, popularized “Citizen's Radio Service,” or anything else of large dimensions. It is confined to the frequencies where genuine scientific knowledge is required to accomplish communication, and where development work must be done before the frequencies are useful to the average amateur.

There is, of course, the danger that the s.h.f. techniques won't always remain so difficult and expensive. There could be some smart technicians, say radio servicemen, for example, who could build such apparatus, and who would avail themselves of this opportunity to get into hamming without being subjected to the code requirement — the kind of people who have wanted noncode examinations for 'phone on our lower frequencies. Also it might not be too long before some smart manufacturer found it possible to bring out a ready-made set, say for the 1215-Mc. band, at a price that some dilettantes could afford. We should examine whether we think we could afford to have some such butcher-boys for the sake of the larger gain of serious technical workers, or even whether a few such occupants wouldn't be affirmatively worth while. We should also consider whether we could protect ourselves if we did run into such troubles as the years rolled on by raising the lower frequency limit of the Class D field, keeping it confined to the bands on which original developmental work was still required.

II — The Examination

Chief reason for proposing that the examination be the same as for Class B except minus the code test is the FCC already has that mechanism set up and the Class B exam has the good feature of requiring knowledge of laws and treaties and regulations governing amateurs. Such an arrangement would also permit a Class D holder to get an endorsement for Class B privileges whenever he subsequently got interested in the lower frequencies and passed the code test. It has been suggested, as an alternative, that Class D be available only upon passing a comprehensive technical examination on microwave techniques. The Board thinks that the considerations earlier outlined outweigh any possible advantages of this alternative; and it is also doubtful whether the present administrative streamlining of the work-load at FCC would make it desirable for us to propose a special examination for this purpose. No person is going to attack the difficulties of the microwaves unless he has at least rudimentary skill in that field. And rudimentary skill is all that any amateur test should require: the amateur learns by doing and the beginning requirement should be just enough to insure that he can conduct himself properly. All things considered, it has seemed best to the Board to rely on the present amateur examination. Even though it does not treat of the microwaves at all, it is basic to the business of becoming an amateur.

American Radio Relay League,
West Hartford,
Conn.,
U. S. A.
While a special microwave technical exam would keep out the butcher-boys we've mentioned, wouldn't it also seem to have the objection of setting up a class too much apart from the rest of us? To be sure, we want highly qualified people but we don't want to bestow a sort of special rank on them that would ever permit them to complain that the rest of us weren't well enough qualified to use our own bands. We would be wanting them only as amateurs, and it has seemed to the Board that having the one basic examination would be conducive to that and to the avoiding of unwholesome jealousies.

It should be well understood that in any event the Class A, B and C licenses authorize amateur operation on all such frequencies, without the need to pass any other test of any description.

III — The Call

The fear has been expressed that some Class D microwave men, once licensed, would unlawfully invade our lower-frequency 'phone assignments and so get in by the back door, so to speak, to operate DX 'phone without qualifying for code as every other 'phone man has had to do. He'd have a call, it is said, and nobody would spot him as unauthorized. To help offset this the Board proposes that Class D stations have a distinctive form of call, one immediately recognizable as such. It is also proposed that the call structure be such that it could be converted to a "regular" amateur call when and if the holder qualifies for Class B. Such a call, for example, might have an extra letter in the prefix, that could later be deleted by FCC.

Of course this doesn't entirely eliminate such dangers. Nothing can. There would be nothing to prevent a Class D man from dropping the significant part of his call himself — except the vigilance of the local gang. But only that and FCC monitoring (and the ordinary honor of most people) prevent Class B men from working in Class A bands now, so it would be no different. The Class D licensee would be authorized only microwaves; for lower frequencies he would be an unlicensed person. There's no difference from what now prevents phonies from trying to operate without any license whatever — fear of the law and amateur vigilance are the biggest deterrents. But if a Class D man did go overboard and changed his call, he'd be guilty of both unlicensed operation and signing a false call, so the proposed provision seems helpful. There seems to be no room to feel that a Class D invader of lower bands would find it any easier to get away with anything because of his possession of a D ticket.

IV — Voting

The fear has also been expressed that Class D men would be so numerous that they would dominate the affairs of the League and, not being c.w. men themselves, would succeed in shaping ARRL policies to the eventual elimination of the code requirement everywhere, the gradual liquidation of c.w., and the opening of the lower-frequency 'phone bands to persons without code knowledge, thus ruining amateur radio. The opposing point of view is that there is no likelihood of Class D attaining appreciable numbers, that the number of people of microwave skills is so relatively limited that we would be fortunate if we ever got as many as two or three thousand of them. Nevertheless, the Board is considering Class D strictly as a mechanism for getting desirable people into this branch of amateur radio, it believes utterly that code is basic to every other part of amateur radio, and it intends to surround the matter with adequate safeguards. It is therefore part of the whole approach to this matter that the League would regard a Class D man as only partly licensed and would deny him full (voting) membership. If the amateurs of the country want to see Class D established and the Board so undertakes, the Board will simultaneously amend the League's by-laws so that the right to vote will unmistakably be confined to those who have passed the code examination. It will also follow from that that Class D men will not be eligible to elective office in the League.

Thus any possible hazard of noneode persons ever

---

General Amateur Poll No. 2

Should the League seek a Class D license without code test, to be valid only above 1215 Mc., licensees of such stations to use distinctive station calls and to be denied voting membership in the League?

☐ YES  ☐ NO

Your name Call City and state

Are you a member of ARRL? _____________

ARRL Division in which you live: ________________________

(See list on page 6.)