Since its inception, the designs of the UTC Engineering Department have set the standard for the transformer field.

<table>
<thead>
<tr>
<th>Hum Balanced Coils</th>
<th>Linear Standard Audio Units</th>
<th>Ultra-Compact Audio Units</th>
<th>Tri-Alloy Shielding</th>
<th>Oscor Audio Units</th>
<th>Universal Equalizers</th>
<th>Sub-Oscor Units</th>
<th>Hermetic Seal Pneumatics</th>
<th>Teroidal Wound High Q Cells</th>
<th>Variable Inductors</th>
<th>Standardized Filters</th>
<th>Sub-Audio and Supersonic Transformers</th>
<th>Stabilized Low Frequency High Q Cells</th>
<th>Transducers for Power Control and Amplification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used by UTC in practically all high fidelity designs. Hum balanced transformers are now accepted as standard practice in the transformer field.</td>
<td>Flat from 20 to 20,000 cycles. A goal no others have met.</td>
<td>A complete series of light weight audio and power components for aircraft and portable applications. Ultra-Compact Audio units are hum balanced...</td>
<td>The combination of Linear Standard frequency response and internal tri-alloy magnetic shielding is a difficult one to approach. Used by G.E., RCA, Western Electric, Westinghouse, Raytheon, Collins, Gutes, etc.</td>
<td>Extremely compact audio units for portable application were a problem until the development of the UTC Oscor series. Fifteen types for practically all applications... range 40 to 15,000 cycles.</td>
<td>The UTC Universal Equalizers, Attenuators, and Sound Effects Filters fill a specific need of the broadcast and recording field. Almost any type of audio equipment can be equalized to high fidelity standards.</td>
<td>A series of ½ ounce miniature units with non-corrosive—long life construction for hearing aid, miniature radio, and similar applications. Five types cover practically all miniature requirements.</td>
<td>Reducing the essentiality of hermetic sealing for many applications, UTC pioneered a large number of the terminals and structures for hermetic transformers... now available for commercial use.</td>
<td>UTC type HO permalloy dust coils afford a maximum in Q, stability and dependability with a minimum of hum pickup. Standardized types for all requirements from 200 cycles to 300 KC.</td>
<td>The type VIF high Q variable inductor revolutionizes the approach to tuned audio circuits. Variation of ±90% to ±50% of mean inductance permits tuning any type of filter or equalizer to precise frequency characteristic.</td>
<td>Filters are standardized to effect minimum cost and good delivery time. Available for frequencies throughout the entire audio range.</td>
<td>Embodies new design and constructional principles, for special frequency ranges. 10 to 50 cycles for geophysical, brain wave applications... to 50,000 cycles for laboratory service, 600 to 200,000 cycles for super sonic applications.</td>
<td>Temperatures stabilized units for frequencies from 1 to 300 cycles with minimal variation in 1 for wide range in exciting voltage.</td>
<td>These adjustable reactors are available for frequencies from 25 cycles to 250 KC.</td>
</tr>
</tbody>
</table>

New Items: The UTC Research Laboratory is developing new items and improving standard designs in 1949. While some of these developments will be described in our advertisements, many are applied to customers' problems.

Write for new catalogue.
For only a few cents more, get a tube that’s R-F-TESTED!

While a 6L6 in design and basic characteristics, the GL-1614 is factory-approved for radio-frequency work. Play safe by plugging-in this sure-fire performer for oscillator, doubler, other r-f applications.

That little extra you pay for a GL-1614—it will come back to you many times over in performance hours, in assurance that you’ve installed a tube fully able to do an r-f job.

Maybe the 6L6 you were thinking about would have perk ed along... for a time... but why gamble? The 6L6 is tested only for audio-frequency service. To employ it at radio frequencies is like using your pen-knife to tighten screws. Maybe the blade won’t buckle in service for which it wasn’t intended!

Rated up to 80 mc at full input, and 120 mc at somewhat reduced input, a GL-1614 will loaf along with the plate taking 30 w CW or 23 w phone. Here’s a low-cost beam power dependable, with plenty of jobs waiting for it in your rig. Install it with confidence!

Your nearby G-E tube distributor will be glad to tell you more. Or write Electronics Department, General Electric Company, Schenectady 5, New York.
The owner of a group like this has the best performing half-kilowatt outfit money can buy.

Operating in the 80, 40, 20, 15, 11 or 10 meter bands, he can run 500 watts of stable c-w, or 375 watts of clean, intelligible phone into his PA amplifier. He has bandswitching in all transmitting circuits except the antenna tuning network, where one plug-in coil covers 80 and 40 meters, and another covers 20, 15, 11 and 10. He has very accurate Collins PTO control right on his desk, in the 310A-3 exciter.

It is often said that you can spot a Collins 30K-1 transmitter on phone as soon as you hear it, and that it seems to have more sock than its rated power. One reason is well engineered speech clipping, which permits running the audio gain at high level, with 100% modulation. Another reason is found in good audio design and fine components, providing remarkable clarity of voice transmission.

Add the sensitivity, stability and tuning accuracy of the 75A-1 receiver, and you have the ideal combination, whether for DX or maintaining schedules.

Get in touch with your Collins dealer. If you do not know him, we will be glad to give you his name and address.
CONTENTS

"It Seems to Us . . ." .................. 9
Our Cover .................................. 10
Feed-Back .................................. 10
The "Basic" Phone Exciter . Byron Goodman, W1DX .................................. 11
80 and 40 on Wheels . . . Richard M. Smith, W1FTX ............... 18
Propagation and Antennas Above 50 Mc. Plotting V.H.F. Station Performance Graphically
M. R. Ludwig, W0QHC ............... 24
Making the Higher Frequencies Pay Off Calvin F. Hadlock, W1CTW ............... 25
A Doorknob Oscillator for 420 Mc. Edward P. Tilton, W1HDQ ............... 29
Happenings of the Month ............... 32
How's DX? .................................. 35
A Versatile Low-Power 'Phone-C.W. Transmitter Calvin F. Hadlock, W1CTW ............... 38
Silent Keys .................................. 41
18th ARRL International DX Competition ....... 42
The Governors-to-President Relay ............... 44
Some Notes on the Clapp Oscillator Richard G. Talpey, W2PUD ............... 45
I Will Do It in '49! . . . Herbert S. Brier, W9EQQ ............... 46
The Black Box . . . Albert E. Hayes, jr., WIIIN ............... 48
The World Above 50 Mc. ............... 51
In QST 25 Years Ago This Month ............... 55
I.A.R.U. News .................................. 56
WWV Schedule .................................. 57
2nd V.H.F. Sweepstakes, Jan. 15th-16th
F. E. Handy, WIBDI ............... 58
On the Air with Single Sideband ............... 60
United States Naval Reserve ............... 61
Hints and Kinks .................................. 62
Correspondence from Members ............... 63
Operating News .................................. 64
Station Activities .................................. 72
An Eimac 4-65A in the versatile Hallicrafters HT-19 medium-power amateur transmitter. The unit is completely self-contained, 20 x 10 x 18 inches in size and operates both narrow-band FM and CW, plus provisions for AM... to give maximum flexibility on five popular bands.

Universally accepted as the dependable tetrode to supply ample power with extremely high stability, the Eimac 4-65A is appearing in ever increasing numbers in the most modern of amateur and commercially built transmitters.

As an example of the trend, in the above illustration the Eimac 4-65A is pictured in the final amplifier of the new Hallicrafters HT-19. This compact transmitter gives maximum flexibility on five popular bands. The 4-65A runs at an input of 185 watts and delivers 125 watts output.

Complete technical data on the 4-65A, including its use as a Class-B linear amplifier in SSSC operation, may be found in a new 4-65A data sheet which is yours for the asking, write direct.
...the New HT-19 transmitter

- Designed for the modern-minded Ham. Maximum flexibility on 5 Bands — 3.5, 7, 14, 21, and 28 MC. High stability, low FM distortion (measured at less than 5%). Provisions for applying AM from external modulator. 125 watts output. Oscillator — reactance modulator with speech amplifier — buffer — and final. The 4-65A in, output stage is air-cooled by a 1000-rpm fan! 5 Tubes plus 2 Voltage Regulators and 3 Rectifiers.

See it at your Hallicrafters Dealers!

the hallicrafters co.
4401 W. Fifth Ave., Chicago 24, Ill.

World leading manufacturers of precision radio and television equipment
**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. Radio Club reports are also desired by SCMs for inclusion in QST. All ARRL Field Organization appointments are also available to League members. See QST, OP-0 and OP-08. Also, where vacancies exist SCMs desire 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).

<table>
<thead>
<tr>
<th>Division</th>
<th>Province/State</th>
<th>City</th>
<th>Name</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ATLANTIC DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern Pennsylvania</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maryland-Delaware-D.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Jersey</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New York</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pennsylvania</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CENTRAL DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illinois</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indiana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wisconsin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DAKOTA DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Dakota</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Dakota</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minnesota</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DELTA DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arkansas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Louisiana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GREAT LAKES DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HUDSON DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New York</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MIDWEST DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iowa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kansas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missouri</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nebraska</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NEW ENGLAND DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connecticut</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massachusetts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Hampshire</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhode Island</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vermont</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NEW ORLEANS DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Louisiana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ROCKY MOUNTAIN DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorado</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nevada</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santa Clara Valley</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ROANOKE DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Carolina</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Carolina</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virginia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SOUTHEASTERN DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alabama</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern Florida</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Georgia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Indies (Caribbean-P.R.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SOUTHWESTERN DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Los Angeles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arizona</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>California</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MARITIME DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maritime (Nfld., &amp; Labr., etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ONTARIO DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>QUEBEC DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quebec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VANALTA DIVISION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alberta</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>British Columbia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manitoba</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saskatchewan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Officials appointed to act temporarily in the absence of a regular official.*
TRIODE MIXING ... in the first detector. This quieter method of conversion greatly boosts the signal-to-noise ratio because there's almost no first detector "hiss." Inductive coupling (rather than electronic) of the oscillator signal avoids multi-grid noise in the sensitive 50-Mc range.

DOUBLE SUPERHET ... After two stages of IF at 10.7 Mc, this 6SH7 makes a second conversion down to 455 kc for ample selectivity, plus complete absence of images. The 6J5, which is used as BFO on other bands and otherwise idle on this band, acts as local oscillator. No extra tubes, yet plenty of extra performance!

Before you buy, see and try the SX-43. Compare its features ... learn the thrill of its superior performance. At its price, it's the hottest thing available—by far.

Range 540 kc to 55 Mc plus FM Band 88—108 Mc; other features include calibrated bandspread, one stage tuned RF, temperature compensated oscillator, crystal filter, two stages IF, tuning meter, two stages audio; 10 tubes plus rectifier.
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 fraternism 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.

"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
New York, N. Y.
Vice-President ............ J. LINCOLN MCCARGAR, W6EY
Oakland, California
Acting Secretary ............ A. L. BUDLONG, W1BUD
West Hartford, Connecticut
Communications Manager . . . FRANCIS E. HANDY, W1BDI
West Hartford, Connecticut
Treasurer .................... DAVID H. HOUGHTON
West Hartford, Connecticut

General Counsel ................ PAUL M. SEGAL
816 Connecticut Ave., Washington 6, D. C.
Assistant Secretaries ............... JOHN HUNTOON, W1LVQ
LOREY T. WAGGONER, W1PEK, RICHARD L. BALDWIN, W1IKE
West Hartford, Connecticut

DIRECTORS
President
GEORGE W. BAILEY ............ W2KH
1 East 79th St., New York 21, N. Y.
Vice-President
J. LINCOLN MCCARGAR ............ W6EY
56 Hamilton Place, Oakland 12, Calif.
Canadian General Manager
ALEX R. STL .. .................. W6SSB
240 Logan Ave., St. Lambert, P. Q.
Alternate: Leonard W. Mitchell ............ VE3AZ
78 Maple Ave., Toronto, Ont.

Atlantic Division
WALTER BRADLEY MARTIN .... W5QV
Alternate: Henry H. Weikenheiser ............ W3KWA
1112 State Ave., Cornopolis, Pa.

Central Division
JOHN G. DOYLE ............ W5GPI
E. W. Olds Associates, 111 W.
Alternate: Wesley F. Martinn ............ W9AND
824 College Ave., Dixon, Ill.

Dakota Division
GOODWIN K. DOSTLAND .... W7TSN
Moorehead, Minnesota
Alternate: Robert A. Kimbro ............ W8BLK
Canyon Lake Blvd., Rapid City, S. D.

Delta Division
VICTOR CANFIELD ............ W8BSR
P. O. Box 665, Lake Charles, La.
Alternate: James W. Wynn ............ W4FLB
220 N. Howell St., Chattanooga, Tenn.

Great Lakes Division
HAROLD C. BIRD ............ W5DPE
114 Hattery Dr., Crescent Lake, Pontiac, Mich.
Alternate: John H. Brabb ............ W9HST

Hudson Division
JOSEPH M. JOHNSTON .......... W2BOX
Avondale, N. J.
Alternate: Gay E. Millon, Jr. ............ W2NJR
170 Broadway, New York 7, N. Y.

Midwest Division
LEONARD COLLETT ............ W5DEA
Civil Aeronautics Administration
Bldg. 276, Joplin, Mo.
Alternate: Alvin G. Bures ............ W6KRT
1201 Merchants Nat'l Bank Bldg., Cedar Rapids, Ia.

New England Division
PERCY C. NOBLE ............ W1BVR
37 Broad St., Westfield, Mass.
Alternate: Clayton C. Gordon ............ W1HRC
70 Columbia Ave., Providence 6, R. I.

Northwestern Division
FRANK M. ROBERTS ............ W7CPY
110 W. Brennan St., Glenvile, Mont.
Alternate: Allen D. Gunston ............ W7GP
7269 Wright Ave., Seattle 6, Wash.

Pacific Division
WILLIAM A. LADLEY ............ W6R7BQ
250 Bayshore St., San Francisco 12, Calif.
Alternate: Kenneth E. Hughes ............ W6CJS
810 W. Orange Ave., So. San Francisco, Calif.

Raccoon Division
EVERETT L. HATTEY .......... W4IA
2008 N. Cleveland St., Arlington, Va.
Alternate: J. Frank Key ............ W4ZA
2701 Fox9 St., Buena Vista, Va.

Rocky Mountain Division
FRANKLIN K. MATEJA ............ W6DQ
P. O. Box 212, Estes Park, Colo.
Alternate: William R. White ............ W6CPA
1263 Pearl St., Denver 3, Colo.

Southeastern Division
WILLIAM C. SHELTON ............ W4ASR
527 Revillo Blvd., Daytona Beach, Fla.
Alternate: William P. Stites ............ W4AUP
Fieming Road, Montgomery, Ala.

Southwestern Division
JOHN R. GRIGGS ............ W5KW
3212 Grace Ave., San Diego 2, Calif.
Alternate: John E. Hezel ............ W5N
1845 Whittier Blvd., Whittier, Calif.

West Gulf Division
WAYLAND M. GROVEY .......... W5NW
P. O. Box 665, Odessa, Texas
Alternate: David D. Calle ............ W8BHO
7770 Joplin St., Houston 17, Texas

AMERICAN
RADIO RELAY
LEAGUE, INC.
THE 21-MC. BAND

When do we get the 21-Mc. band?

That's a question we've been asked more than any other in recent months, and particularly since it is common knowledge that the Atlantic City regulations go into effect January 1, 1949, as chronicled in "Happenings" this same issue. The same item also contains the clue to the answer; it is true the Atlantic City regulations and allocation table go into effect the first of the year, but only that part of the new allocation table above 27.5 Mc. The allocation table below 27.5 Mc. will stay as it is for the time being, and the Atlantic City table won't go into effect for some time to come in that portion of the spectrum. What we propose to do this month is explain this somewhat curious state of affairs — curious, that is, until you know the reason.

First, some background. After every international radio conference, such as Atlantic City, the world emerges with new radio regulations, a vital feature of which is a new allocation table for all the services in the spectrum. The nations at the conference sign the documents, and except for the formality of ratification, the world then has a new set of regulations and a new table of allocations. But these don't go into effect right away; such procedure would be impracticable. It takes time, for instance, to make equipment changes that might be required by new technical regulations for ship installations, or to print and distribute new callbooks and Q signals, just to take a few simple examples. From the allocations standpoint, it obviously is impossible to make the required shifts in services without considerable preparation; new crystals and sometimes new transmitters have to be obtained, perhaps even whole new antenna layouts. Circuits have to be shifted, and that can't be done overnight. So from every standpoint, it is desirable and customary to put an effective date on the new regulations sufficiently far in the future to enable everyone to meet the obligations imposed by the new requirements. The provisions of the Washington conference of 1927 didn't become effective until 1929; the Madrid regulations, arrived at in 1932, didn't become effective until 1934; the Cairo regulations were written in early 1938, but they didn't take effect until the latter part of 1939.

All we've said so far explains the reason for an effective date some time after the conference but it doesn't explain why this January first couldn't be effective for the whole allocation table instead of, as is the case, only part of it. Why not the whole table?

The answer to that is the extensive nature of the changes being made in allocations in the region below 27.5 Mc. We amateurs may not think Atlantic City changed the allocation table very much; it's another story for the other services! Virtually wholesale changes are in the works for them, to an extent that amateurs unfamiliar with the details of the allocation table can scarcely appreciate. These complications arise from the inevitable increase of space for h.f. broadcasting — because the majority of the nations wanted it — and the necessity for carving out of the spectrum sufficient operating frequencies for what is almost a brand-new service, from the standpoint of the international allocations table: aviation. Between the two of them, they made it necessary to find hundreds of kilocycles in the spectrum between 2 and 27.5 Mc. Those channels had to come out of a spectrum in which there are no unassigned frequencies.

Well, they came. But what it means to the radio world is the biggest readjustment for other services that the radio world has faced since the Washington conference of 1927 first created assignments on the high frequencies. Entire bands of frequencies heretofore assigned to the maritime-mobile service have disappeared; not only must the ship stations operating there shift to new frequencies, but the shore stations with which the ships communicated must also shift. Fixed circuits established in bands now to be assigned to aviation or broadcasting (or now in the 21-Mc. amateur band) must move. Move, yes — but where? The Berne list of frequency registrations has stations assigned on every available channel from top to bottom; more than that, there is usually more than one assignment for the same channel, and any subsequent registrations after the
"first" must accept a lower priority, operating only if no interference is caused to the earlier registrant or registrants. Some of the circuits that must be shifted, however, are in themselves "priority" circuits, whose operation is vital; somehow a way must be found to continue them in spite of the fact they have no chance of assuring themselves of continuing rights if they move in on presently-registered assignments.

The radio world, confronted with this apparently insurmountable problem, took the plunge—it decided to wash out all the old system of registrations under the Berne procedure, to throw the whole thing overboard bag and baggage, and to make a completely new start on an "engineered" allocation of every single one of the existing fixed and coastal and broadcast and ground stations in the world. They decided to do this by assembling at Geneva, Switzerland, the experts of the world on these circuits and their requirements, armed with circuit-by-circuit lists of their operating requirements and assisted by propagation experts to help them engineer precisely the right frequencies required—but only those actually required—for their operation. They would employ to the fullest extent, as indeed they are forced to, such technical expedients as geographical and time sharing of frequencies, low-power relays to permit more operation simultaneously on the same frequency in widely-separated regions, and such operating expedients as multiplexing, forked circuits, etc.

And they decided that when they got the job done, but only when, they would have another administrative conference to approve it, and fix a date when the new table and the new set-up would go into effect.

When will that be? Well, the job started just a year ago. The United States, as did other nations, sent a sizable group of Government and industry people to Geneva, where they have been living and working daily ever since. In Washington, a "home team," meets frequently and long to keep them supplied with essential data. Much work has been done, but much still remains to be done. As of this writing, announcement has been made that a "target date" of May 17, 1949, has been set for completion of the new list, so that the special conference to approve it can be called next October 17th. Whether the schedule can be kept is open to question. But if no complications develop, if both these take place on schedule, and if the conference in October approves the job now being done in Geneva, it would be reasonable to expect that the Atlantic City table below 27.5 Mc. could be made effective almost immediately thereafter.

At that time, but not before, two things will happen simultaneously as concerns us amateurs in this below-27 Mc. region: we lose the top 50 kc. of the 14-Mc. band, and we gain the 450-ke. band at 21 Mc.

--- A. L. B.

A Merry Christmas
To Hams Everywhere
—— The Staff
at Headquarters

OUR COVER

The boys who like to collect surplus bargains were quick to snap up "doorknob" tubes at the super-bargain prices recently quoted, but using them turned out to be another matter. This month our V.H.F. Editor describes a simple 420-Mc. oscillator, which should help to get some of these neat little bottles into service.

In our cover picture, LeRoy Waggoner (now known around La Salle Road as "The Hands") checks the transmitter frequency at 440 Mc. Four pilot lamps glowing brightly indicate an output close to 10 watts.

FEED-BACK

F. A. Bartlett, W6OWP, contributor of "Further Advances in Electronic-Keyer Design," October, 1948, QST, advises that the values of $R_s$ and $R_{11}$ in Fig. 2 should be transposed. Correction of the circuit along this line will make possible proper keying action of $R_{24}$.

A note from Cal Hadlock, W1CTW, coauthor of "Improving F.M. Transmission Techniques," November, 1948, QST, regretfully informs us that his manuscript was in error in specifying 0.47 megohm as the value for $R_{15}$, Fig. 1. This resistor should be 470 ohms.

SWITCH TO SAFETY!
The "Basic" 'Phone Exciter
Single or Double Sideband or P.M. from One Transmitter

BY BYRON GOODMAN,* W1DX

While the gadget described in these pages is called a "basic" 'phone exciter, it is actually a single-sideband exciter, with p.m. and double-sideband a.m. thrown in at no extra cost. Also included is adjustable carrier injection, a necessary adjunct to the a.m. and p.m. and a big help in raising operators who don't recognize a carrierless single-sideband signal for what it is or whose receivers suffer from atrophy of the b.f.o.

The output of this unit is on 5.2 Mc., so that a subsequent mixer and a 9-Mc. oscillator will heterodyne the signal to either the 75- or 20-meter 'phone band without complication and with a minimum of adjustment.

If you have been waiting for a "how-many-turns" article on the phasing system of single-sideband generation, here it is.

The principles described by W2KUJ earlier this year 1 make it possible to build a single-sideband exciter unit that has just about everything in it. One three-position switch gives a choice of double-sideband a.m., p.m., or single-sideband. Another switch flips the unit to one sideband or the other, when you are using single sideband. A third control governs the amount of carrier radiated, which can run anywhere from enough to avoid overmodulation on a.m. to something like 25 or 30 db. down from this value. Lacking only f.m. (but substituting p.m.), it can truly be called a "basic" 'phone exciter. This article will tell how to build and adjust such a device — the theory of operation was covered in the original disclosure.


You might wonder why we even bother with the other modes if they are so inferior to single sideband. There are two reasons, and they are both good ones. First off, the other modes are easily obtainable from the single-sideband exciter circuit, requiring the addition of only one switch to make them available, so you get them "for free." Second, they come in handy when you are testing the device, or comparing the various systems. Actually, you don't need the double-sideband position, but it's convenient if you want to prove to yourself (and others) that the "quality" doesn't suffer with single-sideband operation. The p.m. comes in handy if you have sporadic BCI trouble. The adjustable-carrier feature is a "must" until most operators recognize and know how to tune in a suppressed-carrier signal. With this exciter, all you have to do is to put in enough carrier to give a single-sideband-full-carrier signal and call in the usual manner. Then, after you raise the unsuspecting victim, you can explain to him that you have single sideband and how he can tune it in, if he doesn't already know. Then you reduce your carrier and hop up your single-sideband output (to make full use of your output stage), and you're in business. So, until such time as a large number of operators recognize single-sideband signals or use receivers that don't distinguish between single-sideband-reduced-carrier and normal a.m. signals, 2 adjustable carrier injection is a very desirable feature.

The basic unit uses receiving-type tubes throughout, and generates a 5.2-Mc. signal, at a low level. Having once generated the signal at this frequency, it is a simple matter to heterodyne to either 3.9 or 14 Mc. with a 9-Mc. oscillator. Hence following this exciter with a mixer and a 9-Mc. oscillator provides for 75- or 20-meter operation merely by using the proper coils in the output of the mixer and in the following amplifier stages. With the basic signal generated at 5.2 Mc., all you do to change bands is to change coils, and all you do to change frequency within a band

A "basic" 'phone exciter unit. The controls along the front, from left to right, are audio gain control, double-sideband / phase modulation / single-sideband selector switch, sideband selector switch, and carrier-amplitude control.

January 1949
carrier is combined with a pair of sidebands originally related to a carrier different by 90 degrees.

The audio phase-shift networks and the balanced modulators used in this exciter were described by W2KUJ, and you can refer to the earlier article for explanations of them. The r.f. circuit in this unit was devised by W2KUJ but not described, so a few of the salient points will be mentioned. The circuit is shown in Fig. 2. Two similar tanks are link-coupled and both tuned to resonance, resulting in a 90-degree difference in r.f. at the two circuits. Low-impedance push-pull output to drive the balanced modulators is obtained across the 680-µfd. condensers. Equal-amplitude r.f. at A and B is obtained by adjusting the link coupling between L1 and L2, and the over-all magnitude of the r.f. is controlled by the plate and screen voltage on the 6S7. Phase and amplitude adjustments are provided at the grids of the balanced modulators, so that the carrier can be balanced out easily.

The detailed audio circuit is shown in Fig. 3.

If you don't want to include the 3000-cycle low-pass filter you don't have to, of course, but it's easy to incorporate and doesn't add much to the cost. However, you should have something in your audio amplifier to attenuate frequencies above 5000 cycles, because the audio phase-shift network used in this unit begins to fall down above 5500 or 6000 cycles. If you already have a speech amplifier capable of a few volts output, you can use it instead of the one shown in the diagram. But notice that, in this exciter, the speech amplifier plus the audio phase-shift networks represent all of the speech equipment. You can

![Fig. 1 — A block diagram of the basic exciter. As shown, a single-sideband signal is generated, and any amount of carrier can be added through the "Carrier Amplifier." Reversing the push-pull audio input to either of the balanced modulators shifts to the other sideband. Disabling "Balanced Modulator A" and injecting sufficient carrier results in a double-sideband (a.m.) signal. With "Balanced Modulator A" operating, "B" disabled, and carrier inserted, a phase-modulated signal is obtained in the output.](image1)

![Fig. 2 — Basic circuit of the crystal oscillator and 90-degree r.f. phase-shift circuit. The plate circuit of the 6S7 is tuned to resonance by adjusting the slug in L1, and low-impedance push-pull r.f. is obtained at point A. The other tuned circuit is tuned close to resonance with the slug in L2 and tuned carefully with the 10-µfd. trimmer. When this circuit is tuned to resonance, push-pull r.f. appears at B that is different by 90 degrees to that at A. The amplitudes of the r.f. at A and B are made equal by adjustment of the coupling link between L3 and L2, and the over-all amplitude is controlled by the value of Rc.](image2)
Fig. 3 — Wiring diagram of the audio amplifier used in the basic exciter. The low-pass filter is not necessary for the proper generation of a single-sideband signal, but its use is recommended in all 'phone transmitters.

C1, C3 — 10-µfd. 25-volt electrolytic.
C2, Cs — 0.5-µfd. 400-volt paper.
C4 — 0.0022 µfd.
Rs — 0.25-megohm volume control.
C9 — 0.05-µfd. paper.
Rs — 2200 ohms.
C12 — 0.035-µfd. (0.03 + 0.005) paper.
Rn — 22,000 ohms.
C10 — 0.03-µfd. paper.
R12 — 5600 ohms.
C1a — 1.0-µfd. 400-volt paper.
Ria — 0.22 megohm.
C12 — 0.0068 µfd.
R1, R5 — 1.0 megohm.
R4 — 0.27 meorighm.
R8, R10 — 65,000 ohms.
R9 — 0.25-megohm volume control.
R7 — 1000 ohms.
R5 — 2200 ohms.
R9, R14 — 47,000 ohms.
R11 — 22,000 ohms.
R12 — 5600 ohms.
R13 — 0.22 megohm.
L1 — 0.25 by. (Millen 34400-250).
L2 — 0.20 by. (Millen 34400-200).
L3 — 0.075-hy. (Millen 34400-75).

Fig. 3 — Wiring diagram of the audio amplifier used in the basic exciter. The low-pass filter is not necessary for the proper generation of a single-sideband signal, but its use is recommended in all 'phone transmitters.

C1, C3 — 10-µfd. 25-volt electrolytic.
C2, Cs — 0.5-µfd. 400-volt paper.
C4 — 0.0022 µfd.
Rs — 0.25-megohm volume control.
C9 — 0.05-µfd. paper.
Rs — 2200 ohms.
C12 — 0.035-µfd. (0.03 + 0.005) paper.
Rn — 22,000 ohms.
C10 — 0.03-µfd. paper.
R12 — 5600 ohms.
C1a — 1.0-µfd. 400-volt paper.
Ria — 0.22 megohm.
C12 — 0.0068 µfd.
R1, R5 — 1.0 megohm.
R4 — 0.27 meorighm.
R8, R10 — 65,000 ohms.
R9 — 0.25-megohm volume control.
R7 — 1000 ohms.
R5 — 2200 ohms.
R9, R14 — 47,000 ohms.
R11 — 22,000 ohms.
R12 — 5600 ohms.
R13 — 0.22 megohm.
L1 — 0.25 by. (Millen 34400-250).
L2 — 0.20 by. (Millen 34400-200).
L3 — 0.075-hy. (Millen 34400-75).

Go from a watt to a kilowatt and only add r.f. amplifiers — you already have all of the audio gear you need!

The rest of the circuit is shown in Fig. 4. All of the components in this exciter are standard over-the-counter parts, with the possible exception of the low-tolerance resistors in the phase-shift networks. High-grade resistors are used here because of their greater stability over long periods of time, but they probably aren’t an absolute “must.” We know of several rigs that have been built with standard units, but here we stuck to the recommendation of W2KUJ and used precision units. The condensers in the phase-shift networks are mica units shunted by adjustable mica compression trimmers, since you will want to adjust the networks for best results. Here again you might cut corners, if you have access to a capacitance bridge (W6YX and W6DHG built their rigs without the adjustable feature), but being able to “tune” the networks is highly convenient.

How much trouble you take with the networks depends entirely on how good you want to make your rig. For example, you might use the network configuration described by W6DHG and W6YXT and, by carefully measuring the components beforehand, get a minimum attenuation of the undesired sideband of from 20 to 25 db., over a modulation-frequency range of 130 to 3600 cycles. Using the network in this range and adjusting it carefully, you can get a minimum attenuation of around 30 db., from 70 to 5000 cycles. The latest network constants with careful adjustment will give close to 40 db. minimum attenuation over the same range. One big advantage of the latter two networks is that they can be adjusted after wiring into the set — that used by the W6s cannot. The simpler network, while it cannot be adjusted, saves four tubes. This might be a factor in some cases, even though the tubes are only receiving types.

The values of the network components are shown in Table I. Each pair of plate and cathode resistors (e.g., R11, R18) should be matched as closely as possible to each other, but they can depart from the “book” value by 1 per cent or so with no ill effects. Since they should stay matched over a long period of time, precision resistors of the types mentioned in the table are strongly recommended.

The resistance and capacity value for each stage (e.g., R13 and C13) are adjusted so that the resistance is equal to the reactance of the condenser at the “check” frequency. This is done in this unit by making the capacity adjustable. This is no trick with the smaller values of capacity, but the larger ones may require some experimental paralleling of smaller condensers. The values in the table are the “book” values, and variations from the exact resistance are made up by adjusting the capacity value to match. The resistors dissipate no power, and it might be possible to get along with regular types, but the precision units are usually better protected against temperature and humidity effects.

13
Fig. 4 — Circuit diagram of the single-sideband exciter.

**Construction**

The photographs show how the unit was built on a 13 X 17 X 3-inch chassis. We allowed plenty of room, and there is no doubt that the thing could be made smaller. However, the extra space makes working on the unit a simple matter. Usual practice was followed throughout, and there isn't anything tricky about the construction. The output circuit is mounted on a shield can above decks, but this is just a National XR-50 form wound with the proper coil and shunted by a fixed condenser. The tuning is done with the iron slug in the coil. The link coupling between $L_1$ and $L_2$ will require adjusting, so it should be left free to slide up and down until the adjustment is complete, after which it is made secure with a few drops of Duco cement. The trimmer condenser $C_{4a}$ is insulated from the chassis with a pair of fiber washers.

The wiring in the audio end of things is conventional, and no great pains need be taken, although you do want to keep the hum level down.
as low as possible. The main point to watch in wiring the audio phase-shift networks is to provide for ready access to the cathodes involved, because these are used as test points when aligning the set. In the r.f. end of things, make R_{33} easy to get to, because you may want to change it during the tune-up process. The "hot" r.f. leads from C_{42}, C_{43}, C_{15}, and C_{19} to their respective modulator tubes are shielded wires, as indicated in Fig. 4.

Audio Alignment

It is possible that in the future means may be devised for aligning a unit of this type without an oscilloscope, an audio oscillator and a vacuum-tube voltmeter. For example, if 90-degree audio phase-shift networks were for sale "over the counter," you could do a fair job of checking the unit with just a receiver and a multimeter. But until such things are available (enterprising dealers please note!), it is best to rely on the instruments named above. You don't have to own them -- you just have to know people who do.

The first step in getting the oscillator working is to check the shift through the audio networks This requires an oscilloscope and an audio oscillator. The audio from the oscillator is fed in at the point marked "Audio Input" in Fig. 4, because one of the check frequencies wouldn't be passed by the audio filter. Connect the vertical and horizontal amplifiers of the 'scope across R_{15}, and set the audio frequency to 2710 cycles, the first "check" frequency. Adjust the gain of the 'scope amplifiers until you get a line that slants at an angle of 45 degrees. If it is a thin straight line, you have 'scope amplifiers with equal phase shifts, but if the best you can get is a thin ellipse, you will have to compensate one of the amplifiers. This generally means simply putting a resistor in series with one of the leads, and adjusting the resistor value until you get the single straight line. Or, it may be necessary to shunt a condenser across the amplifier input, in some cases. In any event when you have the straight line, you are ready to go ahead. Remove the lead from one of the amplifiers and connect it across R_{21}. If C_{15} is set properly, you will get a circular pattern on the 'scope, or rather an ellipse with one axis horizontal and the other vertical. If the ellipse is canted, a slight adjustment of C_{15} should bring it into line. If it is found impossible to correct the pattern, it indicates that the resistor is too far from the correct value and the condenser cannot be adjusted through the correct capacity. If the ellipse is not smooth all around, the audio level is too high and something is overloaded.

With both 'scope leads on R_{21}, recheck the 'scope amplifiers at 382 cycles for the single straight line canted 45 degrees. If a thin ellipse is obtained, correct one of the amplifiers as described above. Then transfer one lead to R_{24}, and adjust C_{15} for the correct ellipse.

With both 'scope leads on R_{24}, check the amplifiers at 35 cycles, transfer one lead to R_{27} and check the ellipse. Since C_{17} is a large condenser, it is best to bring it to the right value by adding additional mica units across it, or by making minor corrections in R_{35}.

The same alignment procedure is repeated in the other phase-shift channel, starting at R_{41} and a frequency of 10,840 cycles. Once you find your way around in these networks, the actual alignment procedure takes very little time, unless one of your values is in error quite a bit and you have to scurry around to correct it.

If you are using a 'scope in which the amplifiers have similar phase shifts regardless of the gain-control settings, another way to align the networks is to connect one amplifier across R_{15} (for example) and, at the check frequency of 2710 cycles, adjust for a deflection of, say, 10 divisions. Then disconnect this amplifier and connect the other amplifier across R_{21} and set it for the 10-division deflection. Then when you reconnect the first amplifier across R_{15} you can adjust C_{15} for a perfectly circular pattern. And so on down the line. This is a more accurate alignment method, but it does require good 'scope amplifiers.

When you are finished, confirm the action of the two networks over the range by connecting one amplifier across R_{27} and the other across R_{35}, after first setting the amplifiers to equal gains. Then, over a range from 70 to 5000 cycles, you should get a pattern that deviates very little from a true circle. If you find a point where it does, check the phase shift of the 'scope amplifiers, and you will probably find the trouble is in

<table>
<thead>
<tr>
<th>Component</th>
<th>Check Freq. (cycles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_{15} = 398 µfd. (880 adjustable)</td>
<td>2710</td>
</tr>
<tr>
<td>R_{15} = 10.0 megohm</td>
<td>382</td>
</tr>
<tr>
<td>C_{16} = 745 µfd. (470 + 580 adjustable)</td>
<td>382</td>
</tr>
<tr>
<td>R_{16} = 0.66 megohm</td>
<td>382</td>
</tr>
<tr>
<td>C_{17} = 9.10 µfd. (5000 + 3.5%)</td>
<td>382</td>
</tr>
<tr>
<td>R_{20} = 0.66 megohm</td>
<td>382</td>
</tr>
<tr>
<td>C_{21} = 298 µfd. (380 adjustable)</td>
<td>10,840</td>
</tr>
<tr>
<td>R_{22} = 51,000 ohms</td>
<td>10,840</td>
</tr>
<tr>
<td>C_{18} = 1000 µfd. (1200 + 880 adjustable)</td>
<td>997</td>
</tr>
<tr>
<td>R_{45} = 0.10 megohm</td>
<td>997</td>
</tr>
<tr>
<td>C_{24} = 2010 µfd. (1800 + 880 adjustable)</td>
<td>140</td>
</tr>
<tr>
<td>R_{46} = 0.56 megohm</td>
<td>140</td>
</tr>
<tr>
<td>R_{21} = 1000 ohms</td>
<td>140</td>
</tr>
<tr>
<td>R_{35} = 2000 ohms</td>
<td>140</td>
</tr>
<tr>
<td>R_{25} = 3000 ohms</td>
<td>140</td>
</tr>
<tr>
<td>R_{26} = 4000 ohms</td>
<td>140</td>
</tr>
</tbody>
</table>

Resistors are ±2% values, ½-watt rating (Continental Carbon "Noblocloy" or IRC BTS). Fixed condensers are ±5 or ±10% values. Adjustable mica padders are El-Menco Type 46 trimmer condensers. * May require several smaller mica condensers in parallel.

---

January 1949
the 'scope amplifiers and not in your network, if you have been careful in your procedure.

The R.F. Alignment

Most of the hard work is done now. The first step in the r.f. alignment is to adjust the output of the crystal-oscillator stage and the other tuned circuit to give about 1-volt r.f. signals at the grids of the 6SA7s. You can check that the oscillator stage is working by tuning in the signal on a receiver. Then adjust the slug in $L_1$ until a maximum r.f. voltage appears at the grids of Balanced Modulator B. If this voltage is too high above 1 volt, increase the value of $R_{45}$. You can measure the voltage with a vacuum-tube voltmeter, or by temporarily biasing the modulator tubes to 1.5 volts (with a dry cell) and checking to see if there is any grid current through $R_{45}$ and $R_{46}$. (You are using the tube as a slide-back voltmeter.) Make the same check at $R_{44}$ and $R_{46}$, with $L_4$ tuned for maximum signal at the grids. If the r.f. voltage at the grids of Balanced Modulator A is not within 5 per cent of that at B, move the links on $L_1$ and $L_2$ until you get what you want. Start out with too little coupling, to avoid any double-hump tuning. You won’t be able to get all of the r.f. voltages to exactly the same value without trimming $C_{45}$, $C_{46}$, $C_{48}$ and $C_{49}$, but don’t worry about it if they are all within 5 per cent of each other.

Pull out the “Carrier Amplifier” tube, and connect the output at $J_5$ to your receiver. Set the receiver on a.v.c. and tune in the 5.2-Mc. signal that is coming through. Then tune the slug in $L_5$ to peak the signal. If you knock your S-meter off scale at this point, short your antenna input with a small resistor until you can get back on scale. With $S_1$ set for “SSB,” adjust $C_{27}$, $C_{28}$, $R_{38}$ and $R_{40}$ for minimum signal in the receiver. You are now “balancing” the balanced modulators, and you will find that this works just like the book says. With no trouble at all, and in less time than it takes to read about it, you should find the setting where very little signal gets through to the receiver.

The next step can be done on a ‘scope or on the receiver. Assuming you are using a receiver, leave it connected as described, with the a.v.c. on. Feed in the audio oscillator at a low level through the microphone circuit, at 1000 cycles or so. Your S-meter will go off scale as you increase the level, so short out the receiver input with 10 or 20 ohms and put a resistor in series to the “hot” side of $J_3$ until you get back on the S-meter scale. The audio output from the receiver will be an audio tone. Adjust $C_{48}$ for minimum audio output from the receiver, and do the same for either $R_{48}$ or $R_{38}$. (One of these is generally enough.) Now run the audio oscillator up and down the scale. You should hear little or no modulation on the signal, at any frequency.

The equivalent check on the ‘scope requires that the output at $J_5$ be link-coupled to a tuned circuit connected directly to the vertical plates of the ‘scope. With the 1000-cycle audio signal at the microphone jack, a pattern vaguely similar to an a.m. envelope should appear on the ‘scope. As you adjust $C_{48}$ and $R_{38}$ (or $R_{48}$), the modulation should decrease, and you should minimize it for the correct adjustment. The correct pattern for a single-sideband signal (no carrier and a single modulation frequency) is what you are used to thinking of as an unmodulated carrier. If everything is perfect, no trace of modulation will appear, but everything won’t be perfect, rest assured of that! However, over the entire audio range (limited by your audio filter, of course), the ripple should be small. Since this ripple can be introduced by harmonics generated in the audio amplifier, harmonics present in your audio signal generator, carrier leaking through or past the balanced modulators, and incorrect audio and r.f. phase and amplitude, you can see why we aren’t too afraid that it will all be perfect.
The pattern should be the same for either position of \( S_2 \). If it isn’t, it indicates that your audio network isn’t perfect, but you know that the network isn’t exactly right except at a few frequencies. If the ripple has the same order of magnitude at either setting of \( S_2 \), you are doing quite well.

All that is left to do now is to plug in the “Carrier Amplifier” tube and retune \( L_3 \), to compensate for the output capacity of the added 6SJ7. The tube was left out during the alignment procedure to avoid the chance of some carrier leaking through the tube. Even with \( S_3 \) open you may get a little more carrier leaking through than you do with the tube out of the socket, but it isn’t enough to bother anyone on the air. On p.m. and double sideband, you have to insert carrier sufficient to prevent distortion and over-modulation, and your 'scope will help you to determine these levels.

**Power Supply**

We haven’t mentioned the power supply up to this point, but it is an important part of the system. The B+ side of the phase-shift network has to be “stiff,” and the best way to keep it this way is with an electronically-regulated supply.\(^6\) The supply we used furnishes 250 volts regulated, 250 volts unregulated, -105 regulated (for the various biases), and a lead to the two VR-105s across the screens of the balanced modulators. The diagram is shown in Fig. 5.

### General

While the description of this unit may seem long and involved, it is only the result of trying to make the description as complete as possible. Naturally, questions will crop up that have been left unanswered, but we feel that anyone with a little familiarity with the use of a 'scope and an understanding of what he is trying to do will have no trouble with his single-sideband exciter. As mentioned earlier, if prealigned audio networks were available the exciter could be set up using only a receiver and perhaps a vacuum-tube voltmeter. Using the later type of network, one could dispense with the electronically-regulated power supply.

On single-sideband with single-tone modulation, the output at \( J_2 \) is about 0.1 volt across 300 ohms, and working into a tuned circuit will give about 20 volts. This is more than enough, of course, to drive any small mixer tube. The combination used at WIDX consists of a pair of 6K8s in a balanced mixer circuit, followed by a neutralized Class A 6AG7 driving a Class B 829-B. On a.m. the 829-B will comfortably handle a carrier output of about 20 watts, and on p.m. the carrier output can run close to 80 watts. In single-sideband operation, the 829-B will loaf along at a peak sideband output of 80 watts, but this gives a signal equivalent to an a.m. 'phone with 160 watts carrier output (about 225 watts to the modulated stage). As an amplifier for a single-sideband signal, the 829-B is the equivalent of a quarter-kilowatt a.m. 'phone.

Because of space limitations (and the fact that this article is plenty to chew over at one sitting), nothing has been said about the design and adjustment of the converter and output stages. But it is in the works and will be presented in the near future. The important thing to know is any and all converters and amplifiers following this exciter unit should be linear, which means using Class A or Class B amplifiers. The general practice seems to be to use Class A amplifiers at low levels (receiving tubes) and Class B when running powers above 10 or 20 watts.

---

\(^6\) The audio phase-shift network described in footnote 3 is a later development and does not require quite such a "stiff" power supply. — Ed.
80 and 40 on Wheels

A 20-Watt 'Phone-C.W. Rig for Mobile, Portable-Emergency and Fixed-Station Use

BY RICHARD M. SMITH,* WlFTX

M ighty mobile! Are you nuts? — it ain’t worth the bother!” Well, that’s not an uncommon attitude, and it was to combat the objections voiced by our imaginary friend that the 20-watt rig described here was built. Used with a versatile power supply that permits operation from either the car battery or from regular 115-volt a.c. lines, it fills the bill nicely for that long-desired mobile rig for the buggy, serves as a fun-producing QRP rig for home use, and is ever-available for instant use should disaster strike. Thus, you kill three birds with one stone, taking care of mobile, fixed-station and portable-emergency rigs.

The Circuits

The r.f. end of the rig is handled capably by a 6AK5 crystal oscillator that drives a 2E26 amplifier. The oscillator uses a crystal in the 3.5-Mc. range, and will deliver output either at the fundamental or at the second harmonic of the crystal. The plate coil of the oscillator covers both bands, 3.5 Mc. with the condenser set near maximum capacity, and 7 Mc. near minimum, thus eliminating the need for plug-in coils. Capacity coupling is used to series-feed the grid of the 2E26. The parallel-fed plate circuit of the 2E26 is a pi-section affair with a tap switch to adjust the circuit to optimum conditions for loading into random lengths of antenna wire on either band. A small r.f. choke in the plate lead eliminates v.h.f. parasites.

In the audio department, a 6N7 Class B modulator, self-biased to restrict current drain, is driven by a Class A triode, half of a 12ACT7. (This tube includes two separate triodes, each of which has the same characteristics as a single 6DJ.) The other triode section is used as a voltage amplifier to step up the output of a T-17 single-button carbon microphone. This particular mike has very low voltage output, and a miniature transformer is used to boost it to the required level. With microphones having higher output, the transformer may be unnecessary. The modulation transformer is connected to match the 8000-ohm plate-to-plate load impedance of the 6N7 to a 4000-ohm load, which is close enough for the nominal 4300-ohm impedance of the 2E26 plate and screen. C7 is connected across the primary of the modulation transformer to eliminate a parasitic that showed up in the Class B stage; otherwise the circuit is standard.

A three-section three-position switch is used as the 'phone-c.w. switch. It is connected so that voltage is applied to both the audio and r.f. units when 'phone operation is desired, and to the r.f. unit alone in c.w. operation. The cathode returns of both tubes in the r.f. unit are brought out together; this lead is used with the switch in the microphone to provide “push-to-talk” control for ‘phone operation. It is also the break-in keying lead in c.w. operation.

The microphone and key plug into a small control box designed to be mounted on the steering post of the car. The microphone battery and a series resistor to limit microphone current are mounted in the control box.

The power supply uses one of the Handbook circuits, slightly modified to provide the charac-

* Technical Assistant, QST.
Heater lead to Audio Unit
Keying and Stand-by lead to Audio Unit

Fig. 1 — Schematic diagram of the r.f. unit.

C1, C2 — 0.01-µfd. paper, 600 volts.
C3 — 0.0047-µfd. mica, 500 volts.
C4 — 47-µfd. mica, 500 volts.
C5 — 250-µfd. variable (National STH-250).
C7 — 0.0068-µfd. mica, 500 volts.
C8, C9 — 335-µµfd. variable (National STH-335).
R5 — 47,000 ohms, ½ watt.
R6 — 36,000 ohms, 1 watt.
R7 — 22,000 ohms, 1 watt.
R8 — 15,000 ohms, 10 watts.

Characteristics needed by this particular rig. Any supply capable of providing 300 volts at 100 ma. or more will suffice, whether it be from a vibrator, dynamotor, or batteries.

Construction

Mechanically, the transmitter proper is made up of two separable units housed in a standard 9 X 5 X 6-inch steel utility box. The r.f. unit is on a small chassis folded from sheet aluminum, and on a portion of one cover of the box — which also serves as the "panel." The aluminum chassis is 6 inches long, 4½ inches wide, and 1 inch deep, small enough to be made with tools no more elaborate than a vise, a ball-peen hammer, and a couple of extra sheets of aluminum to serve as stiffening material while the bends are folded. All parts in the r.f. unit with the exception of the plate coil and tap switch are mounted on the chassis as shown in the photograph. The switch, however, is mounted on the cover of the box, and the coil is mounted directly behind it, supported at one end by a 2-inch ceramic stand-off insulator and at the other by a short length of No. 14 solid copper wire that extends from the feed-through insulator used as the antenna post to the tuning condenser below it. Additional support is provided by the tap wires that run from the coil to the switch.

Parts placement underneath the r.f. chassis is a very important consideration, from the mechanical end, because there must be enough clearance...
between these parts and the components mounted on the top of the audio chassis. The arrangement shown in the photograph provides sufficient clearance, with the oscillator plate coil and tuning condenser mounted along one edge where they extend down into the space just above the driver transformer and the 12AU7 on the audio chassis. The smaller parts in the r.f. unit are mounted near the other edge, as close to the chassis as possible to insure adequate clearance for the modulation transformer and the 6N7 on the left-hand side of the audio unit. A little care in parts placement and wiring will do the job so that nothing gets shorted to the high voltage when the two units are bolted together.

The audio unit is built on a similar small chassis having the same surface dimensions and depth as that used for the r.f. unit, but with ¼-inch lips bent into the vertical sides of the chassis to provide "rails" on which the assembly rides when it is being slipped into the utility box. Included in the audio unit are the 'phone-c.w. switch and the audio gain control, which mount with their shafts extending through the cover of the box. The parts mounted beneath the audio chassis are visible in the bottom view. As in the case of the r.f. unit, all parts are mounted as close to the chassis as possible.

The two chassis are fastened to the cover of the box by 6-32 screws which pass through the front apron of the chassis. Aluminum strips 4½ inches long by 1 inch wide serve as braces between the two chassis at the rear. A similar strip 1½ inches wide, at the front on the right side, provides a mounting strip for the two Amphenol connectors used to bring the supply voltage and the control circuits into the unit. A cut-out is made in the edge of the utility box to clear the prongs of these connectors when the assembly is slipped into its housing.

**Power Supply**

The power-supply circuits are shown in Fig. 3. A combination transformer is used to permit operation from either the 115-volt a.c. line or the 6-volt car battery. Two 6X5 tubes are used in parallel to carry the total current drain of about 110 to 120 ma., which exceeds by far the 75-ma. rating of a single tube. An extra-large capacity, 32 µfd., is used as the output condenser (C6) to improve the regulation on modulation peaks. Hash filtering is accomplished by chokes and by-pass condensers. Separate output connectors are used for 6-volt and 115-volt power sources. When operating from a 6-volt d.c. source, d.c. is applied to the heaters direct from the battery. When 115-volt a.c. input is used, the other connector applies 6.3 volts a.c. to all heaters from the transformer secondary. A single-pole double-throw switch, S2, is used to switch the heaters of the 6X5 tubes from the battery to the transformer when changing from d.c. to a.c. operation.

All parts in the power supply are mounted on a home-built aluminum chassis measuring 4½ × 8¼ × 1 inches. A bracket is mounted at one end of the chassis to hold the output connectors and the on-off switch. The input cables pass through grommet-lined holes just below the connectors. The entire supply may be enclosed in a steel utility box the same size as that used for the transmitter unit as shown in the photograph. An opening is cut through one end of the box to permit access to the bracket on which the connectors and the toggle switch are mounted.

**Control Circuits**

The control circuits have been simplified as much as possible without sacrificing operating convenience. The control box is a standard 4 × 4 × 2-inch utility box with a mounting bracket made of sheet aluminum bolted to one of the covers to permit it to be clamped to the steering post of the car. Jacks for both the microphone and the key are mounted on the box, which also contains a small 4½-volt battery to supply microphone voltage as well as the series limiting resistor. A 5-terminal receptacle is mounted on
C1 — 0.1-μfd. paper.
C2, C3 — 10-μfd. 25-volt electrolytic.
C4 — 8-μfd. 450-volt electrolytic.
C5 — 0.01-μfd. paper.
C6 — 50-μfd. 50-volt electrolytic.
C7 — 0.0066-μfd. mica, 500 volts.
R1 — 470,000 ohms, 1/2 watt.
R2 — 2200 ohms, 1/2 watt.
R3 — 0.1 megohm, 1/2 watt.
R4 — 4700 ohms, 1 watt.

the bottom of the box to bring the control cable into the box from the transmitter unit.

Only two interunit cables are required. One is a three-wire shielded cable that runs from the control box to the transmitter. The other requires three conductors, one for high voltage, one for the heater voltage, and the third for ground. The ground lead and the lead that carries heater voltage should be made of as heavy wire as possible to minimize voltage drop. In our unit we used a seven-conductor cable, using the shield braid for the ground lead, and a single wire for high voltage. The other conductors were tied in parallel.

The control circuits are arranged so that push-to-talk operation is possible, controlled by the switch on the microphone, once the main power switch has been turned on. Likewise, break-in keying is also possible. In 'phone operation, the switch in the microphone closes the cathode circuits of the two tubes in the r.f. portion of the transmitter. In the "stand-by" position the cathode circuits are opened, taking the signal off the air. Plate voltage is still applied to all tubes in the audio circuits but the microphone circuit is opened, so there is no signal input to the grid of the first audio tube. In c.w. operation, the key performs the function of closing and opening the cathode circuits, and plate voltage is removed from the audio tubes by the 'phone-c.w. switch. A more elaborate system can be used if desired to incorporate an antenna-changeover relay and to open the primary circuit of the power transformer, thus removing all plate voltage during stand-by periods. These refinements are not

Januarv 1949

Fig. 2 — Schematic diagram of the audio unit.

![Schematic diagram of the audio unit](image)

Rs — 0.5 megohm potentiometer, audio taper.
R8 — 560 ohms, 1/2 watt.
R7 — 220 ohms, 2 watts.
S1 — 3-pole 3-position rotary switch.
T1 — Midget microphone transformer, e.b. mic. to grid (Inca F-65).
T2 — Driver transformer, single plate to Class B grids (Thordarson T-20706).
T3 — Multitap modulation transformer (UTC S-18, connected to match 8000 ohms primary to 4000 ohms secondary).

Top view of the audio unit. At the right-hand edge are the gain control and the 'phone-c.w. switch. The 12AU7 and the 6N7 are mounted in line behind the two controls. The transformers occupy the rear of the chassis, located in such position that they clear all parts in the r.f. unit, which mounts above them.
Fig. 3 — Circuit diagram of the power supply used with the 20-watt mobile rig. Provisions are made for operation from either the 115-volt a.c. line or from a 6-volt storage battery.

C1 — 0.5-µfd. paper, 50 volts or more.
C2 — 0.005 µfd., 1600 volts.
C3 — 0.01 µfd., 600 volts.
C4 — 8 µfd. 450 volts, electrolytic.
C5 — 32-µfd., 450 volts, electrolytic (dual 16-µfd. condenser with sections in parallel).
R1 — 4700 ohms, 1-watt carbon.
R2 — 25,000 ohms, 20 watts, wire-wound.
L1 — 2.5 hy., 100 ma. filter choke, 100 ohms d.c. resistance (Stancor C-2303).

Fig. 4 — Schematic diagram of the control box. Connections of the 2-circuit plug used with the T-17-B microphone are shown in the sketch at the top.

After the oscillator circuit is working properly, connect the plate and screen voltages to the 2E26 stage, apply grid drive, and tune the plate circuit to resonance. The dip in current at resonance should be quite pronounced, and plate current should be no more than a few milliamperes. Do not keep the key closed for more than a few seconds, because when operated without load the screen current in the 2E26 stage may be excessive. Connect a 15- or 20-watt lamp between the antenna terminal and ground. Close the key again, return the amplifier tuning condenser for resonance, and then tune the antenna condenser until the lamp starts to glow. It will be necessary to return the amplifier plate circuit each time the antenna condenser is readjusted. The extent to which the lamp will load the amplifier stage can be controlled by back-and-forth adjustment of the

Adjustment and Operation

The r.f. portion of the transmitter should be tested before the audio unit is bolted in place, otherwise some of the points that should be checked will be inaccessible. Separate meters may be inserted in the various supply leads during these initial checks. For 80-meter output, insert an 80-meter crystal in the crystal socket. Disconnect the plate and screen voltage from the 2E26 stage. Apply power, and tune the oscillator condenser, starting at maximum capacity, tuning slowly toward minimum. A sharp dip in current, indicating resonance, should be reached before the capacity has been reduced much from maximum setting. Continue on and look for another dip indicating resonance at the second harmonic of the crystal near minimum capacitance. If it is not possible to go through a complete dip at the second harmonic, remove a couple of turns from the oscillator plate coil and check again to make sure that two points of resonance can be found. Once this is achieved, check the grid current developed in the 2E26 stage. It should be possible to obtain at least 2.5 ma. through the grid leak specified, at both the crystal fundamental and the second harmonic.
antenna condenser and the plate tuning condenser. It should be possible to load the 2E26 to 75 or 85 ma. in this manner. When this point is reached, measure the screen voltage. It should be close to 200 volts. If it is much below this, it is possible that the tube is being overdriven, and excitation should be reduced. If it is much over 200 volts, excitation may be insufficient. With the circuit values shown, operation should be close to the figures mentioned above, for both 80- and 40-meter output. A chart of typical operating currents and voltage is shown.

To tune the transmitter for output in the 40-meter band, set the oscillator tuning condenser at the second harmonic first and then tune the 2E26 stage for a dip, as before. Resonance will be found near the low-capacity end of the tuning range of this condenser. Depending upon the antenna, it may be necessary to turn the loading switch $S_1$ to short out some of the turns of the output coil. Operating conditions for 40-meter output are also shown in the table. If there is any doubt that output is actually on 40 meters, check with an absorption wavemeter.

After the r.f. unit is functioning properly, connect the audio unit into the circuit and, with the amplifier loaded as described above, close the microphone circuit and check for modulation. The brilliance of the lamp should increase perceptibly under modulation. If an oscilloscope is available, the percentage of modulation can be checked in the normal manner. In the absence of an oscilloscope, check for carrier shift with an indicating wavemeter. It should be possible to reach 100 per cent modulation on voice peaks with the gain control at about three-fourths maximum.

A record of the operating voltages and currents should be kept for future reference. In addition, the setting of the oscillator condenser for coverage of 80 and 40 meters should be noted. Data on the settings of the amplifier tuning condenser and the antenna condenser can only be obtained with the transmitter operating with its antenna connected, because the settings of these condensers will depend largely upon what sort of antenna is connected to the transmitter.

After the transmitter and its audio system have been checked on the test bench, assemble them and place the completed unit in its cabinet. In actual operation, all tuning is done with a 0–200 ma. meter plugged into the key jack. At this point the meter will read the total cathode current of both tubes in the r.f. portion of the transmitter. Once the individual operating currents have been measured on the test bench, as described above, all tuning adjustments can be made with only the meter in the common cathode lead. If the transmitter is to be operated from a 6-volt d.c. supply, plug the power cable into the d.c. output connector on the power supply, and turn the heater switch in the power supply to the d.c. position. For operation from the 115-volt lines, this switch must be turned to the a.c. position, and the power cable must be transferred to the a.c. output connector.

It should be remembered that the rating of the vibrator used in the supply will not permit sustained loads of much over 100 ma. if maximum (Continued on page 114)

<table>
<thead>
<tr>
<th>Typical Operating Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditions: c.w.; loaded to 110 ma. total cathode current; supply voltage (under load) 390 volts; 80-meter crystal used.</td>
</tr>
<tr>
<td><strong>80-meter output</strong></td>
</tr>
<tr>
<td><strong>volts</strong></td>
</tr>
<tr>
<td>6AK6 plate</td>
</tr>
<tr>
<td>screen</td>
</tr>
<tr>
<td>2E26 plate</td>
</tr>
<tr>
<td>screen</td>
</tr>
<tr>
<td>grid *</td>
</tr>
</tbody>
</table>

* Grid current and voltage will vary widely from these figures depending on tuning. Optimum obtainable values are shown.
Plotting V.H.F. Station Performance Graphically

BY M. R. LUDWIG, W9QHC

Though many of us who work on the v.h.f. bands were attracted to them originally by the lure of the extended ranges that may be worked when unusual ionospheric or tropospheric conditions are present, sooner or later we are bound to be concerned with the minimum ranges which are workable on these bands as well. In addition, some operators are not interested in a band unless it is useful to them at all times, regardless of conditions. Our years of v.h.f. experience have given us much information on the skywave possibilities of 50 Mc., and recently we have had numerous examples of the phenomenal distances which can be covered on 144 Mc., when tropospheric conditions are favorable. The purpose of this paper is to examine the possibilities of these two bands under conditions when aiding factors are present.

Formulas and graphs will be presented which will permit comparison of 6- and 2-meter operation. They also serve to show the improvement in reliable working range which can be expected as a result of increasing the transmitter power, raising the antenna height, or improving the receiver performance. From these charts it is also possible to determine the amount of power required to transmit a given distance on either band.

Many factors must be taken into account in determining reliable v.h.f. working range, but if standard levels are established for each, and all variations from these levels handled in decibels, it becomes relatively simple mathematically. In the discussion to follow, one-watt output from the transmitter and antenna heights of 50 feet are taken as zero levels for these two factors. As seen in Fig. 1, if one of the antennas is raised to 100 feet a 6-db. increase in received signal should be obtained. Raising both antennas to 100 feet increases the signal by 12 db. over the level obtained with 50-foot antennas. A similar situation applies when the antennas are lowered to 25 feet, except that a transmission loss is incurred.

Determining Working Ranges

The curves of Fig. 2 are based on one watt radiated by half-wave dipoles at 50-foot height, and show the working range under normal conditions on 50 and 150 Mc. over a plane earth (curve A) and for the two frequencies with the earth's radius increased to 4/3. If we know the capabilities of our receiver, our transmitter power output, and the gain of our antenna system, we can use these curves to plot our reliable working range on 6 and 2 meters with reasonable accuracy.

The weakest signal which we will be able to recognize is computed by the following formula:

\[
\text{Power (minimum receivable)} = 4 \times 10^{-18} \times \text{receiver bandwidth in kc.} \times \text{receiver noise figure based on power.}
\]

1 Proc. of I.R.E., October, 1947; Bullington, "Radio Propagation Above 30 Mc."

*315 E. 24th St., Minneapolis, Minn.
If we assume a bandwidth of 4 kc, a perfect receiver would give some indication of a signal which is 168 db below one watt, though it would be far from readable if voice-modulated. Since receiver noise figures vary widely it is difficult to determine the minimum detectable signal. Properly-designed circuits permit a noise figure of about 3, and will be able to reveal a signal which is 5 db. stronger than that which could be detected by a perfect receiver. It frequently happens that a receiver will have a high noise figure, because of serious regeneration in the r.f. stage. Such a receiver will appear to be very sensitive because of high internal noise level and sharpness in the r.f. tuning. Because a 15-db. noise figure can be attained by careful workers this value will be employed in the sample calculations. If we allow 10 db. for a passable signal-to-noise ratio and 3 db. for transmission-line losses to the receiver the minimum observable signal input to our receiver would then be 140 db. below one watt.

Since we can receive a signal of 140 db. below one watt, our maximum reliable range is that distance at which the propagation loss is equal to -140 db. (receiver input level) -20 db. (for use of beam antennas having a gain of 10 db. at each end of the path) -5 db. for transmitter power (the rated output level of an SCR-522), or a total of -165 db. Consulting the curves of Fig. 2, we find that this represents a distance of 65 miles on the 6-meter curve and 54 miles on the 2-meter curve.

Let us now investigate the improvement which can be attained with increases in power. Increasing the transmitter power output 10 times (10 db.) permits a maximum propagation loss of -175 db., conforming to 83 miles on 50 Mc. and 67 miles on 150 Mc. This increase in range is comparable to that obtainable with a receiver having a very low noise figure, with no increase in transmitter power. Obviously weak-signal reception is helped considerably by significant reductions in receiver noise figure. Up to line-of-sight distances a power output increase of 16 times is required to double the distance with the same signal level. Beyond line-of-sight this figure increases rapidly, and soon becomes prohibitive.

Since trees and buildings produce a certain amount of scattering and absorption of the transmitted signal, these results apply only to open terrain. The curves are based on an increase of the earth's radius to 4/3 its normal value, this being considered normal for refraction over open areas. It should be emphasized that these figures are acceptable as distances which could be worked in such terrain day and night throughout the year, regardless of conditions. Actually, weather variations will cause considerable increases during a fairly high percentage of the time, but the fact that two stations using SCR-522 transmitters and relatively small beams can work each other consistently over distances in excess of 60 miles on 2 and 60 miles on 6 meters is still too little appreciated in many quarters.

For greater distances they can make the improvements suggested, or wait for more favorable tropospheric or ionospheric conditions, which may multiply these distance figures many times.

Making the Higher Frequencies Pay Off

BY CALVIN F. HADLOCK, * WICTW

When a ham decides to give v.h.f. a try, he usually starts out on two or six meters with a simple transmitter and receiver and a dipole antenna. If he likes the newly-chosen band, he will probably try to extend his working range by improving his equipment. He may increase his transmitter power or take steps to improve the efficiency of his present gear. The receiver may be redesigned or r.f. stages added to give the best possible sensitivity. The antenna will be given consideration to see what can be done there to send and receive stronger signals. Here, in the antenna, is where the greatest improvement for the least cost can be made. What can be expected of the antenna and what should be done to improve it?

The material to follow is intended to be a simple discussion of antenna characteristics, particularly adapted to v.h.f. (or higher) bands. It will be concerned with line-of-sight or extended ground-wave propagation normally encountered at these frequencies, thereby limiting the discussion to transmission in a plane parallel to the

*41 Bellington St., Arlington, Mass.
earth's surface and excluding higher-angle radiation such as is common in the ionospheric transmission of the lower frequencies. In the interest of restricting the discussion to antennas alone, differences in efficiency and sensitivity of the transmitters, receivers and antenna feedlines will be ignored, and we will assume that these are maintained constant if a change in frequency is made, although we know that this is not necessarily true in practice.

Let us start with the dipole which is the simplest form of practical antenna and consists of a single wire or element one-half wavelength long connected to the receiver (or transmitter) by a feeder system which should be adjusted to match the receiver impedance to the antenna by one method or another. We will often hear the remark that a "J" antenna is better than a folded doublet or a "Y"-matched antenna, or vice versa. This is not a comparison of one dipole to another but rather is connected with the degree and ease (or luck) with which each feedline is matched to its antenna. A dipole is a dipole and will intercept the same amount of energy from space regardless of what feeder system is used with it. Whether the maximum amount of this energy gets to the receiver depends on the quality of the feedline and how perfectly this feedline matches the antenna and receiver impedances. If the match is perfect, the antenna and receiver impedances are equal and the maximum energy transfer occurs. Under this condition, half of the energy developed in the antenna is dissipated in the antenna and the other half is delivered to the receiver, minus some unavoidable loss in the feeder. For further discussion, we will ignore feeder loss.

If a transmitter is connected to an antenna so as to deliver power to it, that power is radiated into space in the form of an electromagnetic wave. The strength, or intensity, of this wave decreases as it gets farther from the transmitting source but its intensity can be measured, or calculated, at any point in free space. This free-space field intensity is given by:

\[ E_o = \frac{\sqrt{30G_t P_t}}{d} \text{ volts/meter.} \]  

(1)

where:

\( P_t \) = antenna radiated power in watts,
\( d \) = distance from antenna in meters,
\( G_t \) = power gain of the antenna.

If we assume that the antenna is a point which radiates equally well in all directions, the antenna gain \( G_t = 1 \). Such a theoretical antenna, called an isotropic antenna (Fig. 1-A), obviously does not exist. If a dipole is used, more power is radiated broadside to the antenna (Fig. 1-B) than off the ends so that, in a direction broadside to the antenna, the dipole has a gain of 1.64 times, or 2.14 db. over the isotropic antenna. It may be a source of satisfaction to the simple-antenna users to find that a dipole has a gain over some-

thing! For a dipole antenna, the above formula can be rewritten:

\[ E_o = \frac{7.03 \sqrt{P_t}}{d} \text{ volts/meter} \]  

(2)

Notice that frequency is not a factor in the above formula. This means that a given amount of power radiated from a dipole will produce the same field strength at a given point in free space, regardless of the frequency used. In other words, a dipole for 2300 Mc. or 420 Mc. is as good for transmitting as a dipole on 144 or 50 Mc.

![Fig. 1 — Comparison of the field patterns of the theoretical point (isotropic) antenna and the dipole. In the case of the former, radiation is uniform in all directions, while the dipole is bidirectional.](image)

This is not the whole story, however. We are interested in field intensity \( E_o \) only so far as it is capable of inducing a voltage in an antenna for receiving purposes. Now, let us suppose that we have a given field strength, \( E_o \), developed by a magnetic field traveling outward from a transmitting antenna and we place a dipole antenna broadside to this magnetic field. Let us assume that the dipole is perfectly matched to a receiver. The field strength \( E_o \) will now induce a voltage in the dipole which will develop an amount of power available to the receiver given by:

\[ P_r = \left( \frac{E_o G_r}{2\pi \lambda} \right)^2 \frac{G_t}{120} \]

(3)

where:

\( P_r \) = watts input to the receiver,
\( E_o \) = field intensity in volts/meter,
\( G_r \) = power gain of receiving antenna (1.64 for a dipole).
\( \lambda \) = wavelength in meters = \( \frac{300}{\text{Freq. (Mc.)}} \)

This formula shows us that the power developed in a receiving antenna in free space is directly proportional to the square of the wavelength or inversely proportional to the square of the frequency. Since \( E_o \) is directly proportional to the transmitted power, it follows that as the frequency is doubled, the signal in the receiver will be reduced to one-quarter. This would indicate that a six-meter dipole would be nine times as effective as a two-meter dipole for receiving. This is not surprising since a six-meter dipole is three times as long as a two-meter dipole and therefore intercepts three times as much voltage.
Since $E_o$ is merely a means to an end, we can get rid of it by dividing equation (3) by equation (1) after first transposing equation (1). This gives a formula which shows directly the ratio of received power $P_r$ in free space to transmitted power $P_t$ as follows:

$$\frac{P_r}{P_t} = \left(\frac{\lambda}{4\pi d}\right)^2 G_t G_r \tag{4}$$

for two dipoles $G_t = G_r = 1.64$ giving:

$$\frac{P_r}{P_t} = \left(\frac{1.64\lambda}{d}\right)^2 = \left(\frac{1525}{\lambda^2 d^2}\right) \tag{5}$$

As before, this formula indicates that, in free space, the received power varies inversely as the square of the frequency. This would indicate that if one contemplates going to higher frequencies, he must use either higher power or more antenna gain to keep the received signal strength from going down. The cheapest way to do this is to use beam antennas which, fortunately, are capable of higher gains in a given space as the frequency is increased. The use of high-gain antennas (i.e. a power gain of 200 at 2300 Mc. in a four- or five-foot parabola) is therefore not a case of building an array whose gain is directly proportional to the antenna gain. Therefore, it can be said that the signal-to-noise ratio of a received signal is directly proportional to the antenna gain. A high-gain beam can produce a decided improvement in signal-to-noise ratio in almost any location. This is not true of the addition of a preselector if the receiver to which it is connected already has ample gain.

The above discussion has been carried on with regard to antennas in free space. This assumption is reasonable for local signals with antennas not too far apart and reasonably high and clear. As the stations get farther apart, the ground starts to get into the argument to a greater degree until finally it cuts off reception completely. The stations that most hams are particularly interested in receiving are those weak ones beyond the horizon that are considered DX or near-DX on the v.h.f. bands. Here the ground really gets into the argument. We also find that the higher frequencies are penalized less than they are in free space and the use of high gain beams is a real advantage.

Let us take the special case of two stations located near the horizon almost out of sight of each other with antennas located as shown in Fig. 2. Above 50 Mc., over ground paths of this sort, we have two signal waves to consider. First there is the direct or free space wave $AB$ which

![Fig. 2 — Diagram showing the two wave paths involved in v.h.f. communication, the direct path, $AB$, and the ground-reflection path, $ACB$. The radius of the earth’s curvature is increased by one-third, taking normal refraction into account.](image)

is the same free-space signal that we have been discussing. In addition, there is a reflected wave $ACB$ which combines with the free space or direct wave to produce the net received signal. To further define our conditions, let us make the following stipulations which, at these frequencies, are valid.

1) The coefficient of reflection is 100 per cent. This means that the earth is a perfect or near-perfect reflector. This is true for horizontal polarization but is only true for vertical polarization for angles of reflection less than about one degree.

Another advantage is gained by using a beam antenna. If the noise received by the antenna is coming from all directions with equal strength, the noise level is approximately constant regardless of antenna gain. The strength of the received signal, on the contrary, is proportional to the antenna gain. Therefore, it can be said that the signal-to-noise ratio of a received signal is directly proportional to the antenna gain. A high-gain beam can produce a decided improvement in signal-to-noise ratio in almost any location. This is not true of the addition of a preselector if the receiver to which it is connected already has ample gain.

January 1949
2) A shift of 180 degrees in phase occurs at the point of reflection. This means that the reflected wave will arrive nearly out of phase with the direct path and will therefore tend to cancel it.

3) The difference in phase from 180 degrees of the two waves is less than \( \frac{1}{4} \) wavelength. This is true if:

\[
\frac{h_1h_2F}{d} < 433,000
\]

where:
- \( h_1 = \) feet, \( h_2 = \) feet, \( F = \) Mc., \( d = \) miles.

4) The antennas are more than two wavelengths above ground. At two meters this is about thirteen feet.

5) The actual radius of the earth’s curvature is increased 33 per cent to produce an apparently flatter earth. This takes into account the normal refraction of the signal around the earth.

It can now be shown that:

\[
P_t = \frac{h_1^2h_2^2}{2.97 d^4} \times 10^{-14}
\]

Let’s see what is going on here. Suppose \( h_1 \) and \( h_2 \) were zero. Then, the length of the direct path is equal in length to that of the reflected path. Since they are 180 degrees out of phase because of the phase reversal of the reflected wave, they cancel each other and the signal strength is zero. As the antennas are raised above the line (dotted) which is tangent to the earth at the point of reflection, the length of the reflected path becomes longer than the direct path so that the relative phase of the two signals is now less than 180 degrees and a signal strength equal to this difference results. As the signal frequency is raised, the phase difference for a given height and difference in path length increases more rapidly; therefore a higher-frequency signal will grow stronger faster than a lower-frequency signal. This effect nullifies the loss in strength from the increase in frequency over the direct path as indicated in equation (5). For this reason, equation (7) does not contain a frequency term and the signal strength is independent of frequency. Thus, under the above conditions, two dipoles would be as effective at 220 Mc. as at 144 or 420. Of course, between the two extremes of free-space and horizon conditions, there will be a transmission effect attributable to the reflected ground wave of greater or less degree. These intermediate conditions are still subject to calculation, but the equations become somewhat formidable. However, we are not particularly interested in actual values of signal strength but rather in what to expect when we try a new v.h.f. or u.h.f. band.

I believe that it is apparent that beams are a “must” for the u.h.f. and s.h.f. bands and that the size of the array is what counts rather than its actual-power gain.

Beyond the horizon, we have to depend on diffraction and unusual weather conditions for our DX. It is being realized that most of these v.h.f. contacts on two meters and above are made by way of ducts or waveguide effects. These ducts are waveguides usually formed between the earth and a discontinuity in the air above the earth caused by a change in density at a certain level. The width of a duct determines the lowest frequency that will be passed by it. Also, the frequency of lowest attenuation is usually quite close to the cut-off frequency. And, incidentally, it makes no difference whether the signal is vertically- or horizontally-polarized. A duct that will pass 144 Mc. would be about a half mile high, a condition that occurs quite frequently. If the duct becomes narrower, it may cut off the 144-Mc. signals while still passing higher frequency signals and these with less attenuation.

Good examples of this occurred last fall (1947) when the writer was scheduling with W2IHWX in Little Silver, N. J., on 235 Mc. One Sunday night the two-meter band was fairly open, and stations in the Boston area were working some W2s around New York City and Long Island; but with generally weak signals. The six-meter boys were working W2s easily. W2IHWX was S2 on 235 Mc. On Monday night, six meters was normal but two meters was wide open with the locals working W2 and W3 stations with strong signals. W2IHWX was S5 on 235 Mc. On Tuesday night, the two-meter band was absolutely dead both in Boston and in New Jersey. But the duct was still there, apparently too narrow for two meters, and W2IHWX was rolling through S9! Wonder what was doing on 420 Mc.? There were several nights when W2IHWX was heard with good signal strength on 235 Mc. when two meters was dead at both ends of this 210-mile path.

It is hoped that this material has helped to clarify the picture of antenna performance at v.h.f. and higher. We hope that we have impressed the reader with the idea that the dipole is the world’s worst antenna and that beams are “good business.” Realizing that the space an antenna occupies is the prime factor in producing strong signals, the writer wishes to express the opinion that 220 Mc. is perhaps the optimum v.h.f. band, as at this frequency we have a practical compromise between size and complexity in the antenna array. However, there is a lot to be learned on still higher frequency bands and some of the results obtained are apt to be quite surprising. Let’s explore them!
A Doorknob Oscillator for 420 Mc.

A Simple Rig for Inputs up to 50 Watts

BY EDWARD P. TILTON,* WHDO

*Most of the activity currently on 420 Mc. is conducted with gear obtained on the surplus market. It is true that there are several transmitters and receivers available at very low cost, which can be converted to amateur use with a minimum of difficulty, but we feel that the fellow who gets started that way is missing at least half of the fun. For those who prefer to build their own, here is a simple rig which will outperform most of the surplus jobs—and since the components are almost entirely handmade or from surplus stock, the cost is pleasantly low.

The amateur who wants to build gear for 420 Mc. has a limited choice of tubes for his transmitting equipment. The 6J6 performs quite well at this frequency, but the amount of power it will take is usually too low for anything but short-range work. The 832 may be made to function as a push-pull tripler with fair efficiency, if the necessary 144-Mc. excitation is available, but this approach may be somewhat beyond the inexperienced worker. There are the various lighthouse types, which do a fine job, but their design makes for mechanical problems which are difficult for the fellow who is not well-equipped with tools.

This leaves the "doorknob" as about the only other possibility. These types are far from new (as far back as 1936, QST and the Handbook were running descriptions of u.h.f. gear using the 316-A) but their design makes them well adapted to 420-Mc. work. They were originally quite costly, and consequently received little amateur attention, but recently both the 816-A and the 703-A have been available on the surplus market at attractive prices, and hundreds are taking on dust in the shacks of amateur surplus collectors. The 316-A (also sold as VT-191) is the better-known and the cheaper of the two. It has a 2-volt filament, and a top frequency rating of about 700 Mc. The 703-A used in the rig described herewith has a 1.15-volt filament, and is capable of operating at frequencies as high as 1200 Mc.

The chief problem in using these tubes is the difficulty involved in making satisfactory contact to the pins. At the frequencies for which they are designed there cannot be anything like a socket or leads in the ordinary sense; the tube pins must make direct contact with the circuit elements, in order to permit operation higher than about 300 Mc. or so. They require considerable filament current, so the connection to the filament pins must be solid. The net effect of these requirements is that, so far as the amateur constructor is concerned, at least, the transmitter must be built around the tubes. If he resigns himself to some arrangement which makes it impossible to change tubes at will he can achieve excellent performance with either of these tubes in the 420-Mc. band.

Two 703-As are used in this oscillator, with a half-wave line in the plate circuit acting as the frequency-controlling element. The grids are tied together and connected to ground through the bias resistor, R1. Small self-supporting r.f. chokes are used in each filament lead, directly at the tube pins. Plate voltage is fed into the lines at their approximate midpoint through a center-tapped r.f. choke, the exact position of which is determined by experiment. At the opposite end of the line from the tubes a small split-stator tuning condenser is used for frequency adjustment.

*V.H.F. Editor, QST.
2 "Tripling to 420," Brannin, June, 1948, QST, p. 52.
With 703-As and the line dimensions shown, the oscillator just hits 450 Mc. with \( C_1 \) at the minimum position. The low end of the band is reached with the plates three-quarters meshed. Output is fed to the antenna by means of a hairpin coupling loop at the midpoint of the line.

**Mechanical Details**

The plate lines are made of \( \frac{3}{4} \) inch soft copper tubing 8 inches long and spaced \( \frac{3}{4} \) inch center to center for the first 6½ inches of the line, at which point the line is fanned out at an angle of about 60 degrees to the tube plate pins, as shown in Fig. 2-A. The two tubes are mounted 2¼ inches apart, center to center. If 316-As are to be used the line will have slightly different dimensions, as necessarily as a tight fit is not usually possible after one or two insertions. The grid connection (Fig. 2-D) is made in the same manner, except that a single piece of brass rod, bent up at each end, is used. Here, again, larger diameter rod stock may be used with the 316-A, because of the wider pin spacing. Two of the filament clips are threaded at the bottom end, in order to screw them into small cone stand-offs which provide the supports for the tubes.

The split-stator tuning condenser, \( C_4 \), is mounted at the right-hand end of the chassis, with the ends of the plate rods soldered directly to the stator rods. The condenser is a Millen 21906D with one stator plate removed from each section. It may be used in its original form, but the removal of the two plates makes for greater ease of adjustment. The rotor of the condenser is not grounded, though this is probably not important, one way or the other.

Connection to the plate line is made with clips cut from soft sheet copper, mounted on one-inch stand-offs. The antenna-coupling loop is connected to a National FWG terminal assembly, which is mounted atop two 2½-inch stand-off insulators. These high posts are used so that the feeder will be well above the plate line, preventing coupling to the antenna other than that provided by the loop itself.

The chassis used is a standard 3 by 5 by 10-inch size. Actually the last operation in the assembling of the unit is the drilling of the chassis, reversing the usual procedure, as the exact position of the various parts will be known only when assembling of the components has been completed. This work should be done with care, as the final assembling should place no strain on any of the tube pins; thus it is best to assemble the unit and then lay out the chassis holes accordingly. The filament transformer is mounted on the rear wall of the chassis, and the cathode jack and filament switch on the front wall.

The filament circuit will depend on which type of tube is to be used, and what type of transformer is available. The 703-As were operated with the series filament connection shown, and also with the filaments in parallel, as shown in the insert in Fig. 1, without any noticeable difference in operation. The transformer employed is a 2.5-volt 6-ampere type, but the heavy drain of the 703-As brings this down to just about the 1.15 volts required, at the tube pins, with the series connection. With 316-As the same transformer could be used with a parallel connection, or a 5-volt transformer could be used with the filaments in series. Whatever arrangement is used, the filament voltage should be checked at the tube pins. If it is higher than 1.15 volts for the 703-A or 2.0 volts for the 316-A, a heavy-duty variable resistor or a Variac may be connected in series with the filament transformer primary to drop the voltage to the required value.
**Adjustments**

Initial tests should be made with a plate voltage not exceeding 250. The clips on the plate lines should be set at approximately the midpoint of the lines, and the plate voltage applied. A meter plugged into $J_1$ will read about 65 to 70 ma. if the tubes are oscillating, increasing about 10 ma. when a lamp load is connected across $L_2$ and the necessary to move the point of connection the frequency should be checked again after the change.

The plate voltage may now be increased, if desired. At 300 volts the tubes will draw around 100 ma., and the output will be 7 to 8 watts. More pilot lamps should be added to the load at this point. At 375 volts the tubes draw about 120 ma. and deliver about 10 watts output, as measured on a u.h.f. wattmeter. The visual indication, with four blue-bead pilot lamps in parallel, checks fairly closely, but at high output levels the bulbs tend to go gassy. The same is true of other lamp loads, and 15-watt incandescent lamps are completely unreliable.

Adjustment of the antenna coupling may be quite different with an antenna than with a lamp load, tending to be looser with the former. It cannot be stressed too strongly that the coupling should be adjusted while checking the power in the antenna, rather than by meter indications, as it is very easy to overcouple.

The coupling should be as loose as possible, as increasing beyond the optimum point detunes the oscillator and may cause a considerable reduction in output and an increase in the tubes' plate dissipation.

Since minor variations in power will have a negligible effect on the signal strength at the receiving point, there is little point in pushing the tubes to the point where the plates show color. At about 45 watts input the 703-As run along nicely, and the 10 watts or so that they deliver at this level, while not high efficiency as we think of it on lower frequencies, is plenty good at 450 Mc., and it will be enough stuff to provide a lot of fun for the experimenter who wants to investigate the possibilities of this intriguing territory.

---

Fig. 2 — Detail drawing of the plate lines (A), the filament connection pins (B and C), and the grid-connecting rod (D). In each case, the rods are slotted with a fine hack-saw blade, and then drilled out with a No. 54 drill. Pressing the rod onto the tube pin makes a tight fit, and does away with the necessity for any connecting leads. The threaded filament pins (B) are mounted on small cone stand-offs to provide support for the tubes.

---

January 1949
ELECTION RESULTS

As a result of the balloting which has just occurred in six ARRL divisions, four new directors and two new alternates have been elected for the 1949-50 term, and two incumbent directors and one incumbent alternate have been returned to office. Here are the details:

In the Central Division, John G. Doyle, W9GPI, was elected in close balloting:

- John G. Doyle, W9GPI: 701 votes
- Carl A. McKay, W9IDZ: 657 votes
- Wesley E. Marriner, W9AND: 296 votes

Jack Doyle is president of the North Shore Motor Company of Milwaukee. He is a director and an honorary life member of the Milwaukee Radio Amateurs' Club, and was general chairman of last year's ARRL National Convention. He is an active amateur of many years' standing, and has held PAM and OBS appointments.

Wesley E. Marriner, W9AND, is the Central's new alternate director, the voting having been:

- Wesley E. Marriner, W9AND: 1044 votes
- Raymond L. Hupp, W9CLE: 918 votes

Wes Marriner is an assistant to the research engineer of the Illinois State Highway and Engineering Office. He was active in the affairs of the Ogle Radio County Traffic Association and is a former R.M. During the war, Wes was an instructor in radio-operating procedure at the Officer's Candidate School of Yale University. He is currently SCM of Illinois, active in the Rock River Amateur Radio Club, and holds appointments as ORS, OPS and OBS.

In the New England Division, the incumbent, Percy C. Noble, W1BVR, was returned to office by a thumping majority. The voting:

- Percy C. Noble, W1BVR: 998 votes
- Frank L. Baker, Jr., W1ALP: 392 votes
- David P. Erickson, W1NLU: 271 votes
- Arthur A. Stockeburg, W1SS: 200 votes
- Lawrence R. Mitchell, W1HIL: 93 votes

Clayton C. Gordon, W1HRC, won the alternate post handily by receiving 1358 votes to 487 for Carroll O. Peacor, W1GAG. Thus Clayt Gordon resumes the alternate post he held for three terms, 1941-1946.

In the Northwestern Division R. Rex Roberts, W7CPY, the current alternate, was elected the new director, the voting having been:

- R. Rex Roberts, W7CPY: 470 votes
- Harold W. Johnston, W7DXF: 330 votes
- Raleigh A. Munkres, W7HAN: 282 votes

Rex Roberts is manager of the Glendive and Wibaux, Mont., exchanges of the Mountain State Telephone and Telegraph Co. He has served four terms as alternate director of his division, as well as several terms as SCM of Montana. He holds appointments as PAM and OPS.

As previously reported, Allen D. Gunston, W7GP, has been elected alternate director of the Northwestern Division without membership balloting.

In the Roanoke Division balloting, Everett L. Battey, W4IA, was elected the new director when he received 520 votes to 254 for the incumbent, Hugh L. Caveness, W4DW. Ev Battey has the long title of "administrative assistant for elec-

With nearly 10,000 votes cast, the annual ballot-counting operation occupies a full day at Hq. In this corner are, l. to r. around table, Treas. Houghton, Comm. Mgr. Handy, Asst. Secy. Huntoon, Mr. Soule (certified public accountant who triple-checks the tallies), Acting Secretary Rudlong, President Bailey, Asst. Secy. Baldwin.
tronics and special schools, officer training section, field administration division, training activity, Navy Department." He has taken particular interest in organization matters, starting perhaps with his term as SCM of Eastern Massachusetts from 1927 to 1929; he then became assistant communications manager on the Headquarters staff where he served until March, 1947, when he resigned to take up his present work. He is a commander, USNR, and was on active duty for five years during the war.

In the race for alternate the incumbent, John R. Griggs, W6KW, who received 581 votes to 520 for the incumbent, Hans R. Jepsen, W6KEI. John Griggs is research laboratory analyst for the Consolidated Vultee Aircraft Corporation of San Diego. He has been licensed since 1922, and is especially active in affairs of the San Diego Amateur Radio Club and the San Diego County Council of Amateur Radio Clubs, being respectively president and chairman of those associations at present. He served overseas during the war as a radar field engineer.

As previously reported, John E. Bickel, W6NY, was elected alternate director without membership balloting.

In the West Gulf Division the incumbent, Wayland M. Groves, W5NW, was returned to office by receiving 685 votes to 265 votes for his opponent, Richard W. White, W5EEY. As previously reported, the new alternate in the West Gulf Division is David H. Calk, W5BHO.

Almost exactly 50% of the eligible voters returned ballots in the six divisions where balloting took place, but individual divisions varied a good deal, both above and below that figure, as can be seen:

<table>
<thead>
<tr>
<th>Division</th>
<th>% of Membership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voting</td>
<td></td>
</tr>
<tr>
<td>Central</td>
<td>43.4</td>
</tr>
<tr>
<td>New England</td>
<td>58.4</td>
</tr>
<tr>
<td>Southwestern</td>
<td>47.9</td>
</tr>
<tr>
<td>West Gulf</td>
<td>47.8</td>
</tr>
</tbody>
</table>

ALANTIC CITY REGULATIONS

The Atlantic City regulations, with the exception of the allocation table below 27.5 Mc., become effective January 1, 1949, and it is incumbent on the ratifying countries, of whom the United States is one, to alter their service regulations to comply with the new international provisions. For some services this is going to mean some substantial changes, but amateurs, especially in the United States, will hardly notice the difference between the old and the new. The allocation above 27.5 Mc. under Atlantic City is what we have here now, with the exception of a slight shift in the 11-meter band; other changes in the international regulations applicable to amateurs are mostly editorial clarification, although one or two Q signals change somewhat and there will eventually be some new call allocations for some countries.

Our 11-meter band, now 27.160-27.430 Mc., will be shifted to 26.960-27.230 Mc. This shift is now in process at FCC but has not yet been made; it shouldn't be long, however, so keep an ear out for W1AW if you're one of the boys on "11." While on this subject of allocations, bear in mind that only that portion of Atlantic City allocations above 27.5 Mc. is effective January 1st; as further explained in this month's editorial, the new table below 27.5 Mc. is not yet effective. This means both that we do not yet acquire operating rights to our new 21-Mc. band, and that the 50-ke. cut at the high end of the 14-Mc. band doesn't take place. Don't look for them soon, either; it will probably be the end of the year, at the earliest, before these changes occur.

Apart from allocations, there will eventually be a change in the system for indicating types of emission, but we'll go into those when the FCC acts to put them into effect here. A desirable addition to the international regs is that the amateur service is now recognized and defined as "A service of self-training, intercommunication and technical investigations carried on by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interests." The definition of an amateur station is simply a station in the amateur service. Both these are in accord with our wishes.

Changes in existing Q signals are for the most part merely editorial, except for QRI and QRX, where the exact meaning will now be slightly different although still treating of the same subject matter as before; these will be discussed next month in Operating News, as will the merits of some of the new Q signals that have been created under Atlantic City which may have amateur application. In connection with call allocation blocks, the United States inherits the AA.A-LZ series, but it is not anticipated that amateur calls will be assigned from it; some foreign allocations have been changed and will be reported in these pages when actual changes in amateur calls are made.

Under the old Cairo regulations, there was an Article 8 which gave general treatment to certain aspects of amateur stations and private experimental stations. Under Atlantic City, this article becomes Article 42, and — again as we wished — is devoted solely to us amateurs; experimental stations are given a separate article. Aside from editorial changes for purposes of clarification, this article duplicates old Article 8 except for one new provision appearing as the last sentence of paragraph (1) of § 3, where it is now provided that the code requirement may, if desired, be waived in

January 1949
the case of stations making use exclusively of frequencies above 1000 Mc., this again, was a U. S. proposal. This whole article on amateur stations, incidentally, is something with which amateurs should be familiar, so we quote it herewith:

**Article 42**

Amateur Stations

§ 1. Radiocommunications between amateur stations of different countries shall be forbidden if the administration of one of the countries concerned has notified that it objects to such radiocommunications.

§ 2. (1) When transmissions between amateur stations of different countries are permitted they must be made in plain language and must be limited to messages of a technical nature relating to tests and to reports of a personal character for which, because of their unimportance, recourse to the public telecommunication service is not justified. It is absolutely forbidden for amateur stations to be used for transmitting international communications on behalf of third parties.

(2) The preceding provisions may be modified by special arrangements between the countries concerned.

§ 3. (1) Any person operating the apparatus in an amateur station must have proved that he is able to transmit, and to receive by ear, texts in Morse code signals. Administrations concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 1000 Mc/s. Administrations may, however, waive this requirement in the case of stations making use exclusively of frequencies above 1000 Mc/s.

(2) Administrations shall take such measures as they judge necessary to verify the qualifications, from a technical point of view, of any person operating the apparatus of an amateur station.

§ 4. The maximum power of amateur stations shall be fixed by the administrations concerned, having regard to the technical qualifications of the operators and to the conditions under which those stations work.

§ 5. (1) All the general rules of the Convention and of the present Regulations shall apply to amateur stations. In particular, the transmitting frequency must be as constant and as free from harmonics as the state of technical development for stations of this nature permits.

(2) During the course of their transmissions amateur stations must transmit their call sign at short intervals.

**CIVIL DEFENSE**

The long-awaited report of the Office of Civil Defense Planning has finally been issued. It is a formidable job, comprising some 300 pages, put together during the past nine months by the planning group of 43 persons at Washington, assisted by 133 consultants, among them Acting Secretary Budlong and Communications Manager Handy, of ARRL.

The report outlines the requirements for civil defense planning, suggests the structure for local, state and national civil defense organizations, discusses the many specialized requirements of these groups in civil defense planning, outlines the means at their disposal in the solution of defense problems and lays the groundwork for suitable legislation to implement the plan at national, state and local levels.

About the only way to comprehend the full scope and nature of this tremendous job for those interested is to study the report itself. Titled "Civil Defense for National Security" it is available for $1.00 from the Superintendent of Documents, U. S. Government Printing Office, Washington 24, D. C.

It should be stressed that this is a report on all phases of civil defense — medical and radiological control problems, chemical and special weapons, defense, fire, police, warden, rescue and transportation services, communications, plant protection, mutual aid, evacuation considerations, air-raid warning systems, etc. Communications, therefore, represent only a part of the picture; but, as the report itself points out within the first few pages, they are essential to any defense system. The general nature of communications necessary to civil defense are then treated in subsequent sections.

Primary reliance is, understandably, placed on wire communications but it is gratifying to report that the place of the amateur is recognized and commented upon. First treatment is in connection with a chapter on local organization in the defense program, where local communications aspects are discussed as follows:

"Communications: Should embrace all forms of communications, namely telephone, telegraph, radio, emergency messenger service and all other emergency means. Existing telephone, telegraph and radio facilities and services should be used to the extent possible, but provisions should be made for emergency communication services and alternate means of transmitting messages when regular facilities are put out of working order. Such emergency means would include mobile radiotelephones, the use of amateur radio services, and any other possible means that could be developed . . ."

Later in the report we are again included in a general discussion of communications as a special service where, under the heading of fundamental requirements, it is stated:

"Studies and surveys will be required of the availability and for the proper utilization of various systems of communications. These should embrace common carrier telephones, telegraph, typewriter and radiotelephone services, municipal communications systems, radio broadcasting stations and amateur radio services."

Finally, in separate paragraphs devoted to each of the above classifications there appears the following:

"Amateur Radio: Emergency service is a tradition in amateur radio operations. The amateur's record during peacetime disaster indicates they are resourceful, adept at improvisation and possess a high sense of community service. They are licensed radio operators owning their own portable radiotelephones and telegraph equipment, thus providing for maximum flexibility. Under a carefully organized plan they are capable of making an important contribution to civil defense in providing supplementary emergency communications channels, especially during a post-raid period. The Office of Civil Defense should initiate study with a view to incorporating the civil defense program with the Army and Air Forces for the utilization of the amateurs' services."

The fundamental unit in the whole plan is the municipality; everything stems from this concept. The basic philosophy is self-help within communities, with mutual aid between communities being the second line of civil defense, state aid being the third line and finally a fourth stage of military aid to the civil government where and when required. As a result, the greatest organiza-
CONDUCTED BY ROD NEWKIRK,* W9BRD

How:

Don't fall over, guys, but we're off the soapbox this month. Since you'll all be busy lining up your own 1949 resolutions, anyway, there should be no need for kibitzing on our part. So we have turned up a more congenial subject to hash over.

The real granddaddy of this little corner (we won't name him but he is at present busily suppressing his carrier all over the place) took time out recently to remind us of the good old days. By the same token he wondered out loud what had become of the on-the-air DXCC Roundups that were so popular just before the

Big Fracas. Of course, he might have been mildly insinuating that we're holding out on such doings until we break into the Select Circle ourselves [If we ever do, I'll DDT.1 — Jeeves] in order to participate, but we'll accept his comments in better faith.

As the old-timers know, DXCC Roundups were cozy little affairs held during some otherwise quiet week end in which holders of the hallowed certificates took part. Now, seeing as how you've all been at each others' throats without a break for the past few years, isn’t it about time everybody got together and shook hands for the next round?

Although the Roundup won't be intended as a knock-down-drag-out contest it will be interesting to see who swaps pleasantries with the most members in the most countries and continents. The leaders in these respects won't win fur-lined bathtubs or the like but we think they'll meet a lot of nice guys. Naturally, those who made DXCC under different previous calls could also join the fun and there won't be any distinction between prewar, postwar and all-time sheepskin holders.

Since awardees now number in the hundreds, an interesting few hours should be had by all. You'll probably bump into a lot of buddies you haven't heard for years as real DX men supposedly listen 90 per cent of their operating time!

Well, the above details are tentative and depend upon what comments turn up in our mailbag. If the "ayes" have it, we'll surely set an early date — perhaps in May — for such a shin-dig.

Now let's get down to business . . .

What:

W2CKN has been making hay on eighty between 8:30 p.m. and 1:30 A.M. local time, scoring with GD3UB (3520 48), FA8IH (3518), HB9AW (3525 18), GI6TK (3515), OZ4FT (3520), ON4FG (3523) and various Fs and Gs. . . . . . . HH2BL has been haunting 3705 kc. during thrice-weekly skeds with WHIN. Doc also accounts for KV4AA (3505) . . . . . . ZL1CI (3507), ZL2MP (3524), FA8BG (3502), CM2SW (3520), ON4QF (3516) and a collection of Gs occupy space in the log at W2EQS. . . . . . . VE1EA's list includes HPI1R, K25AX, GW3ZV and PA8RE . . . . . . The following Gs have been reported working Ws on 80: G2DOW; G3EKH; G5LI; G6s FO and GM; Gs JR, RL, TK and VB. French stations getting through: F3MS; F8s EO, IO, PK and TM . . . . . . A lone report from west of the Mississippi has KL7KB (3517) being worked by W6CFB. Gerald has his 3.5-Mc. WAC salted down but needs a card from FA8BG.

On forty, W2KIR and VE1EA captured ZC1CL (7030). The former also snagged VF6SJ, HA1KK, OX3BC, TI2KP, HJC1J, CE4AD and KM6AK, all countries of 14-Mc. quality . . . . . . . W6CFB collared KG66I, KP6AE, OX2MR, OX3J, VP2CE, VP5AX, CN8AN, TG8MO, TI2RZ, GI6TK/A, GM3BST, GW3DPX, 10 Gs, 13 VKs and 8 ZLs. . . . . . . Four hundred watts raised HE1CE (7100), TI2EXO (7087), VP9CC (7093) and G4NU (7033) for W0VDC . . . . . . . W1QMJ lost shuteye for YV5AL, D5BG (7010),
The rig at W4MDV/5 blows up every time he calls VK2SH! So Bert resorted to a chat with VK2AM. VE3OY has a lot of Oceania catches as well as CN8MZ, TH4MAR, VP6EG and some Gs. VR2AM/ZK2 (7030) adorns the log of W2PUD, as well as OX2MR (7050), FM6AD (7000) and VP2AG (7035). W7LAN is awaiting cards from PY7DN, PY7WS, K6AB (7075) and PK2AB.

The BC-458 of W50NL cooked up KL7HI (7060), VK3QH, VK2RA and KH6LQ. Here’s the one that will make the 14-Mc. 200-country gang perk up and take note: PY7DN, PY7WS, KJ6AB (7075) and PK2AB.

The rig at W4MDV/5 blows up every time he calls VK2SH! So Bert resorted to a chat with VK2AM. VE3OY has a lot of Oceania catches as well as CN8MZ, TH4MAR, VP6EG and some Gs. VR2AM/ZK2 (7030) adorns the log of W2PUD, as well as OX2MR (7050), FM6AD (7000) and VP2AG (7035).

As far as twenty is concerned, W5ACL “wasn’t on much” and accumulated VK5JTW (14,010), MI3FG (14,015), VR2BD (14,085), KM6AJ (14,040), ST2GH (14,095) and HAIKK (14,105). W9JIN recommends PJX6 (14,090), CR0AN (14,100), J6ADE (14,078), HA4EA (14,055), UBSBK (14,112) and VE8MR. Some of the cagier individuals swiped by W2ITD’s rig at W4MDV/5 included 9AON, 9AKG, KG6DW, K1A1AP, K1A1BX, CS2Z, H11AB, H11CC, CR9AG, K66AF, OQ5CF, ZC6UN, HZ1AB, YS1PB and PJ5KO. All this and no spots on the neighbors’ Kinescopes! W2GUR associated with VO8AD (14,055), VO4SGC (14,050), VO2GW (14,080), UA8FL (14,100), UA8SI (14,030), W9MCF/C1 (14,080), I6DD (14,100), UN1AB (14,090), Z60UNJ (14,080), IS1IFIC (14,045), W1EBC/KW6 (14,020), C1JH (14,110), VP2GT (14,000) and several J’s. Slipping through the W/VE gauntlet, CM2AZ grabbed ZD1PW (14,060), U6DBM, ZD2RGY, KG6DY, PJ1OY, CE7AA, LS8FA, YR5I, H4AEE and WA6G.

W2QHH reeled in ZC8PM (14,010), VP8AK (14,100), VP8AP, VP8AM, YS6AE (14,039), VS6BAM [14,013], ZS3D (14,070), ZS3B (14,119), WK7MV/Two (14,080), UC2CB (14,113) and C7AT (14,039) which helped make up two more 24-hour WACs for Howy’s 35-watt rig. Some nice ‘phone confirmations have already reached W8BF from ET3AF, MI2ZJ, AR1PC, ZK1AA, CR9AG, DA4VL/MD7, TA8FS and VR4AA. W2TXB had little trouble with CZZAC (14,040 t7), UI5AE (14,045), VP2GJ, VP8AO (14,090), ZD9AA (14,070), ZC1CL (14,064), MP4AB (14,025-075 t7) and the aforementioned ZC8PM, who is in Arab Palestine.

A line from W6BIL lists as worked C4BC, VICT, RV2/FO8, FO8AA, VR2AP, W4DGD/KJ6, CE4AD, VP11M, YN1FTB plus a truckload of Us and Js. Texan W5JPC dented the wall for OH2PG (14,042), VP5MU (14,029), UA3AF (14,060), UA3DC (14,062) and VQ6Z (14,130). A long-distance report from VK9GW specifies UBSKAF (14,100), ZBIQ (14,100), OH2NB (14,100), FK8AB (14,095) and GM3BZ (14,110) which shows that a rare DX station can work something else when the Ws are napping. VK9GW has been using 40 watts and a doublet with one crystal. Relaxing after an AC4YN QSO, W6MX trapped VQ8CB (14,110), GC4LI (14,140), EI1AEP (14,070), UF6KAB (14,160), C3EA (14,080), UOSAC (14,140), VP8AJ in Grahamshals (14,030), CZ1AZ (14,065), UI5KAA (14,090) and UL7BS (14,070). KH6PM warmed up the new VFO with CR7AP (14,055 t8), CR7BC (14,080 t8), CR7VAL (14,025), HK3FF (14,005), HP1BR (14,045), KX6BA (14,035), PZ1FM (14,060), VP1AA (14,035), VP9JM (14,110), VP5AX (14,070), VS1CV (14,050), VS6AZ (14,105), Z2ZKM (14,000 t8), ZD8B (14,020), ZE2JS (14,035), ZK2AA (14,130) and CX4CZ (14,025). Not bad for a single cool 8071.

An extensive ‘phone summary from W4BA: AP4B (14,290), KP6AA (14,250), KX6BA (14,190), TR1P (14,350), VP6SD (14,155), CT2AB (14,350), ZD1BD (14,399), ET3AB (14,395), ZE1XJ (14,350), CT3MN (14,370), PZ1FM (14,390), CNSB, EN6s A and B, W7MV/Two and ZD8A. W4IUSO’s mike was worked AR8AB (14,395), EA1FO (14,303), FA9OW (14,347), PJK50 (14,335), VK7AZ (14,315) and GD6IA (14,398). On c.w. he derived HZ1A (14,060), MI3AB (14,013), UG6AB (14,070) and the popular ZC1CL.

With ten getting a big workout, the mail sack is taking a beating. W2QIH found J2AAL (28,020), J2HY5 (28,002), ZE1JJ (28,080), ZD4AB (28,090), CR7VAL (28,070), Z6EM (28,000), VP4DCA (28,000), VP2GJ (28,000) and VP8AD (28,020). W50JH’s list has ZD4AH, OQ5BQ, HHSME, H11BK, H11CU, HR1MB, H11KN.

A modest array of gear does not necessarily make for modest results. Here we have Jack H. Hill of Cassock, N.S.W., at the controls of his station, VK2ADJ. There are p.p. 90% in the final at 30 watts, modulated by p.p. 809%. A newly-completed double-conversion superhet is not shown, as well as several beam antennas, VK2ADT has been high W4phone scorer in ARRL DX Tests for two successive years.

QST for
VP6LD and some ZS-men... Samples at W2KZE are KP6AA, UA3AC, UA3BU, LB8R, ZLAGA, OE7FR, OH20P, CN5B, OK2SO, and OZ1W... ZS8A (28,200), OA1C (28,220), EL7A (28,245), VP9DD (28,315) and HH1SW (28,245) were nice A3 contacts for W5FUE... W2RUK chatted with GM8SM and then raised GW8WJ—nope, it wasn’t GM8MJ sending upside down!... From W8CCJ we hear of C7HY, CE4AD, CX6AF, LA4K, TG9BA, VP8AD and an armful of VKs, Gs and PYs, all c.w... W1EUK contrived conversation with ISIAYN, ISIAEX, KA1AC, AP2R and KX6BB, all nice ones on ‘phone... From the West Coast, W6ZGY gathered up GM3A WW (28,055); CE3AX (28,080), OK3SP (28,065) and last, but not least, FABBG (28,035)... Long time no hear from W6ZZ. Miles now has 10 countries on eleven, TI2FG, KH6KA, KX6BC and KZ5EL being the latest additions, and needs just three more cards for DXCC.

Where:

We have a few items of general interest to propound. Further data from Spain dwell upon details concerning a new unofficial-status C:JSL bureau, as follows: EAI — P.O. Box 12, Gijon; EAA — P.O. Box 113, San Sebastian; EAS and EAS — P.O. Box 1312, Barcelona; EAS and EAS — P.O. Box 12354, Madrid; EAT — P.O. Box 228, Cadiz. These are in Spain proper and then we have EAS — P.O. Box 346, Las Palmas de Gran Canarias, Canary Islands, plus EAS — via EASAT... ZD9AA claims that cards for him must be sent via Box 4887, Johannesburg, only... AP8A or AP5B will act as a bureau for AP2, AP4 and AP5 areas... The OE QSL situation is pretty weird, each station devising its own route of entry. Better check all lists you have available pertaining to OE before you uncork that card.

ZLIMB, one of the more widely-heard New Zealand fellows, operated by “Slim” Herbert in Auckland. This station was high ZL c.w. scorer in the last ARRL DX Competition.

January 1949
A Versatile Low-Power 'Phone-C.W. Transmitter

A 6AG7-2E26 Rig for 3.5 to 50 Mc.

BY G. A. BAKER,* W6CWQ

Some of the arguments usually advanced for a small transmitter are that it is ideal for the beginner, while the old timer should have it around as an auxiliary or emergency transmitter. It is also supposed to be good for portable operation, for use as a stand-by while rebuilding the big rig, or as an exciter for driving a high-power stage to be added later. The transmitter described in this article seems to meet the above requirements. It was designed with the idea that it would be used primarily for "fixed-station" operation and perhaps occasionally installed in a car to take advantage of the new regulations concerning mobile operation.

Before proceeding with the circuit or construction data let's see what this little rig has to offer. Complete coverage from 80 to 6 meters, 'phone and c.w., is possible using crystals in the 3.5 to 9 megacycles range. That is seven bands, if you count 11 meters and the projected 15 meter band. Only three tubes are used, which makes compactness and simplicity possible. The tube filaments require a total of 2.35 amperes, a rather high value for mobile work; however, it is doubtful if any other combination of tubes would give the same flexibility and power output with much less filament current.

A compact low-power rig that can be used on all bands from 3.5 to 50 Mc. It is adaptable to portable or mobile work as well as fixed-station operation. Tuning controls, meter and stand-by switches, and microphone and key jacks are mounted on the panel.

The circuits used have appeared in several publications, but the combination provided results which were even better than anticipated. A 6AG7 harmonic oscillator delivers enough output up to the fourth harmonic of the crystal to drive the 2E26 amplifier, which can be operated either straight through or as a doubler. The 2E26 seems to be an excellent frequency multiplier and delivers a moderate amount of power when operated as a doubler; the output on ten meters when using 80-meter crystals will compare favorably with that obtained when using higher-frequency crystals and driving the final straight through. Normally, 40-meter crystals are used for ten-meter operation and the 6AG7 is tuned to their fourth harmonic. The same is true for 11 meters, using 6-megacycle crystals.

If you have purchased any surplus crystals outside the regular amateur frequencies, here is where you can possibly put them to work. Those between 4667 and 4800 kc. will triple into the 20-meter band. Just plug a 20-meter coil into the oscillator and you will find it delivers ample grid drive to the 2E26. You can also double in the amplifier stage to 10 meters, in which case crystals up to 4950 kc. can be used. Operation on 15 meters can be accomplished by tuning the oscillator to the third harmonic of a 40-meter crystal. For operation on 6 meters the 2E26 is always used as a doubler. Crystals from 8337 to 9000 kc. should be used with the oscillator tuned to the third harmonic. Six-meter operation is also possible using crystals from 6250 kc. to 6750 kc. and tuning the oscillator to the fourth harmonic.

Circuit and Construction Data

The complete transmitter, less power supply, is mounted on a 7 X 9-inch chassis with a front panel of the same dimensions. The oscillator and amplifier are located at the front of the chassis and the modulator portion at the rear. The front-panel controls are as follows: oscillator and amplifier tuning on the left and right respectively, stand-by switch, meter switch and two jacks for...
key and microphone. Three controls are located behind the panel. They are the gain control, crystal switch and variable coupling condenser.

The crystal holder plus oscillator coils and coil socket were taken from a surplus BCR-746-A tuning unit. Since the crystal holder would accommodate two crystals a s.p.d.t. switch was added for crystal switching. The oscillator circuit is not tricky, and none of the faults common to some oscillators was encountered. There was no heating of the crystal and keying seemed quite satisfactory. The crystal oscillates at all times regardless of whether the plate circuit is in resonance. A very pronounced plate-current dip occurs when the oscillator is tuned to the fundamental frequency, but the dip becomes progressively less as the higher harmonics are used. With 400 volts on the plate the current did not exceed 20 ma. and no particular precautions are necessary, since this is within the plate-dissipation rating of the tube.

In the original design a meter was provided for measuring oscillator plate current, but the amplifier grid current proved to be a much more accurate indication of resonance. In tuning the oscillator stage care must be exercised at the higher frequencies to select the proper harmonic. Some grid drive can be detected up to the eighth or

January 1949
tenth harmonic with low-frequency crystals, and as many as five harmonics may appear when using the ten-meter coil.

The coupling condenser, $C_6$, is a 25-µµfd. air variable, mounted underneath the chassis between the 2E26 and the shield. It is adjustable from the top with a screwdriver. For operation on the lower frequencies adequate grid drive will be secured with this condenser almost open. For operation where the oscillator is tuned to the third or fourth harmonic all the capacity may be required.

The 2E26 tube has three cathode socket terminals, and the manufacturer recommends that each be by-passed through individual mica by-pass condensers. The high power gain of this tube necessitates complete isolation of the grid and plate circuits. For that reason the amplifier plate tank circuit was mounted on top of the chassis and a small shield installed between the two stages. This shield is rather difficult to see in the photograph, but it is nothing more than a piece of aluminum approximately four inches square. It is fastened to both the front panel and chassis and extends to the rear of the 6AG7. The amplifier tank coil was elevated slightly above the chassis by using an Amphenol (23-IS) socket mounting, but the socket could be supported with two short spacers or stand-off insulators. This procedure keeps the tank circuit above the chassis, and makes possible a shorter lead to the amplifier-tube plate cap. No trouble with feedback or instability was encountered, and a tube shield for the 2E26 proved unnecessary.

The final amplifier has a combination of grid leak and cathode bias. $R_4$ is the grid resistor and $R_5$ the cathode resistor. The cathode bias provides partial protection for the 2E26 should excitation be lost by detuning or interrupting the crystal oscillator. As an additional precaution, the meter switch keeps the negative "B" lead to the amplifier circuit open until the meter is switched to read the amplifier cathode current.

The meter used should have a 0–10 ma. range in order to read the amplifier grid current ac-

![oscillator section](image)

Fig. 2 — Alternative output circuit for coupling to random-length antennas.

$C_1$ — 100-µµfd. variable.
$C_2$ — 140-µµfd. variable.
$C_3$ — 0.002-µfd. mica.
RFC — 2.5-mh. r.f. choke.

accurately. The meter switch is double-pole single-throw, and when it is open the meter reads grid current. With the switch closed the meter reads amplifier cathode current, and the meter shunt, $R_{12}$, is connected across the meter to extend the range to 100 ma. The shunt was made of No. 32 copper wire wound on a small form. No value is given since the exact resistance required will depend on the type meter selected for use.

The 6L6 modulator stage seems to be adequate, and reports received from contacts on the air ranged from "very good" to "all that could be expected when using a carbon mike." The gain control appears on the right rear corner of the chassis. Mounting it on the front panel seemed unnecessary, because once set it requires no further adjustment. The microphone current is obtained from a tap on the 6L6 cathode resistor, $R_S$. Microphone current can be adjusted to the required value by sliding the tap.

For c.w. work, both the oscillator and amplifier cathodes are keyed. An extra set of contacts on the key jack shorts out the secondary of the modulation transformer when the key plug is inserted for c.w. operation.

The oscillator coils were wound on small surplus coil forms measuring ¾ inch outside diameter. For 80 meters a total of 60 turns was required, using No. 30 wire close-wound. The 40-meter coil has 24 turns close-wound, and for 20 meters 14 turns are spaced over a length of 1¼ inches. No form is required for the 10-meter oscillator coil since it consists of 4 turns of No. 12 wire, which is self-supporting. The 6AG7 tube was used as a winding form. This same coil is used for 6-meter operation since the oscillator is tuned between 25 and 27 megacycles.
In this bottom view, the variable coupling condenser is visible just to the right at the 6AG7 socket. The form seen end-on just below the meter switch at the top center is the one on which the meter shunt is wound. The circular object just below the coupling condenser is the r.f. choke in the grid circuit of the 2E26. Other parts are easily identified.

The amplifier uses B & W "junior" size plug-in coils. None was available for 6 meters, so it was constructed by winding 3 turns of No. 12 wire around the metal 6L6, using the tube as a temporary winding form.

Power Supply

Any power supply delivering 300 or more volts at 125 ma. is adequate. For c.w. operation a maximum of 600 volts at 66 ma. can be applied to the 2E26, but 500 volts is the maximum tube rating for 'phone. In this rig the limitation on 'phone input is the power output of the 6L6 modulator. With cathode bias as shown in Fig. 1 the rated audio output is 6.5 watts, which will modulate 13 watts input. The modulation transformer is rated to work from a 6L6 into an 8500-ohm load and to carry a primary current of 60 ma. For all-band operation a 375-volt plate supply is suggested. With this voltage an amplifier plate current of 44 ma. will provide the proper load for the modulator and will permit about 90 per cent maximum modulation. The dropping resistor, \( R_{11} \), is calculated for a power supply delivering 375 volts.

It is possible to increase the amplifier input and modulate 100 per cent if 18 volts of fixed bias is substituted for the cathode bias on the 6L6 as shown in the diagram and the 6L6 plate voltage is increased to 350. In this case a 425-volt plate supply can be used and \( R_{11} \) changed accordingly. (Also, a dropping resistor should be provided to lower the oscillator voltage.) The amplifier plate current under these conditions should be 50 ma. for an impedance match. However, the inconvenience of having to supply fixed bias outweighed the small increase in power output, in the writer's opinion. Also, on 10 and, particularly, 6 meters there may not be quite enough grid drive available for the higher input. Six-meter 'phone operation is not optimum in any event, since the 2E26 is used as a doubler, but it works out quite satisfactorily as evidenced by local contacts on that band.

With 375 volts on both the oscillator and amplifier, the following readings were obtained: On 80, 40 and 20 meters the 2E26 unloaded plate current was 15 ma. when operating straight through, and about 20 ma. on 10 meters. When doubling in the final to 10 meters, the current is about 25 ma. and on 6 meters it is near 30 ma.

The circuit values shown in the parts list may not be optimum, but some experimentation indicated the rig was performing about as well as could be expected. In operation on all bands from 80 to 6 meters, using both 'phone and c.w., many favorable reports were received in actual contacts on the air.

Mobile Operation

Although, as stated in the beginning, some thought of mobile operation was in mind in designing the set, actual operation in a car has not yet been tried. However, since building the transmitter we have experimented a bit with feeding a whip antenna, and have found that the revised amplifier plate circuit shown in Fig. 2 will load a 12-foot whip or any random length of wire on all bands. This is the customary pi-network output circuit when the antenna is connected to terminal A1, the loading being adjusted by the setting of \( C_2 \) and resonance maintained with \( C_1 \). For working into the output link with a full-sized antenna, condenser \( C_2 \) should be shorted out. This restores the circuit to the original, with the exception of the substitution of parallel feed.

Silent Keys

I trust with deep regret that we record the passing of these amateurs:

W2GCD, Fr. Henry P. Curley, O.F.M., Paterson, N. J.
W2MRO, R. Kenneth Ruether, East Syracuse, N. Y.
W3AEG, George F. Jackson, Baltimore, Md.
W3EZV, J. Parsons, Baltimore, Md.
W4EP, Rufus O. Hardin, Knoxville, Tenn.
W5MIH, Claude A. Maund, Dallas, Texas
W5KIM, Glen Johnson, Crestline, Ohio
W9WUM, Peter Riepl, Wauwatosa, Wis.
VE1GR, Harold J. Ward, Armadale, Halifax, N. S.
VK3KU, H. K. Love, Victoria

January 1949
It's time again to ready your station for the ARRL International DX Competition, to be held in February and March of this year. This contest, the fifteenth of its kind, gives everyone an opportunity for all W and VE operators to add new countries to their DX totals, other stations to fill in for their WAS and WAVE awards, and everyone to match DX operating skill with other operators in his country or ARRL section. But, whether you have 9 or 9 hundred watts, whether you work 2 or 2 thousand stations, whether you have a wire out the window or a 7-element antenna, you can have a whale of a lot of fun in this annual event.

As in the past, two week-ends are devoted to c.w. operation and two to 'phone operation, giving everyone an opportunity to participate in four week-ends of hot activity. The rules are practically identical to those of last year, except that the c.w. quota for VE stations is raised this year. Past contests have shown that the sparse amateur population of some VE call areas has penalized the station log and records.

Entries by multiple-operator stations are encouraged and will be listed, but only single-operator stations will be eligible for the special bronze medallions offered to the top 'phone and c.w. scorers in each country and ARRL section. Multiple-operator scores can be grouped with single-operator scores in club competition, however, and a handsome gavel is offered to the club with the highest aggregate score. Within a club, single-operator entries can compete for the "club-certificate" awards given to the highest c.w. and 'phone scorers.

If you’re new to the DX Contest, it won’t take you long to catch on. During the contest period, stations outside the U.S. and Canada will call “CQ W/VE” or “CQ TEST” and will exchange numbers as shown in the sample elsewhere on these pages. You can try a “CQ DX” or “CQ TEST” if you’re a W or VE, but past experience shows that this pays off very seldom. On c.w., Ws and VEs have quotas but this doesn’t apply to 'phone. Keep your log carefully, and send a copy of it, in the form shown, to ARRL. Free contest forms are available from ARRL Headquarters, West Hartford, Conn., upon request. Get your station working at top efficiency, make no social commitments for the important week ends, read the rules to acquaint yourself with the pattern, and then get set for more DX per kilocycle per hour than your poor crystal filter and "Q5-er" have ever had to cope with before.

### Rules
1. **Eligibility**: Amateurs operating fixed amateur stations in any and all parts of the world are invited to participate.
2. **Object**: Amateurs in the continental U.S. and Canada will try to work as many amateur stations in other parts of the world as possible under the rules and during the contest periods.
3. **Conditions of Entry**: Each entrant agrees to be bound by the provisions of this announcement, the regulations of his licensing authority, and the decisions of the ARRL Award Committee.
4. **Entry Classifications**: Entry may be made in either or both the 'phone or c.w. sections; c.w. scores are independent of voice scores. Entries will be further classified as single- or multiple-operator stations. Single-operator stations are those at which one person performs all the operating functions. Multiple-operator stations are those obtaining assistance, such as from "spotters" or relief operators, or in keeping the station log and records.

### CONTEST TIMETABLE

#### C.W. Contest:

<table>
<thead>
<tr>
<th>Time</th>
<th>Start</th>
<th>Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>CST</td>
<td>Feb. 11th 2400</td>
<td>Feb. 20th 2400</td>
</tr>
<tr>
<td>EST</td>
<td>Feb. 11th 5:00 P.M.</td>
<td>Feb. 20th 5:00 P.M.</td>
</tr>
<tr>
<td>PST</td>
<td>Feb. 11th 8:00 P.M.</td>
<td>Feb. 20th 8:00 P.M.</td>
</tr>
<tr>
<td>The second period of this contest starts at these same hours Mar. 11th.</td>
<td>The second period of this contest ends at these same hours Mar. 18th.</td>
<td></td>
</tr>
</tbody>
</table>

#### 'Phone Contest:

<table>
<thead>
<tr>
<th>Time</th>
<th>Start</th>
<th>Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCT</td>
<td>Feb. 18th 2400</td>
<td>Feb. 20th 2400</td>
</tr>
<tr>
<td>AST</td>
<td>Feb. 18th 8:00 P.M.</td>
<td>Feb. 20th 8:00 P.M.</td>
</tr>
<tr>
<td>EST</td>
<td>Feb. 18th 7:00 P.M.</td>
<td>Feb. 20th 7:00 P.M.</td>
</tr>
<tr>
<td>PST</td>
<td>Feb. 18th 4:00 P.M.</td>
<td>Feb. 20th 4:00 P.M.</td>
</tr>
<tr>
<td>The second period of this contest starts at these same hours Mar. 18th.</td>
<td>The second period of this contest ends at these same hours Mar. 18th.</td>
<td></td>
</tr>
</tbody>
</table>
**LOG, 15th A.R.R.L. INTERNATIONAL DX COMPETITION**

### C.W. Entry

(Logs from W or VE show, for each band)

<table>
<thead>
<tr>
<th>Bands</th>
<th>3.5 Mc.</th>
<th>7 Mc.</th>
<th>14 Mc.</th>
<th>27 Mc.</th>
<th>28 Mc.</th>
<th>Total Different Countries Worked</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. DX Stations QSOed</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. Countries QSOed</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

(Logs from remote points indicate, for each band, in the above part of the log: "Number U.S.A.-Canada stations QSOed" and "Number U.S.A.-Canada licensing areas worked.")

<table>
<thead>
<tr>
<th>Call</th>
<th>Name</th>
<th>Address</th>
<th>Antenna(s)</th>
<th>Transmitter Tubes</th>
<th>Plate Watts (input last stage)</th>
<th>No. Hours Station Operation</th>
<th>ARRL Section (for continental U.S. and Canada)</th>
</tr>
</thead>
</table>

**Date & Time** | **Station Worked** | **Country** | **Worked Record of New Countries for Each Freq. Band** | **Numbers Exchanged** | **Points** |
|----------------|------------------|------------|-----------------------------|------------------------|----------|

Feb. 11th 4:02 P.M. PST | VP9E | Bermuda | 1 | | 568543 | 478901 | 3 |
Feb. 13th 8:15 P.M. | G2MI | England | 2 | | 488543 | 488111 | 3 |
Mar. 12th 9:28 P.M. | ZL1MR | N.Z. | 1 | | 579543 | 579287 | 3 |
10:50 P.M. | VK2TI | Aust. | 2 | | 457543 | 398657 | 3 |
11:50 P.M. | VP9X | Bermuda | 3 | | 349543 | 589884 | 3 |
Mar. 13th 12:05 A.M. | VE2BA | Aust. | 2 | | 568543 | 579000 | 3 |
3:10 P.M. | VE2TI | Aust. | 4 | | 495543 | 489852 | 3 |
3:20 P.M. | PY2AC | Brazil | 1 | | 487543 | 480853 | 3 |

**Multiplier:** 2 + 4 + 1 = 7

24 (points) × 7 (multiplier) = 168 Final Score

I certify, on my honor, that I have observed all competition rules as well as all regulations established for amateur radio in my country, and that my report is correct and true to the best of my belief. I agree to be bound by the decisions of the ARRL Award Committee.

Operator’s Signature

---

5) **Contest Periods:** There are four weekends, each 48 hours long: two for ‘phone work and two for c.w. The c.w. section starts at 2400 GCT, Friday, February 11th and Friday, March 11th, ends 2400 GCT, Sunday, February 13th and Sunday, March 13th. ‘Phone section starts at 2400 GCT, Friday, February 18th and Friday, March 18th, ends 2400 GCT, Sunday, February 20th and Sunday, March 20th.

6) **Valid Contacts:** In the ‘phone section, all claimed credits must be made voice-to-voice. In the telegraph section, only c.w.-c.w. contacts count.

7) **Exchanges:** Each participating operator will choose three figures as a self-assigned number. C.w. contestants will exchange five-figure numbers, each consisting of an RST report plus the three self-assigned numbers. (Examples are given in the sample log). ‘Phone contestants will exchange five-figure numbers, each consisting of a Readability-Strength report plus the three self-assigned numbers.

8) **Scoring:**
   a) **Points:** 1 point is earned by a W (K) or VE station upon receiving acknowledgment of a number sent, and 2 points upon acknowledging a number received. Two points are earned by any other station upon receiving acknowledgment of a number sent, and 1 point upon acknowledging a number received.
   b) **Final Score:** W (K) and VE stations multiply total points earned under Rule 8(a) by the number of countries worked on one band plus the number of countries worked on each other band. All other stations multiply total points earned under Rule 8(a) by the sum of the number of W (K) and VE licensing areas worked on one band plus the number of W (K) and VE licensing areas worked on each other band.

Countries will be those on the ARRL Countries List. There are 18 licensing areas: 10 in the United States, 8 in Canada.

**January 1949**
9) Repeat Contacts: The same station may be worked again for additional points if the contact is made on a different frequency band. The same station may be worked again on the same band if the complete exchange for a total of three points was not made during the original contact on that band.

10) Quotas: The maximum number of points per country per band may be earned by W (K) stations in the c.w. section is 9, and contacts made on the same band with the same country after the quota is filled will not count. Thus complete exchanges with 3 stations in one country on one band fill the band quota for that country. The maximum number of points per country per band which may be earned by VE stations in the c.w. section is 15, and contacts made on the same band with the same country after the quota is filled will not count. Exchanges with 5 stations in one country on one band are thus permitted VE participants. There is no quota for stations in the c.w. section outside of W (K) and VE. There is no quota for any station in the 'phone section.

11) Reporting: Contest work must be reported as shown in the sample form. Each entry must include the signed statement as shown in that example. Contest reports must be mailed no later than April 20, 1949, to be eligible for QST listing and awards.

12) Awards: To document the performance of participants in the Fifteenth ARRL International DX Competition, a full report will be carried in QST. In addition, special recognition will be made as follows:
   a) Engraved medallions will be awarded to the 'phone and to the c.w. winners in each country (as shown in the ARRL Countries List) and in each of the 72 U.S. and Canadian ARRL sections (see page 6 of this issue) from which valid entries are received. Only single-operator stations will be eligible for these awards.
   b) A suitable certificate will be awarded to the operator making the highest single-operator 'phone score in each ARRL-affiliated club, provided the club secretary submits a listing of 'phone scores by bona fide resident members of such club, and provided further that these scores are confirmed by receipt at ARRL headquarters of the individual contest logs from such members. The highest single-operator c.w. scorer in each club will be awarded a certificate under the same conditions.
   c) ARRL will award a gavel to the affiliated club submitting the greatest aggregate 'phone and c.w. score by bona fide resident club members, whether single- or multiple-operator entries, provided such scores are confirmed by receipt at ARRL headquarters of the individual contest logs from such members.

13) Judges: All entries will be passed upon by the ARRL Award Committee whose decisions will be final. The Committee will void or adjust entries as its interpretation of these rules may require.

14) Disqualifications: Off-frequency operation (as confirmed by a single FCC citation or advisory notice or two accredited official observer measurements) will disqualify. Low tone reports in logs will also be considered by the ARRL Award Committee as grounds for disqualification.

---

From a recent AACS bulletin:
"S/Sgt. Wm. ('Pappy') Henderson was making an AACS installation on the Island of Cyprus, and found he was lacking supplies. He fired up his ham rig, called Wiesbaden, and raised D4AFE. 'Pappy' asked D4AFE to copy a list of needed supplies, and to pass it on to AACS headquarters. D4AFE did even better—he saw to it that the supplies were on a Cyprus-bound plane the next day.

"D4AFE, incidentally, is the call of Lt.-Gen. Curtis Lemay."

---

**THE GOVERNORS-TO-PRESIDENT RELAY**

**Jan. 19th (5 P.M. EST) to Jan. 20th (5 P.M. EST)**

The President of the United States will be inaugurated on January 20, 1949. On that occasion radio amateurs will participate in a sixth Governors-to-President Relay. Each ARRL section communications manager in whose territory there is a state capital is designating an amateur to approach and secure a message for President Truman from his Governor. The Washington Radio Club, in cooperation with area clubs, is sponsor of this activity and has requested that the National Emergency Net and W1AW be alerted to funnel messages into Washington.

Every active U.S. amateur with a station on the air will be interested in helping in the relay. Messages will all start from designated amateur stations at 5 p.m. EST (4 p.m. CST, 3 p.m. MST, 2 p.m. PST) January 19th. The relay will continue until the same hour January 20th. Some of the governors' messages will be long ones. Handle messages whenever you can, but be ready to QRX and assist in copying as well as relaying, if QRM or other difficulties turn up.

**Information for Operation in the Relay:**

1) Listen on 5560, 3650, 8875, 7100, and 14,150 kc., or call near those frequencies. Washington-area stations will monitor these frequencies (those italicized are the National Emergency Net frequencies).
2) Stations with GPR traffic will call "CQ Wash. . . . GPR." (3) Washington stations may call "CQ GPR." (4) W3AKB/W238W will maintain a tabular chart by states of messages received. Area stations will telephone Randolph 9407 and report receipt of each message, state from which received, and their own call. (5) Short calls with break-in will be most effective.
6) (After the relay is completed, messages will be collected at a central point to be designated to area stations.

**Reporting:** Send ARRL complete copies of the message(s) you handle in connection with this relay. Show time received, time forwarded, and both or all stations with whom handled. A file of traffic showing the comparative handling of the message of each state is desired so that QST can fully credit each routing in this demonstration of amateur capabilities.

—F. E. H.
Some Notes on the Clapp Oscillator

BY RICHARD G. TALPEY,* W2PUD

The following notes on the Clapp series-tuned oscillator are a result of the author's experience in building a VFO using this circuit. It is hoped that they will be useful to others.

The circuit used is shown in Fig. 1. Values are conventional, but only high-quality components were used.

Greatly-improved isolation between the oscillator and succeeding buffers may be accomplished with the circuit as shown. One half of a double triode (12AU7 or 6SN7) is used as the oscillator and the other section operates as a cathode follower. The low output impedance of the cathode follower makes the voltage and frequency less sensitive to load changes. W2PBA has used a cathode follower to isolate other VFOs, but the Clapp oscillator lends itself very simply to this circuit. If the oscillator is not keyed, the follower grid may be directly coupled to the oscillator cathode, since little or no d.c. voltage exists at this point. If the oscillator is keyed in the cathode circuit, capacity coupling should be used to prevent the open-circuit cathode voltage from appearing on the follower grid.

It was found that an r.f. choke in the cathode circuit of the follower improved the output. The output is somewhat less than that from the oscillator alone, although neither is very large. In this installation about 3 volts output was obtained, enough to drive a 6AC7 Class A. The 6AC7 was found to be superior to the 6AG7 in cases where the grid drive is small. This is to be expected from the high perveance of the 6AC7. In addition, it was desired to keep power dissipation to a minimum, and the 6AC7 gives more output at lower current. A 2E26 may be driven to full output with the 6AC7 operating Class A from the cathode follower.

The mechanical construction used with this type of oscillator must be considerably more rugged than with the usual high-C VFO. The junction between the tuning capacitor and the coil is very hot and any change in stray capacitance at this point will spoil the stability. The coil and condenser should be mounted so that no relative motion can occur between these components or between them and the shield.

Available ceramic coil forms did not give Qs which came up to expectations. An air-wound coil similar to the B&W type having a length about equal to its diameter was selected as having the best Q. The coil was clamped on one side in a polystyrene bracket. The Q of this coil with-

* 59 Orland Road, Rochester 9, N. Y.

out a shield was measured as 275 at 3.5 Mc. It should be realized that placing a shield around a coil will reduce its Q. The coil should be spaced from all sides of the shield by a distance at least equal to the coil diameter to lessen the reduction in Q by the shield.

The usual precautions as to condenser bearings should be observed. The small amount of tuning capacitance used in this circuit makes the frequency more dependent upon strays and minimum capacitance of the condenser. Condensers in which spacing can be changed with longitudinal...

(Continued on page 118)
I Will Do It in '49!

BY HERBERT S. BRIER,* W9EGQ

If you have ever felt the thrill of raising, on the first attempt, a DX station that the other locals have been calling for hours, you know all about the annual ARRL DX Competition. If you do not, all I can say is that to a DX man it combines the thrills of a big-game hunt, the World Series, and the Rose Bowl Game.

In 1947 my score was among the first ten, which wasn’t bad for a location with room for only a dual ten-twenty four-element rotary and a 40-meter doublet bent in a “Z.” But I resolved to do better in 1948 — I raised the rotary another twenty feet, and . . .

... Who am I? Well, I was christened Thomas Kenneth Wilson, but since I have been a ham even my mother calls me “TK.” I started out on forty meters with fifty watts input, and my one ambition was to WAS until I dropped to twenty and worked a G. From that moment I have been a DX man!

Before continuing, I want to make a few things plain. First, my wife Betty can never say she is a radio widow, because I hardly ever spend more than four hours a day on the air, week ends and holidays excepted, of course. Secondly, if you have heard that my initials stand for “Three-Kilowatt Willie,” forget it. My transmitter is nothing special; just a bandswitching kilowatt for the DX bands, with everything big enough to run coolly at full input.

To get back to the contest. On New Year’s Day of 1948 I hung a calendar in the parlor with the all-important week ends circled. Betty and the kids did not have to be told what that meant. Skipping ahead to the first Friday of the contest, I came out of the shack at 2300 GCT (5:00 P.M. CST) and ate a light lunch. Then I kissed the family good-by, and carried the thermos jug of coffee and two cartons of cigarettes into the shack. Closing the door, I deliberately locked it behind me.

At 0001 GCT, plus fifty seconds, I called XF1A. Juan went back to Hammerhead Nelder, three blocks away. This set the pattern. Every station I called seemed to hear Hammerhead first. And he has only a pair of prewar T40s! Otherwise things went pretty smoothly. I was really popped up to work FM8AD for No. 199 postwar.

XF1A was tough, and I was calling him for the eighth time when there was a timid knock at the shack door and Susan said, “Daddy, Mr. Smith is here. He says you’re interfering with both his radio and television set.”

“Tell him I’m not home.”

“We did, but he can see the light in your shack. And besides, the street light is blinking like it always does when you’re working DX.”

Meanwhile I was trying to copy XF1A’s number through Hammerhead’s key clicks. I asked for a repeat as Smith started pounding on the door. Seeing that I was trapped, I barked, “Just a minute,” receipted Juan’s number, and started to send my own.

In spite of all my warnings, Betty picked that moment to plug in her electric iron, and every light in the house went out! My anguish then was nothing compared to when I discovered that there wasn’t another fuse in the house. The next thing I remember is finding myself sitting in a chair, staring aimlessly into the darkness.

It would take some doing to get back on the air. All the stores were closed, and there was no use appealing to the neighbors. Even if they had 50-amp. fuses, they would never help me get back on the air. Pennies were out, too, after what the electrical inspector said after our little fire last fall. Suddenly I recalled the drugstore.

*385 Johnson St., Gary, Ind.
They had two 15-amp. fuses left. I knew that such small ones would hardly carry the filament load with the final connected. But if I coupled the antenna to the 304TL drivers...

The first dot after the change blew the new fuse. Slipping the other one into the box so the family could see to go to bed, I tortured myself by listening to the juicy stuff coming through. Then I grabbed a pencil to figure how much power I could squeeze through a 15-amp. fuse.

The power consumed by the receiver (in stand-by), the transmitter tube filaments (without the final), the exciter power supply, and the beam motor totaled about eight hundred watts. This, divided by 115 volts, equaled seven amperes, leaving eight amperes. I brightened up a little, figuring that I could work a few stations with 920 watts input. But I had forgotten two things: the driver power supply was not more than 75 per cent efficient, and its bleeder drew sixty milliamperes at three thousand volts. Subtracting these additional losses left me with only 510 watts! Suddenly I realized that I did not have to rotate the beam while transmitting. I had another hundred watts! Disconnecting the refrigerator and shutting off all the lights, I tuned up by the light of a candle. Being conservative, I only ran the autoformer up to six hundred watts, leaving ten watts to spare.

Working VK3EO, PY2BA, KH6IJ and G2LR in quick succession reassured me that low power would get out; therefore I started listening under the top layer. CR9AG came back on my first call, and gave me 589000. I answered, "RGE JOHN. BR NR -"

I got no further. Betty's brother Fred (who lived with us then) came in from a date and turned on the light. The last fuse quietly collapsed. Numbly, I blew out my candle and stumbled off to bed.

The first electric shop had no 50-amp. fuses, nor did the second, nor the third. "I don't know why," a clerk told me, "but we've had a terrific demand for heavy-duty fuses the past week." It was no mystery to me—mine aren't the only 750Ts in town!

I grabbed the telephone to call some of the other DX men, only to be told that none of them was home. I should have known; they all were in the contest, and had given their families the usual instructions. I would have to visit one in person, but which one? W5BUNK was out. He hasn't spoken to me since I called that OM on top of that CR4 he thought he had raised. And a little thought made me realize that my chances of success would improve the farther from my own shack I went seeking help.

W6OGEE, across town, seemed my best bet. We have never had a run-in, except the time... but I hoped he would not remember that. I do not think he did, because he parted with three fuses in exchange for a 4-mfd. 5000-volt filter condenser and a promise to help him erect his new ninety-footer.

My score for the first period was fifty-eight contacts and a multiplier of twenty-five.

Getting ready for the second week end, my first move was to install a new three-wire line of No. 4 wire for 220-volt service for the transmitter. Next, I replaced the fuses with circuit breakers. In some way I was so busy that I forgot about the radio club meeting, which saved me a lot of explaining.

The day before the second period began, I put blackout curtains on the shack windows and instructed the telephone company to disconnect the telephone until Monday morning. And it was a stroke of genius to pack the family off to Grandma's for the week end.

My work paid off. By the time ten had faded out I had forty-one contacts! Results on twenty were equally good; operating continuously, I worked everything I heard, and much of it stuff I had never heard before. As a result, I knew that I had done my best as I fell asleep in my chair after the last contact at 2359 GCT, Sunday.

By Tuesday my ears had stopped ringing enough for me to get on the air to compare scores. My smile got bigger and bigger. It looked as though I had done it so I went to the radio club to gloat a bit.

"Hi, 'TK,' what do you think of Jim's score," greeted me at the door.

There was no use kidding myself. Jim would be hard to beat, but I managed to reply casually, "I haven't heard. What was it?"

I almost laughed aloud on hearing that he had worked eighteen fewer stations and five fewer countries than I did. Then the sky fell on me! Jim had worked twenty countries on eighty, and his multiplier was fifteen greater than mine!

(Continued on page 110)
The Black Box

3.5- and 7-Mc. VFO Transmitter for Fixed, Portable or Mobile Operation

BY ALBERT E. HAYES, JR.,* W11IN

The acquisition of a PE-103A dynamotor was the spark that got us thinking of the possibilities of portable/mobile/emergency operations. Visions of checking into a traffic net while breezing merrily down U. S. route 6, plus a consideration of the writer's location — back in the Connecticut hills twenty-five miles from Hartford, where the power line goes out every time one of the neighbors' cows sneezes — finally proved too much to resist, and the project was begun. The ratings of the PE-103A, 500 volts output at 160 ma., continuous duty, and a consideration of the needs of W11IN/portable/mobile/emergency 3.5-Mc. and 7-Mc. traffic circuits, virtually dictated the final-amplifier stage if maximum performance was to be attained: a single 807. Allowing 100 ma. for the plate of the final, and 10 ma. for bleeder currents and the like, left 50 ma. for the exciter.

Crystal control or VFO operation? There was the question. With crystals at a couple of bucks a piece and the recent introduction of the series-tuned Colpitts oscillator circuit giving VFO operation a "new look," it was determined to try a 6L6 "Clapp-circuit" oscillator driving the 807 final. A 7 × 7½ × 14-inch black crackle-finished cabinet happened to be available, so we convinced ourselves that here, indeed, was the optimum size for housing the brain child. An antenna tuner was a "must" since such items are usually difficult to haywire together in time of emergency.

A look at the circuit diagram will show that the circuit arrangement is along conventional lines. The 6L6 oscillator operates without benefit of a tuned circuit in its plate. In the usual set-up where a 6L6 drives an 807, there is an excess of drive available — in our case, with the untuned 6L6 plate circuit, we need every available bit of drive. Hence the unusually large coupling condenser to the 807 grid. Untuned coupling is not a shortcoming, however, since the 807 is driven sufficiently hard to double with good efficiency, and the untuned circuit in the 6L6 plate contributes materially to the stability of the unit when the oscillator is keyed.

The switch S1 lives a double life; purists may call it a "key-either-oscillator-or-final switch," but the traffic man calls it a "nonswisher." By pushing S1 to the side that connects the cathode of the 6L6 directly to ground it is possible to set the oscillator on top of your quarry unbeknownst to the general public. When the switch is in its other position, the oscillator is keyed along with the 807. In addition, leaving the switch in the "nonswish" position provides amplifier keying, with a continuously-running oscillator, thus yielding the best possible keying characteristics when break-in keying is not needed. The other switch is not there just for appearance's sake, but operates the starting relay in the PE-103A when Terminal 2 is connected to the appropriate pin on the dynamotor plug.

The 200-ma. meter is wired permanently into the plate circuit of the 807 since we can't see any

* National Emergency Coordinator, ARRL.

The variable-ratio dial satisfies both those who must hop madly around the band during contests and the more conservative operators who seek to set themselves exactly on a net frequency. The two knobs are (l. to r.) 807 plate tuning and antenna tuning. Two hat-handle toggle switches and a key jack round out things on the appearance side.
Fig. 1 — Schematic diagram of the transmitter.

C1 — National ST-35 with all but one stator plate removed.
C2 — 35-µfd. air trimmer.
C3 — 500-µfd. silver mica.
C4 — 750-µfd. silver mica.
C6, C9, C10, C13 — 0.01-µfd. 600-volt paper.
C11 — 750-µfd. silver mica.
C12 — 0.001-µfd. 600-volt paper.
C13 — 100-µfd. variable (National ST-100).
C14 — 8-µfd. 150-volt electrolytic.
R1, R2, R3 — 25,000 ohms, 10 watts.
R4 — 30,000 ohms, 10 watts.
R5 — 50,000 ohms, 10 watts.
R6 — 15,000 ohms, 1 watt.
R7 — 220 ohms, 1/2 watt.
R8 — 0.1 megohm, 1/2 watt.
R9 — 10 ohms, 1 watt.
L1 — National AR 16-80E with link removed.
L2 — 3.5 Mc. — 27 turns No. 16 enameled, close-wound.
L3 — 7 Mc. — 14 turns No. 16 enameled, close-wound.
L4 — 3.5 Mc. — B & W 80 JCL with base connections rewired as shown.
L5 — B & W 40 JCL with base connections rewired as shown.
L6 — B & W 40 JCL with base connections rewired as shown.
J1 — Open-circuit jack.
MA — 0-200 d.c. meter.
RFC1, RFC2, RFC3, RFC4 — 2.5 mh. r.f. choke.
S1 — S.p.d.t. toggle switch.
S2 — S.p.s.t. toggle switch.

The antenna tuner is ideally suited for coupling to a 135-foot wire fed at the center with 50 feet of 300-ohm Twin-Lead, providing series tuning on 80 and parallel tuning on 40. Such an antenna, if the flat top is made of reasonably limp wire, is an excellent two-band portable antenna since it can

reason to measure any of the other currents — no adjustments are provided to do anything about them.

The area above the 6 1/2 x 11 x 2-inch chassis is divided by aluminum partitions into (l. to r.) the antenna tuner, 807 amplifier and its associated tank circuit, and the entire oscillator. The Millen terminal strip used for power-supply connections is preferred to the use of a plug since the transmitter can be hooked to a "strange" power supply more conveniently during emergency.

January 1949
mounted about an inch to provide adequate clearance between the plate cap and the lid of the cabinet. If a slightly larger cabinet is used this submounting will not be necessary.

It is in the physical construction of the oscillator itself that the greatest care should be used, since mechanical instability of any kind will result in unsatisfactory performance. Tighten down every mounting screw, and see that all joints are well soldered, and there should be little trouble with oscillator instability.

The antenna tuning condenser and the 807 tank tuning condenser are insulated from the chassis by virtue of their being mounted on small polystyrene buttons. In order to keep all tuning shafts lined up the oscillator tuning condenser is similarly mounted, but well grounded both at the point of mounting and to the common ground bus which connects the common grounding points of the two stages.

The shield between the oscillator and amplifier is bent from a sheet of aluminum, and is firmly fastened to both the chassis and the front panel. It not only provides shielding between the adjacent oscillator and amplifier tank circuits, but contributes to the rigidity of the assembly — a factor to be considered in the search for oscillator stability. The shield between the amplifier and the antenna tuner is not especially needed for its shielding properties, but is provided as an additional strengthening member.

In operation, with the 3.5-Mc. coils in the appropriate sockets, 6.3 volts applied to the filament circuit, and 500 volts for the plates, and the key depressed, a minimum unloaded plate current to the 807 of about 15 ma. should be obtained. With an antenna or transmission line connected to the output terminals, rotation of the antenna tuning condenser should increase the current to well over 100 ma. Don't leave the current at that setting, but retune the amplifier tuning condenser for minimum plate current, which should now be considerably higher than 15 ma. Repeat these operations until the minimum 807 plate current is between 90 and 100 ma. If it is impossible to load her up to this extent it is probable that adjustment of the number of turns on the link which is coupled to the antenna tank circuit will straighten things out.

The 3.5—4 Mc. band should cover most of the 100 divisions on the oscillator dial. If not, adjustment of the trimmer C2 will correct the matter. Bandspread is entirely adequate for any purpose, since 3500 kc. appears at 5 on the dial while 4000 kc. falls at 95. Could anyone ask more bandspread than this?

Operating on 40 simply requires that the appropriate coils be plugged into the amplifier and antenna circuits. The output is about 60 per cent of the 80-meter output when doubling in this fashion.

With 500 volts applied from the dynamotor, the output is about 30 watts on 3.5 Mc. When operated at the home station from a 750-volt supply, the output is about 50 watts, and the keying is every bit as good as when 500 volts is used. We even tried the gadget with 100 volts applied to the "high-voltage" terminals, and it still works FB.

The voltage-frequency characteristic of this unit is well above average. Changing the applied high voltage from 750 to 250 volts produces a frequency shift of about 100 cycles. Temperature-wise, we have no problems either since after a ten-minute warm-up period (during which the drift is about 100 cycles) no appreciable drift has been detected.

Although parasitics were not a problem in the construction of the particular unit illustrated, they should be watched for carefully in the first tests before the Black Box is put on the air. The damping resistor in the grid circuit seems to kill all signs of instability, but additional damping resistors or chokes in the screen or plate circuits may be found necessary in the event that unwanted frequencies are found.

Don't be surprised if our little monster gets out as well as your high-powered rig. The effectiveness of 30 to 50 watts in the antenna has been proved by a weekly schedule with HH2BL on the low end of the 3.5-Mc. band.

The works, illustrating the compact and rugged wiring of the oscillator circuit and the relative simplicity of the amplifier portion. The several tubular paper condensers are separated from the wire-wound resistors in the bleeder string, otherwise wax would flow. A bottom plate is in order, even though the unit is mounted in a metal cabinet, since it contributes materially to the rigidity of the structure.
The fall of 1948 may have been several months past the peak of the sunspot curve, but that did not keep the sharper operators from getting in a few 50-Mc. F₂ DX contacts during November. Most of the openings were of short duration, and relatively few of the gang were on deck at the right time (that F₂ stuff will break out at 10 in the morning!) but transcontinental openings occurred on several days, and a few fellows added South America to their 6-meter logs. The North Atlantic path was being watched closely, both in this country and in Europe, but though the m.u.f. crept up close to 50 Mc. on several occasions, as far as is known there were no actual contacts over that route this year.

Generally speaking, the m.u.f. on north-south paths was higher than on the east-west ones. As early as Nov. 1st 50 Mc. was open between England and South Africa, G5BY and ZSIP making several two-way 6-meter contacts between 1404 and 1509 GCT on that date. There were indications that 50 Mc. was open between the United States and South America on several days, but the only contacts thus far reported from the southern end were made by HC20T, Guayaquil, Ecuador. Steve, ex-W5DNN, worked W5ZZF, Big Spring, Texas, on the 20th, at 11:05 EST, after having heard W5JTI, Jackson, Miss., and W5JLY, San Antonio, Texas, just previously. On the morning of the 21st, HC20T worked W5JTI, Jackson, Miss., and W5ZZF, Big Spring, Texas, in a 2-hour opening.

November provided a number of transcontinental openings, which, though not up to last year in either duration or signal strength, came as a welcome surprise. Predictions had indicated an m.u.f. between our two coasts of about 40 Mc. for the month, but the W₁, W₂-W₇, VE₁ route was open several days, and there were brief flashes of W₁s on a couple of occasions. On the 13th W7DYD, Bothell, Wash., worked W2BYM, Lakehurst, New Jersey, at 11:35 A.M. PST, having heard him first about a half hour earlier. W7DYD heard W2BYM again the following day at 10:15 A.M., and worked VE₁QY, Portsmouth, N. S., and heard W1CLS, in about 2 hours of intermittent band-edge openings. On the 15th W1CLS was worked at 9:55 A.M. PST, followed by WIFMHI, Chibougamau, and W1ATP, Holliston, Mass.

Apparently Nov. 14th and 15th were about the best days. W1CLS noticed that the skip on 28 Mc. was getting down under 1000 miles at 2:45 P.M. EST on the 14th and W7s started to break through on 50 Mc. just before 3 P.M. W7DF, Everett, Wash., and VE7BQ, Vancouver, B. C., were worked, and various commercial harmonics were heard up to about 51 Mc. around 3:30. W7BQX, Sequim, Wash., worked VE₁QY and heard W1CLS. The band opened for sporadic-E skip to W4, W5 and W6 during the evening. The 15th was good in the early afternoon, and W1CLS worked VE7CN, W7DYD, W7ERA, VE7AEZ and VE7NM. On the 17th a brief opening to California permitted an exchange with W6GQ, Santa Ana, around 1 P.M.

During the week of the 14th the North Atlantic path was showing brief flashes up to about 50 Mc. The frequencies between the 10- and 6-meter bands were opening with a rush each morning, the m.u.f. shooting up to about 47 Mc. almost daily, and a careful listener would hear occasional bursts up to 50 Mc. or higher, but the openings, if such they may be called, were of such short duration that no contacts had been made, up to this writing.

The m.u.f. was high to South America during this week, too. Commercial harmonics were reported up to 50 Mc. by several listeners on dates other than those for which the reports of HC20T were received.

* V.H.F. Editor, QST.
show the band to have been open. An unusual feature was the evidence of actual openings between northeastern U. S. A. and South and Central America. No W1 has yet worked two-way with Latin America, but reception by HC20T of W1CLS and W1AEP demonstrates the possibility. Your conductor heard a Spanish-transmitting c.w. signal on 50.2 Mc. on the 16th, and HPE, Panama, was S9 on 47.8 Mc. for more than an hour the same morning. HKO, Colombia, and various other commercial sigs, were heard with good strength between 46 and 50 Mc. on several dates. The 16th must have been good in some direction, for, though no DX contacts have been reported for that date, W8MVG heard W1CLS and W1HDQ, apparently by the rebound method, around 1 p.m. EST, indicating an m.u.f. well above 50 Mc., it seems certain that the possibilities of the higher band would be shown to be much better than the above meager reports would indicate.

Wanted: More Regular V.H.F. Activity

Almost without exception, the letters received from 50-Mc. men recently bear the same comment. They report DX heard or worked, and then add: "This was my first activity on the band since last summer. Activity here is at a very low ebb." Though v.h.f. activity always sags at this season, this year, this time it seems to have dropped more than ever. Yet there are plenty of fellows scattered around the country who would like to see things rolling. Can't we get together on some program to this end? This need applies to other v.h.f. bands as well, for the same complaint is heard from 2-meter workers.

First of all, we would do well to remember that v.h.f. interest and activity cannot live by DX alone. We all like to work the DX, of course, and much of the good that has come from amateur v.h.f. operation is directly or indirectly the result of our urge to expand our horizons. But the fair-weather v.h.f. enthusiasts — those who put in an appearance on a band only when DX starts to break — miss the best part of it all. Almost all of us, by now, recognize that the v.h.f. bands are without equal for reliable night-and-day local coverage. When we want local contacts let's shift to the v.h.f. bands to make them. If every contact which is possible on 6 and 2 meters were made there, these two bands would never lack for oc-

cupancy. How many contacts are now being made over distances under 100 miles on 10, 20, 40 and 80? Diverting even a small part such work to 6 and 2 would certainly help. How about it?

Many would-be v.h.f. operators are discouraged over their prospects when they listen on 6 and 2 and discover nothing but silence or auto ignition. If they heard a dozen stations talking amongst themselves they'd rush to join them — but silence breeds more of the same. Now it is not always possible to keep things rolling every night in the week, but getting on is easy, and we can help matters along by getting together on an operating schedule for a night or two a week. Not a night or two when we'll listen in and see if there's anything doing, but a night when we guarantee actually to get on the air and generate some activity.

Such a program requires some promotion. Talk it up with your local gang. Keep the subject alive at radio elub meetings. Send the dope on your program to this end? This need applies to other v.h.f. bands as well, for the same complaint is heard from 2-meter workers.

First of all, we would do well to remember that v.h.f. interest and activity cannot live by DX alone. We all like to work the DX, of course, and much of the good that has come from amateur v.h.f. operation is directly or indirectly the result of our urge to expand our horizons. But the fair-weather v.h.f. enthusiasts — those who put in an appearance on a band only when DX starts to break — miss the best part of it all. Almost all of us, by now, recognize that the v.h.f. bands are without equal for reliable night-and-day local coverage. When we want local contacts let's shift to the v.h.f. bands to make them. If every contact which is possible on 6 and 2 meters were made there, these two bands would never lack for oc-

cupancy. How many contacts are now being made over distances under 100 miles on 10, 20, 40 and 80? Diverting even a small part such work to 6 and 2 would certainly help. How about it?

Many would-be v.h.f. operators are discouraged over their prospects when they listen on 6 and 2 and discover nothing but silence or auto ignition. If they heard a dozen stations talking amongst themselves they'd rush to join them — but silence breeds more of the same. Now it is not always possible to keep things rolling every night in the week, but getting on is easy, and we can help matters along by getting together on an operating schedule for a night or two a week. Not a night or two when we'll listen in and see if there's anything doing, but a night when we guarantee actually to get on the air and generate some activity.

Such a program requires some promotion. Talk it up with your local gang. Keep the subject alive at radio club meetings. Send the dope on your local schedules in to us and we'll run it in QST. And get on, not just when it's convenient, but every schedule period. It pays off.

In the region around Akron, Ohio, W8LBH is attempting to promote a local 6-meter net. W3KPH writes, from Sunbury, Penna., that he would like to hear from others in eastern and central Pennsylvania who would be interested in

2-Meter Standings

<table>
<thead>
<tr>
<th>States</th>
<th>Call Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>W8UJS</td>
<td>14</td>
</tr>
<tr>
<td>W8WJC</td>
<td>14</td>
</tr>
<tr>
<td>W8XYV</td>
<td>13</td>
</tr>
<tr>
<td>W8CYE</td>
<td>12</td>
</tr>
<tr>
<td>W8NMX</td>
<td>12</td>
</tr>
<tr>
<td>W8KXU</td>
<td>12</td>
</tr>
<tr>
<td>W4PBJ</td>
<td>11</td>
</tr>
<tr>
<td>W3PGY</td>
<td>11</td>
</tr>
<tr>
<td>W3RUE</td>
<td>11</td>
</tr>
<tr>
<td>W3HMS</td>
<td>10</td>
</tr>
<tr>
<td>W2WLS</td>
<td>10</td>
</tr>
<tr>
<td>W3CB</td>
<td>9</td>
</tr>
<tr>
<td>W9AB</td>
<td>9</td>
</tr>
<tr>
<td>W8WRN</td>
<td>9</td>
</tr>
<tr>
<td>W2PAJ</td>
<td>9</td>
</tr>
<tr>
<td>W1HDQ</td>
<td>9</td>
</tr>
<tr>
<td>WICTW</td>
<td>9</td>
</tr>
<tr>
<td>W100P</td>
<td>8</td>
</tr>
<tr>
<td>W9HAQ</td>
<td>8</td>
</tr>
<tr>
<td>W3QBE</td>
<td>8</td>
</tr>
<tr>
<td>W3WKG</td>
<td>6</td>
</tr>
<tr>
<td>W3BZG</td>
<td>6</td>
</tr>
<tr>
<td>W3GOK</td>
<td>6</td>
</tr>
<tr>
<td>W3KZD</td>
<td>6</td>
</tr>
<tr>
<td>W4KEG</td>
<td>5</td>
</tr>
<tr>
<td>W3KZG</td>
<td>4</td>
</tr>
<tr>
<td>W4HYX</td>
<td>4</td>
</tr>
<tr>
<td>W3FJS</td>
<td>3</td>
</tr>
<tr>
<td>W8KFW</td>
<td>3</td>
</tr>
</tbody>
</table>

Send in claims for most-states worked awards before Jan. 10, 1949. See Jan. 1949 QST, page 150, for details.
6-meter schedules. W7BQX, Sequim, Wash., says that he works W7DF at Everett nightly on 6, but otherwise there is almost nothing doing, except for the band openings. W7ETS, Bellingham, Wash., says he's heard only two signals since last summer. WSNQD, Ashland, Ohio, finds the picking lean. On almost any night but Tuesday 6 seems rather quiet in New England, but with the Horsetraders and the New England Net functioning that evening at least 20 stations may be heard, and efforts are underway to promote similar activity on other nights.

The boys around Erie, Penna., have been doing something about the winter slump in 2-meter activity. This group has been putting out letters to the 2-meter regulars within a radius of 50 miles or so of Erie, suggesting Monday and Thursday nights for concentrating on keeping activity going. They will be on between 9 and 11 on these evenings for a starter, but will change the schedule if a consensus indicates the desirability of a different time or date.

Activity on 144 Mc. is being maintained on the Minneapolis-Champlin-St. Cloud circuit by a uniform operating technique which involves calling and listening on the hour and half hour, nightly, starting at 7:30 p.m., according to W5QCXC.

Two-Meter News

Pittsburgh, Penna. — Readers of Bill McNatt's popular V.H.F. News know well, by now, that statements of a controversial nature regarding v.h.f. propagation are sure to bring a response from Lew Gilmer, W3HZF. The moon-reflection activity going. They will be on between 9 and 11

Lew, "The idea of an amateur having a self-

De Witt in the 1946 experiment at Belmar. Says

The reply that Lew's analysis and mathematics permit actual radiation of 500 watts of power. Lew assumed a receiver bandwidth of .50 cycles; the antenna gain, the receiver bandwidth, and possible reflections from the earth. Lew included a 4-db. line loss applied to 500 watts transmitter output: Ken believes that proper design should permit actual radiation of 500 watts of power. Lew's assumption of a power gain of 50 for a 32-element array can be improved upon, according to Ken, raising this figure to at least 100, and gaining 6 db. for the system on the two-way basis. The figure for gain resulting from earth reflections, set at 8 db. by W3HZF, can be boosted to approximately 12 db. by installation of a reflecting mat or counterpoise, according to W2RH. We suspect that the end has not yet been heard of this discussion, and more will be

50 W.A.S. Mc.

Standings as of Nov. 30th

<table>
<thead>
<tr>
<th>Time 1948</th>
<th>All-Time 1948</th>
<th>Time 1948</th>
</tr>
</thead>
<tbody>
<tr>
<td>W9ZJH 48</td>
<td>W5AJG 43</td>
<td>W9GWZU 46</td>
</tr>
<tr>
<td>W2ZJ 48</td>
<td>W5ML 42</td>
<td>W9GWUV 44</td>
</tr>
<tr>
<td>W1CJL 44</td>
<td>W9HY 40</td>
<td>W5FZK 48</td>
</tr>
<tr>
<td>W4CH/1 41</td>
<td>W6LY 39</td>
<td>W9GWMS 43</td>
</tr>
<tr>
<td>W4LL 40</td>
<td>W9FCD 38</td>
<td>W5ALU 42</td>
</tr>
<tr>
<td>W3HDSQ 39</td>
<td>W9FSC 37</td>
<td>W9GWKM 40</td>
</tr>
<tr>
<td>W7CQY 38</td>
<td>W5IXD 35</td>
<td>W9GWDA 36</td>
</tr>
<tr>
<td>W3HMS 36</td>
<td>W5ZEF 34</td>
<td>W9GWAB 36</td>
</tr>
<tr>
<td>W4LJK 35</td>
<td>W5QCN 32</td>
<td></td>
</tr>
<tr>
<td>W1NF 35</td>
<td>W5Qop 30</td>
<td>W9JUSI 47</td>
</tr>
<tr>
<td>W4KHL 34</td>
<td>W5LJU 34</td>
<td>W9JFW 46</td>
</tr>
<tr>
<td>W4LUA 32</td>
<td>W5LWU 19</td>
<td>W9JGQ 45</td>
</tr>
<tr>
<td>W4CJL 32</td>
<td>W5LWU 19</td>
<td>W9JAB 45</td>
</tr>
<tr>
<td>W4GJL 30</td>
<td>W5UXN 47</td>
<td>W9JMN 45</td>
</tr>
<tr>
<td>W4FAF 27</td>
<td>W6YK 40</td>
<td>W9JBN 44</td>
</tr>
<tr>
<td>W3EIO 24</td>
<td>W5SANN 38</td>
<td>W9JEO 43</td>
</tr>
<tr>
<td>W4HIH 21</td>
<td>W9GBS 27</td>
<td>W9JFRQ 42</td>
</tr>
<tr>
<td>W4BMR 32</td>
<td>W9GAM 15</td>
<td>W9JGK 42</td>
</tr>
<tr>
<td>W4AMJ 38</td>
<td>W5FPV 31</td>
<td>W9JGY 41</td>
</tr>
<tr>
<td>W4TDE 38</td>
<td>W5BGW 18</td>
<td>W9JBC 39</td>
</tr>
<tr>
<td>W4QYH 37</td>
<td>W9QYQ 45</td>
<td></td>
</tr>
<tr>
<td>W4RLY 37</td>
<td>W7BQX 45</td>
<td>W9JHS 38</td>
</tr>
<tr>
<td>W5RQY 26</td>
<td>W7FRA 43</td>
<td>W9JFSK 36</td>
</tr>
<tr>
<td>W4SQY 38</td>
<td>W5TRE 41</td>
<td>W9JISW 29</td>
</tr>
<tr>
<td>W3OJ 33</td>
<td>W7RBA 40</td>
<td></td>
</tr>
<tr>
<td>W3GOG 32</td>
<td>W5FDJ 36</td>
<td>W9JQY 29</td>
</tr>
<tr>
<td>W4RUE 34</td>
<td>W5PTE 35</td>
<td>W9JNY 47</td>
</tr>
<tr>
<td>W4MKL 33</td>
<td>W7RAD 35</td>
<td>W9JQZ 14</td>
</tr>
<tr>
<td>W3KMQ 25</td>
<td>W7PA 34</td>
<td>W9JBU 24</td>
</tr>
<tr>
<td>W3GQY 40</td>
<td>W7QAP 32</td>
<td>W9JCY 23</td>
</tr>
<tr>
<td>W4GIO 48</td>
<td>W7CAD 28</td>
<td>W9JGQ 20</td>
</tr>
<tr>
<td>W4QIM 41</td>
<td>W7QCG 27</td>
<td>W9JIK 19</td>
</tr>
<tr>
<td>W4QYN 40</td>
<td>W7QCN 19</td>
<td>W9JFO 19</td>
</tr>
<tr>
<td>W4QYN 40</td>
<td>W7OWX 15</td>
<td>W9JCR 16</td>
</tr>
<tr>
<td>W4FID 46</td>
<td>W8GT 40</td>
<td>W9JJB 14</td>
</tr>
<tr>
<td>W4DRZ 46</td>
<td>W5QD 44</td>
<td>W9JBE 17</td>
</tr>
<tr>
<td>W4FBRH 34</td>
<td>W5QGD 31</td>
<td>W9JQ 10</td>
</tr>
<tr>
<td>W4GMP 34</td>
<td>W5BFW 25</td>
<td></td>
</tr>
<tr>
<td>W4WMI 33</td>
<td>W5SDJ 22</td>
<td></td>
</tr>
<tr>
<td>W4PNI 33</td>
<td>W5LJU 21</td>
<td></td>
</tr>
<tr>
<td>W4HYY 39</td>
<td>W5LE 29</td>
<td></td>
</tr>
<tr>
<td>W4AMS 39</td>
<td>W5LWU 21</td>
<td></td>
</tr>
<tr>
<td>W4J 29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W4LNG 23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Last call for 1948 States-Worked report! Remember that medallion awards are offered to the amateurs working the most states on 50, 144 and 220 Mc. and up. Send in claims before Jan. 10, 1949.

January 1949 53
Two-meter signals cross the Atlantic? Not yet, despite last month's report of 144-Mc. reception of W3EEK in the Netherlands. A check with PA5Q brings the response that report is false. Somebody having fun (?) again, it would appear. But there is plenty of activity on the other side of the Atlantic. With the 5-meter band about to be denied to most of Europe's amateurs, they have turned to 2 meters in droves. Results have been most gratifying, particularly in Great Britain, Belgium, France and the Netherlands.

Conditions between England and the Continent provide almost daily extended ranges on the higher band, and distances now being covered far exceed the range formerly attained on 58 Mc., as far as tropospheric coverage is concerned. As more stations come on in the continental countries, the European DX record is being expanded every few days. Numerous Gs have been working the QNs, PA6s and Fs, at distances up to more than 400 miles, and inter-G work is possible over many paths which were seldom, if ever, workable on 58 Mc. G6BY and G6DH, some 250 miles apart, have had numerous solid 2-meter QSOs, whereas 5-meter contact between the two was a rare occurrence. Located in the southwestern tip of England, G6BY has nevertheless been able to work the stations on the Continent on several of the better nights. The Gs are now hoping for 2-meter activity in D2 and IB90, as the current DX is already limited by the extent of activity on the Continent.

Lancaster, Penna. — A Spanish-speaking voice was heard on 149 Mc. by W3AKC on the night of October 29th, around 7:30 p.m. The signal had considerable fading, fairly rapid and even, peaking about S3. W3AKC would like to know if others have heard this signal, and if information is available as to its source.

Groton, Mass. — A chance for v.h.f. hams with portable or mobile gear to do some interesting work in connection with timing of sled-dog races is mentioned by W1JHK. He has been discussing the possibilities with K. G. Saxton, president of the New England Sled Dog Club, which sponsors a series of races in various Maine, New Hampshire and Vermont locations in January and February. Race dates are as follows: Jan. 1st, Tamworth, N. H.; Jan. 8th and 9th, Fitzwilliam, N. H.; Jan. 15th and 16th, Pittsfield, N. H.; Feb. 5th and 6th, Lyndonville, Vt. (N. E. Championship); Feb. 12th and 13th, Colebrook, N. H.; Feb. 19th and 20th, Bridgton, Maine; and Feb. 26th and 27th, Newport, Vt. Anyone who would like to work with the Club in providing radio facilities for timing any or all of these races is invited to get in touch with Mr. Saxton, 217 Chapman St., Groton, or L. G. Massey, W1JHK, 272 Silver St., Groton.

Baltimore, Md. — Not all the stuff is being worked on 2 meters with high power and big beams. W3LMC started in this fall with a 15-watt rig and a folded-dipole antenna, yet he has had many contacts in Pennsylvania and New Jersey, and during the evening of Nov. 8th he worked W1JKC of Stratford, Conn. The attractions of the 2-meter band looked good, and high power and beams are on the agenda.

Newport, R. I. — That night of the 8th was pretty good for late fall, all along the Atlantic Seaboard. W1JFF raised W5GGR, Pleasant Hill, Md., on a CQ, and worked three other W3s in Eastern Pennsylvania. This was one of those nights that caught many of the gang napping, and there were not too many W3s active, but those who were, including the Cape Cod DX twins, MNF and BCN, were knocking off the W3s in fine style.

Helpful Hints Department:
Reducing F.M. Interference in 50-Mc. Receivers

As more and more broadcasters move into the high f.m. band, 88 to 108 Mc., the interference problems of 50-Mc. operators multiply. As anyone who has attempted work on 6 in the vicinity of these high-band stations knows, the second harmonic of the receiver or converter oscillator beats with f.m. signals, producing strong and very annoying spurious responses in the 50-Mc. band. Of course some of the signals are not spurious — we know of at least one instance where an f.m. station is actually radiating an S9-plus sub-harmonic — but most of the signals are in the spurious category, and can be gotten rid of easily.

The selectivity of tuned r.f. circuits at 50 Mc. is not sufficient to reject strong 100-Mc. signals completely, even when two r.f. stages are used; and when broad-band stages are employed, or in receivers having one or no r.f. stage, the interference can be very bad, indeed. This trouble can be corrected in two ways, though in the case of very strong interference both methods may be necessary. Usually just a simple trap circuit inserted in series with the antenna pick-up coil at the antenna terminals will suffice. Such a trap, which will have an attenuation of about 40 db., may consist of about 7 turns of No. 14 wire, %-inch diameter, across a 3-30 µf. mica trimmer. This, when tuned to the frequency of the interfering signal, will knock it out completely, or at least drop it below troublesome level in most cases. It will tune quite sharply, so it should be adjusted on the most troublesome signal, if more than one are in evidence. Normally it will have no effect whatever on the 50-Mc. operation of the receiver. If several interfering signals are present the selectivity of this arrangement may be too great, in which case more inductance and a lower setting of the trimmer should be used, for broader tuning.

Many converters use more oscillator injection than is necessary. Ordinarily this is not harmful, but it may increase the interference pick-up of
the converter considerably. If the trap method does not completely cure spurious responses, try reducing the oscillator plate voltage. It may be found that considerably less oscillator power can be used, without reducing the converter's sensitivity, and in some instances such reduction may even improve the signal-to-noise ratio. It certainly will not harm the converter's stability, in any case.

The 6J6 as a Doubler

The use of an 832 as a tripler seems to be a more-or-less standard way of getting excitation for a 144-Mc. amplifier, but there are other ways which may do fully as well. The various dual triodes (6J6, 12AT7, 7F8, etc.) all operate as triplers, but the output is usually too low to drive an 832 amplifier satisfactorily, unless the tripler itself is driven very hard. The 6J6 makes a fine doubler to 144 Mc., however, according to W6PIV. Running the 6J6 either as a push-push or parallel doubler requires lower drive than for tripling in push-pull, and the over-all complexity of the rig may not be greater in the end. A 6J6 doubler provides more than adequate drive for an 832 amplifier, at 200 to 250 volts on the 6J6. The amplifier grid circuit may be made to resonate at about 180 Mc., and still pick up enough drive for the 832. No neutralization is required in such an arrangement.

A Simple System for 2-Meter N.F.M.

Wishing to try n.f.m. on 144 Mc., W1CTW put in a 6J5 alongside the crystal oscillator in his 2-meter rig (described in QST for July, 1946, and in the 1947 ARRL Handbook). The 6J5 is resistance-coupled to the crystal-oscillator screens, and driven from the regular speech amplifier. About 15 to 20 volts of a.m. produces sufficient phase modulation for true narrow-band operation. A screen by-pass of about 0.0015 \( \mu \)fd. cuts the highs enough to balance the audio quality, the low tones being somewhat weak with this arrangement otherwise. The fellows with the communications receivers report good speech quality but those with 522s have a difficult time of it, with that amount of deviation.

The World Above 420 Mc.

After months of testing, with the one-way results previously reported, W1IYO, Milford, Conn., has worked W2HWX two-way on 420 Mc., the first contact taking place on Oct. 30th. W1IYO had been hearing W2HWX, W2ASL and W2UCD, all about 75 miles distant, in cross-band tests with W1IYO listening on 420 and transmitting on 144 Mc., but had not been able to get back to them on 420 until the above date, when the first Connecticut-New Jersey 420-Mc. QSO finally came off. Signals were about S5 in both directions.

(Continued on page 118)
QSL BUREAUS

Changes and additions. Complete lists will be published as usual in the May and October issues of QST.

Germany (De only): E. G. Styles (D2GU), PW/DP Branch, 120 HQ CCG (BE), Brunswick Baor 11
Philippine Islands: Elpidi DeCastro, Philippine Amateur Radio Assn., 931 R Hidalgo St., Quiapo, Manila
Southern Rhodesia: S. E. B. Anderson (ZE2JN), 3388 Queens Park, Bulawayo, Southern Rhodesia
Virgin Islands: Richard Speceley (KV4AA), Box 403, St. Thomas

CHILE

The Radio Club of Chile is seeking from its sister societies in South America an expression of opinion as to how the 14- and 28-Mc. bands should be subdivided for 'phone and c.w. operation. The Chile society suggests that c.w. be restricted to the frequencies 14,000-14,100 and 28,000-28,100 kc.

SOUTH AFRICA

The South African Radio League extends to all amateurs an invitation to participate in its first postwar DX Contest, to be held on the weekends of January 22 and 30, 1949.

General

1) The contest is open to licensed amateurs throughout the world, and will be on c.w. only.
2) Contacts with ships or unlicensed stations located in countries where licenses are obtainable will not count for points. The decisions as to whether a station is to be classified "unlicensed" will rest with the S.A.R.L. DX committee.
3) Only one person is allowed to operate a specific station for the duration of the contest.
4) Certificates will be awarded to the first three DX stations, and to the first three South Africa stations who are members of the S.A.R.L. Certificates also to the leading station in each prefix zone provided at least three entries were received from that zone.
5) Band-monitoring stations under the auspices of the S.A.R.L. will be active and any station reported off frequency will be disqualified.
6) Logs should show the following: (a) date, (b) time (GCT), (c) band, (d) serial in, (e) serial out, (f) station worked, (g) points claimed. An analysis sheet for each band should accompany entries: (a) prefix zone, (b) contacts (number), (c) points.

ARGENTINA

The first convention of Argentine radio amateurs was held earlier this year at the Savoy Hotel, Tucuman. As a result of this meeting various suggestions were made to the Argentine government, and are briefly outlined below.

Adoption of a call-letter assignment system of suffixes was advocated whereby certain letters would indicate the particular territory of location,
such as "Z" for island possessions and the numeral "0" for mobile stations.

The government was offered the facilities of amateur stations for propagation studies.

It was recommended that dummy antennas be required for testing and that authorization to handle third-party traffic within the country be granted on the basis of no remuneration.

A proposal to recommend the issuance of licenses to foreigners was turned down.

It was resolved to recommend to the government the following subdivisions of the amateur bands:

- 7,000-7,050 exclusively c.w.
- 7,050-7,300 exclusively 'phone
- 14,000-14,100 exclusively c.w.
- 14,100-14,150 shared between c.w. and 'phone
- 14,150-14,400 exclusively 'phone
- 25,000-28,100 exclusively c.w.
- 28,100-30,000 exclusively 'phone

**FIRST EUROPEAN DX CONTEST RESULTS**

V.E.R.O.N. lists the following winners of the First European DX Contest, held the week ends of November 28 and December 12, 1947.


'Phone - OK3ID, OZ7G, G8JQ, OH1OD, F8WY, HA4AE, HRRM, LX1SI, PA90O, CTINT, GM2UU, GW3OG, LK4AD, VK3RU, VE3AFY, CNS3D, JR4AI, W3IVU.

**JAPAN**

The **FEARL** (Far Eastern Amateur Radio League) Bulletin of November, 1948, carries an announcement that effective January 1, 1949, amateur stations operated by civilian and military personnel of the occupying nations will use the prefix JA, instead of J as formerly. This announcement does not carry with it any implication that Japanese nationals are soon to be licensed.

The new JA calls, a list of which is available at IARU headquarters, bear no relationship to the J calls, insofar as numerals and the letters following the numerals are concerned.

The QSL bureau address remains the same.

**MISCELLANY**

Liga Panamena de Radio Aficionados has proposed to its government a set of regulations to govern amateur radio in Panama. Action on the recommendations has not yet been taken by the civil authorities.

The Headquarters has been unofficially advised that the sister society in the Netherlands Indies (N.I.V.R.A.) may soon be dissolved because of lack of sufficient activity.

Amateur radio activity in Spain continues to increase. An amateur society has been formed whose organizers hope the Spanish authorities will soon grant official sanction to amateurs.

The Headquarters continues to receive regularly the official organs of the various sister societies. These publications all evidence a high order of workmanship and enthusiasm. Our congratulations are extended to all.

**WWV Schedule**

Standard-frequency transmissions are made continuously, day and night, as a public service by the National Bureau of Standards over its standard-frequency station, WWV, on the following frequencies:

<table>
<thead>
<tr>
<th>Me.</th>
<th>Power (kw.)</th>
<th>Audio Freq. (cycles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>0.7</td>
<td>1 and 440</td>
</tr>
<tr>
<td>5.0</td>
<td>8.0</td>
<td>1 and 440</td>
</tr>
<tr>
<td>10.0</td>
<td>9.0</td>
<td>1,440 and 4000</td>
</tr>
<tr>
<td>15.0</td>
<td>9.0</td>
<td>1,440 and 4000</td>
</tr>
<tr>
<td>20.0</td>
<td>8.5</td>
<td>1,440 and 4000</td>
</tr>
<tr>
<td>25.0</td>
<td>0.1</td>
<td>1,440 and 4000</td>
</tr>
<tr>
<td>30.0</td>
<td>0.1</td>
<td>1 and 440</td>
</tr>
<tr>
<td>35.0</td>
<td>0.1</td>
<td>1</td>
</tr>
</tbody>
</table>

A 0.005-second pulse may be heard as a faint tick every second, except the 59th second of each minute. These pulses may be used for accurate time signals, and their one-second spacing provides an accurate time interval for physical measurements.

The audio frequencies are interrupted at precisely one minute before each hour and each five minutes thereafter (59th minute; 4 minutes past hour, 9 minutes past hour, etc.), resuming after an interval of precisely one minute. This one-minute interval is provided to give Eastern Standard Time in telegraphic code and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. Ionospheric-disturbance warnings applicable to the North Atlantic path are given at 19 and 49 minutes past each hour. If a disturbance is in progress or is anticipated within 12 hours, the time announcement is followed by 6 Ws; if conditions are quiet or normal, the time announcement is followed by 8 Ns. The announcements of the station’s services and call are given by voice at the hour and half hour.

The accuracy of all the frequencies, radio and audio, as transmitted, is now better than a part in 50,000,000. Transmission effects in the medium may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency received, however, is as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.000001 second. The beginnings of the periods when the audio frequencies are resumed are synchronized with the basic time service of the U.S. Naval Observatory.

January 1949
2nd V.H.F. Sweepstakes, Jan. 15th-16th

Certificate Awards to Section 1 and Club Leaders, 50 Mc. and Above—Gavel to Winning Club

BY F. E. HANDY,* W1BDI

Test your v.h.f. station coverage on January 15th and 16th. The Second Annual V.H.F. Sweepstakes will start at 2:00 P.M. your local time, Saturday, January 15th, ending at midnight Sunday. 'Phone, m.c.w. or c.w. may be used, with results all contributing to one score. The aim of the contest will be to work as many v.h.f. stations as possible in one week end. All points from such work will be multiplied by the number of different ARRL sections worked. Here's a chance to advance your WAS standing.

To "prove" a QSO customary SS exchanges (for the report sent Hq.) will be required. Exchanged information is in the form of a message preamble, with the ARRL section 1 substituted for the city and state, and the RST report for "check." Any station you work is good for one point in the score, if you get the other operator's acknowledgment of "message" whether he is in the contest for score or not. If an exchange of SS data is completed in both directions two points may be claimed. To make it easy to record exchanges they should be sent in the order of information shown.

Contest reporting forms for your convenience will be sent gratis to anyone who requests them by radiogram or card. Neither advance entry nor forms is required. You can follow the log arrangement shown. All lists are welcomed by ARRL even if they show only a small score, to help support claims and make complete results in QST possible. Report as soon as the test is over.

Awards—Individual and Club

Distinctive certificates will go to V.H.F. Sweepstakes winners in each ARRL section 1 and to leading operators of clubs where three or more submissions are received under our rules. Also, a club gavel goes to the club with top aggregate score. Get set for a v.h.f. operating week end and see what you can do!

Rules

1) Eligibility: Amateur operators in any field-organization section 1 operating fixed, mobile or portable under one call on or above 50 Mc. are invited to take part.

2) Object: Amateurs in U. S. and Canadian sections of the ARRL field organization will attempt to contact as many other stations in as many of the 72 sections as possible during the contest period.

3) Contest Periods: The contest starts at 2:00 P.M. your local time Saturday, Jan. 15, 1949 and ends at midnight Sunday, Jan. 16, 1949.

4) Exchanges: Contest exchanges including all data shown in the sample must be transmitted and receipted for as a basis for each scored point.

5) Scoring: (a) Contacts count one point when the required exchange information has been received and acknowledged, a second point when exchange has been completed similarly in both directions.

EXPLAINING V.H.F. SS CONTEST EXCHANGES

<table>
<thead>
<tr>
<th>Send Like Standard</th>
<th>Msg. Preamble</th>
<th>CK</th>
<th>Place</th>
<th>Time</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchanges</td>
<td>Contest numbers 1, 2, 3, etc., a new NR for each station worked</td>
<td>Send your own call</td>
<td>CK (Readability ... or RST 2 of station worked)</td>
<td>Your ARRL section 1</td>
<td>Send time of transmitting this NR</td>
</tr>
<tr>
<td>Purpose (example)</td>
<td>QSO NR tells how you are doing. (NR 1)</td>
<td>Identification (W1AW)</td>
<td>All exchange reports (699)</td>
<td>Section 1 vital contest data. (E. Mass.)</td>
<td>Time and date must fall in contest period. (6R55 p.m. Jan. 15)</td>
</tr>
</tbody>
</table>

* Communications Manager, ARRL.

1 See list of sections in the ARRL field organization, page 6. Awards include Puerto Rico, Hawaii, Aleaska, P. I. In operating use section name abbreviations such as E. Mass., R. I., W. N. Y., Neb., N. Y. C.-L. I.
(b) Final score is obtained by multiplying totaled points by the number of different ARRL sections worked, that is, the number in which at least one SS point or exchange has been credited.

6) Conditions for Valid Contact Credit: (a) Repeat contacts in other bands confirmed by completed exchanges of up to two points per band may be counted for each different station worked. (Example: W1XXX worked W3MQU on 50 and 144 Mc. for complete exchanges, 2 points each on each band, 2 + 2 = 4 points but only one section multiplier.)

(b) Crossband work shall not count for any points or sections.

(c) All work submitted as one entry must be accomplished from points within a given ARRL section.

7) Awards: Entries will be classified as single- or multiooperator, a single-operator station being defined as one manned by an individual amateur who neither receives assistance nor gives assistance to any person in the contest period. Certificates will be granted based on the leading work in the single-operator classification in each ARRL section. Multioperator work will be grouped separately in the QST report of results.

When three or more individual club members compete and submit logs naming the club with which they are identified, an ARRL certificate will be issued through such club to the leading individual in the local competition. When less than three individual logs are received there will be no club award or club mention.

A gavel with engraved sterling-silver band is also offered to the club whose secretary submits the greatest aggregate score, which is the tabulation of all individual V.H.F. Sweepstakes score claims successfully confirmed by individual amateur reports which mention the club.

8) Conditions of Entry: Each entrant agrees to be bound by the provisions of this announcement, the regulations of his licensing authority, and the decisions of the Award Committee.

9) Reports from all entrants must be postmarked no later than February 1, 1949, to be considered for awards.
One of the questions asked most frequently about the single-sideband stations is, "When are they on the air? I want to hear what the stuff sounds like." This column will report schedules and operating times of active single-sideband stations, describe operating experiences and sometimes the gear in use, and possibly discuss some of the practical operating problems and suggested solutions. Contributions from active single-sideband stations will be welcomed.

The dog team finally got through the drifts with a letter from W7IKY in Seattle, with full details on his rig and recent experiences. Dick built his own filter, and first got on with a Class A 80Mc running about 10 watts peak output. With this power, his best DX was W7JCU in Montana. Adding Class B 811s, he has worked KH6FQ, W5QH and W4CPG. W5QH . . . had his r.f. gain turned down so low that, when he also turned off his b.f.o., he couldn't tell I was there," and "On some local contacts, when I was running low power, selective fading was quite bad on a.m. signals, but not on mine!" are quotes from Dick's letter that bear out the theory nicely. Of course it hasn't all been smooth sailing. At first he landed close to a "net" frequency, and his 10 watts was smearing some 150-watt signals that then reacted in the traditional manner. But rewinding a few coils, so that the other sideband could be used, put his signal away from the injured parties, and all is serene.

Another newcomer to the ranks is W2VVC in Rochester, N. Y., who runs about 400 watts peak input to a pair of 813s, driven by the W6DUL exciter described in July, 1948, QST. No startling DX so far, but lots of interesting contacts and some duplex work with W3ASW.

But it isn't the duplex work that is the big news this month. It is the QRM tests made by W3ASW and W2VVC. They made them with the help of W2STK, who was receiving both of their single-sideband signals at about equal strength on an NC-100-A. Both were using the same sideband and, with a (suppressed) carrier separation of about 250 cycles, all W2STK had to do to copy one or the other, when they were both transmitting, was to shift his b.f.o. back and forth! The two signals were close enough to enable W2STK to set his b.f.o. halfway between the two and copy one when the other wasn't talking. Do you blame them for being enthusiastic?

This W3ASW is really getting into the fine points in his rig. He made a few refinements in his filter, but most of his efforts have been directed toward complete elimination of the carrier, with an eye to better duplex work. He has the carrier down to a point where it is lost in the tube noise. But the tube noise is amplified, of course, and sets a limit to the duplexing. Here is a point that hasn't been mentioned before, but it is going to be a problem if we're going to have good duplex operation. When you have a string of high-gain r.f. amplifiers, as one does in a single-sideband rig, the tube noise in the lower stages is amplified to a level sufficient to be heard in the receiver. Any suggestions as to how to get around the thing will be gratefully received. Dick has an "imbalance" control on his modulator that will throw in enough pilot carrier for locking in on receivers using the W2KUJ single-sideband adapter, and reports complete success with the system. But duplex and pilot carriers aren't going to live together unless someone comes up with one or two smart angles.

Work on filters at W6MNN has resulted in some refinements of design that show considerable promise. By using a first carrier frequency of 20 kc, he is able to simplify the subsequent stages in the rig.

The filter rig that W3MBY uses on 14 Mc, will be described in an early issue of QST, with full dope on how to build and check the sideband filter. Since this filter uses inductances that are not too difficult to obtain, its construction is within the reach of practically everyone.

The hams beat the mobile-marine service to single-sideband, but not by very much. A recent announcement of the radio equipment on the new 34,000-ton Cunard White Star liner Caronia contains the following interesting paragraphs:

"Greatly-improved radiotelephone service over long distances is provided by means of single-sideband transmission and reception, with equipment operating in the frequency band 4 to 22 Mc. The Caronia will therefore have the distinction of being the first passenger ship to be fitted for single-sideband telephony. The radiotelephone installation will consist of a single-channel single-sideband transmitter with associated drive equipment and one double-channel single-sideband receiver. The double-channel feature on the receiver will permit reception of either channel of a double-channel single-sideband circuit as offered by a shore station. The second channel may also be usefully employed as an order wire while the main channel is busy on subscriber calls.

"The single-sideband transmitter has been so designed that a further single-sideband channel may be readily added, thus providing two separate channels on a single frequency in one direction during peak traffic periods.

"In addition to the single-sideband equipment a high-power double-sideband radiotelephone-radiotelegraph transmitter is installed. This may be used either for supplementary telephone duties to countries where single sideband is not yet available or for internship calls." — B. G.
The first of a series of two-day courses in Combat Information Center indoctrination was held recently at the Kenosha (Wis.) Naval Reserve Training Center. The new school, a project of the Electronics Warfare Program of the Ninth ND, is directed by Lt. A. C. Canepa, USNR, district CIC training officer. Twenty-five officers and men from a dozen cities attended the initial course which was geared for Reserve officers and men who will be concerned with CIC training in their respective training centers. It is planned to hold similar courses on the last Thursday and Friday of each month during the year. It is expected that by July, 1949, future instructors from all 96 Naval Reserve training centers in the Ninth will have attended this indoctrination course. The Kenosha CIC installation was designed as a model for other training centers. To date, fifty Naval Reserve training centers in the Ninth Naval District have equipment installed for CIC work. All of these installations are to be fully operative by next July.

In addition to the above, plans are being formulated for a number of major CIC installations in various parts of the country, for advanced training of officers and men in this important phase of Naval operations. At a number of these projected installations advanced training in antisubmarine warfare will be integrated with the CIC training. A pilot model of such an installation is now in operation at the Naval Gun Factory, Washington, D. C.

Naval Reservists on active duty at Eighth Naval District headquarters supervising the Reserve Electronic Warfare Program include W5OM, W5HKP, W5BUK, ex-W5DPT, W5LNU and W5JKT.

Plans for Naval Reserve radioteletype nets are well underway. It is expected that the first link of a network that will eventually connect all district headquarters will be activated in the near future between Washington, D. C., and Chicago using f.a.k.

Cmdr. Walter Rogers, USNR, W1DFS, is in command of Electronic Warfare Company 1-5, with a splendid radio station installed in the Police Station at Somerville, Mass.

Results of the Receiving Competition and of the QSO Party held on Navy Day-1948 are scheduled for February QST. Early reports indicate the success of both activities.

The Federal Communications Commission recently licensed the following amateur stations at Naval Reserve activities:

K1NRK Pawtucket, R. I. K6NAL Fillmore, Calif.
K4NRK Perry, Fla. K5NLAM San Luis Obispo, Calif.
K5NAS Tyler, Tex. K8NRC East Liverpool, Ohio
K5NAT San Angelo, Tex. K9NRD Moline, Ill.
K5NAU Waco, Tex. K9NRG Decatur, Ill.
K5NAV Van Horn, Tex. K9NAR Denver, Colo.

"Skunk bearing 090, range 6000!" Ninth ND personnel get the latest dope on CIC operation at the new CIC indoctrination course held two days each month in Kenosha, Wis. L. to r.: Lt. A. C. Canepa, USNR, in charge of Reserve CIC training in the Ninth ND and organizer of the course; S. J. Green, SR; J. M. McDonnell, RM2c; R. E. Spoor, ET2c; W. G. Hoffmann, RM3c.
RECEIVER B.F.O. AS KEYING MONITOR

It may not have occurred to some of those who have added a "Q5-er" to their communications receivers that the idle b.f.o. in the receiver may be used as a convenient keying monitor.

If oscillator cathode keying is used in the transmitter, the b.f.o. can be keyed simultaneously simply by tying the two cathodes in parallel, as shown in Fig. 1. Otherwise, the b.f.o. can be keyed with a relay.

If desired, the usual b.f.o. switch can be replaced with a s.p.d.t. switch, as shown at S1, so that the b.f.o. can be switched from normal use to use as a monitor.

If the electron-coupled circuit is used in the b.f.o., as shown in Fig. 2-A, the circuit may be keyed by parallel-feeding the cathode as shown at B.

Usually the b.f.o. is operated at low voltage through dropping resistors, as indicated in Fig. 3-A. These resistors may be responsible for a chirpy monitor signal. If this is the case, the chirp can be eliminated by operating the b.f.o. from a VR tube working from the receiver power supply as shown in Fig. 3-B. The b.f.o. voltage should be checked first and an appropriate VR tube selected. A VR-75 will serve in most cases.

TWO USES FOR BLOWN FUSES

The life of small glass cartridge-type fuses does not need to end when the fuse element blows. They make excellent forms for small v.h.f. chokes, and when pigtail leads are soldered to the ends, they can be mounted firmly the same as a resistor or condenser. — Jack Nelson, W2FW

The need for an insulated coupling device to tune small condensers in v.h.f. gear can sometimes be filled by using a small glass-cartridge fuse. The diameter of many of these fuses is ¼ inch, making them a "natural" for use with the usual tuning condenser. The fuse can be attached to the shaft by soldering the metal tip to the end of the condenser shaft. This method is ideal for use with the many screwdriver-adjusted padder condensers that are so plentiful in surplus gear, but which are often unusable because of the lack of suitable means of tuning by knob or dial. — Harold Held, W9OCK

DE LUXE CALL-LETTER PLATES

A new type of sign material called "Scotchlite" is now available, and is widely used on highway signs. This material reflects light and makes an excellent call-letter plate for a ham’s car.

(Continued on page 180)
Correspondence From Members -

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

"QUADS"

Casilla 991, Quito, Ecuador

Editor, QST:

I wish to take this opportunity to thank you for your interesting article on the “Quad” antenna, which appeared in the November issue of QST.

Measurements or tests we have made seem to agree with everything you say. This type of antenna has been used here at HCJB for some time, because of limited space for antennas. Therefore, we’re able to use no other type, except the dipole.

For your information, we made a test at one time with BCA between this antenna and the dipole and they reported a gain of 3 to 6 db. However, the “quadrant” antenna was at a height of nearly a wavelength and the dipole at a height of about a half-wavelength; and the location of the dipole was such that it did have some obstructions in front of it during this test.

Again, let me thank you for your article and I trust that you have cleared up a good number of questions that have been in the minds of many people in regard to this antenna.

- P. K. Mghre, HC1JB

EKGI

906 Franklin Street, Columbus, Ind.

Editor, QST:

I have run into a new and novel problem. Have you ever heard of EKGI? Well, EKG1, or electrocardiograph interference, caused the ending of a QSO very abruptly. My father, a doctor, has his office next door and I got a ‘phone call asking if I was transmitting at that moment. I finished the transmission and found that I had been interfering with his taking of an electrocardiogram. No longer will I use any type of wire, except the line cord, which could be picking up the signal. I am running 28 watts at present and hope to go to 150 very soon. I am on 40 or 80 when the interference occurs. It is definitely from my transmitter, I have established to my sorrow. Now, what I want to know is if someone has had the same trouble and can suggest a solution. I am baffled as to where to install a wavetrap or if that would help. I certainly hope someone can help me with the EKGI problem.

- Richard Scott Fisher, WD6FL

QST


Editor, QST:

It seems to me that you people are missing up on a good thing when you sidestep television in your mag. Next to the pursuit of the hobby of “ham” radio, it is running a close second in many a ham shack. But it is your business and if you don’t think it is worth thinking about, I say you are wrong.

There are a lot of us who really can’t afford subscriptions to more than one mag — or think we can’t. So maybe it will be a good thing to think it over. You may or may not know it but there has been a lot of adverse criticism about the way you handled war surplus, or rather the way you didn’t handle it. Especially the neglect shown toward the SCR-522.

But I realize that you have been criticized for a lot of things — and have survived — and grown. Also I know that a lot of institutions have grown — gotten a little snug and careless — and collapsed. Even empires.

I’m sure that in monitoring the 75-meter band, as an example, the faces of ARRL must occasionally grow very red. However, as I have said, this is your business.

- Edward P. Edlin, W3IBU

5010 Walsh Ave., East Chicago, Ind.

Editor, QST:

I’m just a guy who wants a ticket more than anything else in this world. Learning the “ropes” is preparation for the great event. I deeply shelve out for having been cut off once a month for the privilege of perusing the academic pages of QST which stimulate a desire to rush to the nearest seat of higher learning in search of a course on higher electronics and radio engineering. Doggone it, I’m not inferring that you cater to Einstein minds. It appears, rather, that your material is strictly for the advanced professional or old-timer who has forgotten more than I ever hope to learn — me, with my rickety code-practice key and buzzer and anemic skeletal structure that is gradually shaping up into a transmitter.

Like a vast number of would-be hams, I’m interested in the activities and career of those who haven’t been in the game too long — who have started humble and who are still having a sweet time. Neither does my heart flutter at the sight of a thousand-dollar layout topped by a collection of distant QSLs. Shouldn’t I be at a loss when my eye wanders across such gems as “low vertical angles of radiation, aminural resolution or discrimination — with wide coverage when rotated”? This seems to be the general tone of most of your stuff. I’m not snapping snallums at the boys who are familiar with it, who have the necessary wherewithal and time to make it a reality — they are all a highly-developed form of amiability, courtesy and good goin’, they’re OK.

Consider my plea, good sir. Give the lowly ham a break — or, can you recommend a good publication for amateurs?

- W. A. Furman

114 West Front St., Oil City, Pa.

Editor, QST:

You stress building your own rigs, receivers and what have you, and still devote a large number of pages to single sideband or v.h.f., using the latest tubes and sometimes items that are just out of our reach. How about a few items for an old 27 tube or even some of the 6- or 12-volt tubes that are pirated from h.c. sets — things like lamps can get his hands on quieter than folding money.

Realizing that these old bottles won’t handle the higher frequencies, we may be restricted to the lower bands. At least we are getting on the air and still have some built equipment, and are enjoying our hobby — having fun.

Or have you gotten away from the oversimple rigs that appeal to some of us casuals — not casualties?

- Lawrence A. Shafer, W800P

Bayfield, Wis.

Editor, QST:

This business “About Antennas for 80-Meter Mobile” is very interesting to me, being connected with marine applications. Around this corner of Lake Superior, we have radiotelephones on our boats. One of the goals constantly

(Continued on page 180)

January 1949 63
Participation in ARRL Week. ARRL Week (Jan. 16th-23rd) is not a contest but instead is a time set down for observance and thoughtful dedication to some League betterment or personal steps toward taking a more active part in ARRL organization. It is hoped that all operating members will for each of the seven days of this week accomplish some act that will strengthen or broaden or perfect one's own part in his ARRL organization or contribute to future strength of the amateur service. Practical plans to make the week mean all it can for you might include such things as: (1) applying to your SCM for station appointment along lines of qualification, experience and interest; (2) building an emergency transmitter to work off your car battery; (3) reporting into your section net to originate messages over the air through your own station, asking replies from old radio friends or from director or SCM with whom you should be personally acquainted. Our December QST announcement gave further suggestions. There is also one "operating angle" to ARRL Week. Six sets of ARRL President certifications will be arranged for the pairs of written confirmations confirming the greatest DX worked between any two ARRL members in each of six designated frequency ranges. A special recognition or written citation by Mr. Bailey will also be sent for the most constructive report of projects started or furthered in the given week, in the direction of better or fuller ARRL organization. As we see it, this might mean anything from submission of a QST article to individual suggestion letters pointed at key problems of ARRL and the amateur service. A best report on what you or a group under inspired leadership did or planned or suggested in the given week will meet the requirements for consideration. January Activities. The first month of the New Year will be filled with opportunities for operating and technical accomplishment. For details on the Member QSO Party of Jan. 22nd-23rd, a separate activity but rating a top listing in ARRL Week, see December QST. Members outside the U.S.A. and Canada will have the good word this year, so without turning this into a DX contest, we shall see DX QSOs on some bands. All frequencies open to amateurs can be used. In this 7th annual event Member Party scores will be welcomed from all appointees and members. A generous credit is given in the Member Party score for copying President Bailey's ARRL Week message, as sent by radio from W1AW and 500 OBS appointees Jan. 16th to 23rd, and attaching the message with call, date and time of transmission of the station you copied to your report on the January 22nd-23rd QSO Party.

Other January activities are so numerous as to be handled best by tabulation:

**Code-Proficiency Certification, Jan. 15th (Thurs. 10 p.m. EST)** See announcement, page 70. Correct copy attached to score or statement of highest code speed in an earlier ARRL certification counts for points in the Member QSO Party. **V.H.F. Sweepstakes.** Jan. 15th-16th Report QSOs on 20 Mc. and above. See rules elsewhere in this issue.

Governors-to-President Relay. Jan. 19th-20th A demonstration of traditional radio-traffic forwarding from SCM-appointed stations at state capitals to WRC-PYRC receiving points at Washington, D. C., on the occasion of the inauguration.

**Frequency-Measuring Test.** Jan. 21st Prizes to leading 00 and non-00. See full announcement elsewhere in these columns. Open to amateurs with individual equipment.

**New BPL Recognition.** The Brass Pounders League has long provided a monthly mention in QST constituting editorial credit for the leading traffic handlers. Over the years the actual requirements have been changed upward or downward to follow seasonal and long-term trends in originations and interest. At present handle 500 messages (ARRL count per Handbook) in a calendar month and you are in. Or handle 100 messages made up of deliveries and extra delivery credits and you're there.

Now it is quite some accomplishment and takes consistent application and effort as well as a good station and know-how to handle 500 messages in a 30-day period. Delivery records are
equally hard to make for most amateurs. . . .
The BPL position is an "earned recognition."
However, not since an international test many
tears ago in which we filed 500-word messages
with all entrants have we actually backed QST
credits with a real citation or token award to
the hard-working traffic operator! In an era in
which we give out some certificates just for being
many years in the game we think that situation
should be changed. Therefore, effective Jan. 1,
1949, ARRL is pleased to announce the avail-
ability of a new BPL citation. This is in the form of
a certificate-card that will be distributed to
section communications managers, and issued
over their signatures on receipt of traffic reports,
backed up by message files, attesting and confirm-
ing that the monthly operations qualify for the
Brass Pounders League. A handsome certification
printed in color, we trust it will soon be displayed in
many ham shacks.

Traffic Originations. There are quite a num-
bner of ways to tap interesting sources of traffic.
Message boxes in hospitals, veterans' recreation
facilities and other places from which convenient
daily collections can be made, standing invita-
tions to file (with appropriate explanation giving
section communications managers, and issued
over their signatures on receipt of traffic reports,
backed up by message files, attesting and confirm-
ing that the monthly operations qualify for the
Brass Pounders League. A handsome certification
printed in color, we trust it will soon be displayed in
many ham shacks.

Traffic Originations. There are quite a num-
bner of ways to tap interesting sources of traffic.
Message boxes in hospitals, veterans' recreation
facilities and other places from which convenient
daily collections can be made, standing invita-
tions to file (with appropriate explanation giving
section communications managers, and issued
over their signatures on receipt of traffic reports,
backed up by message files, attesting and confirm-
ing that the monthly operations qualify for the
Brass Pounders League. A handsome certification
printed in color, we trust it will soon be displayed in
many ham shacks.

Traffic Originations. There are quite a num-
bner of ways to tap interesting sources of traffic.
Message boxes in hospitals, veterans' recreation
facilities and other places from which convenient
daily collections can be made, standing invita-
tions to file (with appropriate explanation giving
section communications managers, and issued
over their signatures on receipt of traffic reports,
backed up by message files, attesting and confirm-
ing that the monthly operations qualify for the
Brass Pounders League. A handsome certification
printed in color, we trust it will soon be displayed in
many ham shacks.

Traffic Originations. There are quite a num-
bner of ways to tap interesting sources of traffic.
Message boxes in hospitals, veterans' recreation
facilities and other places from which convenient
daily collections can be made, standing invita-
tions to file (with appropriate explanation giving
section communications managers, and issued
over their signatures on receipt of traffic reports,
backed up by message files, attesting and confirm-
ing that the monthly operations qualify for the
Brass Pounders League. A handsome certification
printed in color, we trust it will soon be displayed in
many ham shacks.
OCTOBER CD QSO PARTY

Many Communications Department appointees who missed the October CD Party lost out on what was undoubtedly the biggest such activity yet held. The gang was out in large numbers and at times the affair took on the aspect of an SS contest. For the second consecutive contest, W6WNI brought top scoring honors to the West Coast, this time to the tune of 491,030 points and a record-breaking QSO total of 491 to keep the fun!

The next opportunity for the CD appointee group to get together will be during the ARRL Member QSO Party, January 22nd-23rd. It should be an even busier week end than that of the October Party. Plan now to be on hand for the fun!

Claimed Scores (C.W.)

<table>
<thead>
<tr>
<th>Station</th>
<th>Score (C.W.)</th>
<th>Contacts</th>
<th>Different Sections</th>
<th>Stations Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>W6WNI</td>
<td>907,630</td>
<td>335</td>
<td>223</td>
<td>38</td>
</tr>
<tr>
<td>W4KFC</td>
<td>878,970</td>
<td>491</td>
<td>296</td>
<td>57</td>
</tr>
<tr>
<td>W9GQM</td>
<td>585,850</td>
<td>424</td>
<td>263</td>
<td>57</td>
</tr>
<tr>
<td>W4A</td>
<td>572,250</td>
<td>411</td>
<td>270</td>
<td>55</td>
</tr>
<tr>
<td>W9RD/Q</td>
<td>642,130</td>
<td>402</td>
<td>256</td>
<td>68</td>
</tr>
<tr>
<td>W8ROX</td>
<td>552,075</td>
<td>338</td>
<td>248</td>
<td>55</td>
</tr>
<tr>
<td>W1EOB</td>
<td>506,940</td>
<td>320</td>
<td>229</td>
<td>55</td>
</tr>
<tr>
<td>W9KEO</td>
<td>481,360</td>
<td>332</td>
<td>229</td>
<td>55</td>
</tr>
<tr>
<td>W9RPQ</td>
<td>477,770</td>
<td>212</td>
<td>198</td>
<td>23</td>
</tr>
<tr>
<td>W6ISQ</td>
<td>428,610</td>
<td>224</td>
<td>188</td>
<td>53</td>
</tr>
<tr>
<td>W8GBF</td>
<td>407,380</td>
<td>202</td>
<td>111</td>
<td>53</td>
</tr>
<tr>
<td>W1IEO</td>
<td>400,920</td>
<td>305</td>
<td>209</td>
<td>48</td>
</tr>
<tr>
<td>W2CFG</td>
<td>383,160</td>
<td>302</td>
<td>199</td>
<td>49</td>
</tr>
<tr>
<td>W3W1L</td>
<td>356,250</td>
<td>290</td>
<td>201</td>
<td>49</td>
</tr>
<tr>
<td>W9FKL</td>
<td>351,000</td>
<td>190</td>
<td>100</td>
<td>39</td>
</tr>
<tr>
<td>W4LRE</td>
<td>340,560</td>
<td>264</td>
<td>210</td>
<td>48</td>
</tr>
<tr>
<td>W3N7Y2</td>
<td>320,000</td>
<td>270</td>
<td>192</td>
<td>48</td>
</tr>
<tr>
<td>W7KWC</td>
<td>327,888</td>
<td>184</td>
<td>151</td>
<td>47</td>
</tr>
<tr>
<td>W1LHE</td>
<td>312,300</td>
<td>294</td>
<td>189</td>
<td>49</td>
</tr>
<tr>
<td>W1YHY</td>
<td>214,370</td>
<td>271</td>
<td>183</td>
<td>48</td>
</tr>
<tr>
<td>W9TAQ</td>
<td>310,590</td>
<td>233</td>
<td>211</td>
<td>48</td>
</tr>
<tr>
<td>W2GQ</td>
<td>304,470</td>
<td>290</td>
<td>155</td>
<td>44</td>
</tr>
<tr>
<td>W6VAQ</td>
<td>304,200</td>
<td>185</td>
<td>129</td>
<td>51</td>
</tr>
<tr>
<td>W9INH</td>
<td>300,370</td>
<td>260</td>
<td>178</td>
<td>47</td>
</tr>
<tr>
<td>W1CHW</td>
<td>217,570</td>
<td>273</td>
<td>168</td>
<td>50</td>
</tr>
<tr>
<td>W4PBQ</td>
<td>282,250</td>
<td>250</td>
<td>192</td>
<td>45</td>
</tr>
<tr>
<td>W2CWK</td>
<td>292,500</td>
<td>255</td>
<td>177</td>
<td>48</td>
</tr>
<tr>
<td>W2RSG</td>
<td>290,700</td>
<td>248</td>
<td>182</td>
<td>46</td>
</tr>
<tr>
<td>W3UW</td>
<td>292,720</td>
<td>222</td>
<td>198</td>
<td>50</td>
</tr>
<tr>
<td>W6DAE</td>
<td>278,845</td>
<td>250</td>
<td>168</td>
<td>61</td>
</tr>
<tr>
<td>W5YTF</td>
<td>273,280</td>
<td>240</td>
<td>178</td>
<td>46</td>
</tr>
<tr>
<td>W7QAP</td>
<td>263,160</td>
<td>170</td>
<td>124</td>
<td>48</td>
</tr>
</tbody>
</table>


FREQUENCY-MEASURING TEST

W1AW will transmit signals for the purpose of frequency measurement starting at 9:30 P.M. EST (6:30 p.m. PST) Tuesday evening, January 18th. The signals will consist of dashes interspersed with station identification. They will follow a general message sent to enable listeners to locate the signals before the measurement transmission starts. The approximate frequencies used will be 3510, 7105, 14,110, and 28,370 kc. About 4½ minutes will be allowed for measuring each frequency, with long dashes for measurement starting about 9:36 P.M. It is suggested that frequencies be measured in the order listed. Transmissions will be found within 5 or 10 kc. of the suggested frequencies.

At 12:30 A.M. EST January 19th (9:30 P.M. PST January 18th), W1AW will transmit a second series of signals for the Frequency-Measuring Test. Approximate frequencies used will be 3660, 7125, 14,110, and 28,150 kc.

Individual reports on results will be sent ARRL members who take part. Copies of this report are sent SCMs so eligibility for OQ appointments is known. When the average accuracy reported shows error less than 71.43 parts per million, or falls between limits of 71.43 and 357.15 parts.

Hams all! Amateur radio is a family affair with the Zellingers of Oklahoma City, Okla. Mary, the YLI, used to sit and crochet while Fred, sr., WSHXJ, was on the air. In January, 1948, she, daughter Margie, aged 14, and son Fred, jr., 12, were bitten by the radio bug. The inevitable result: three shiny new calls. Mary is now WS5CH, Margie W5PAD and Freddie W5PBO. A room in the Zellinger home has been converted into a ham's paradise with several receivers, transmitters and other pieces of gear. So far as is known the Zellingers hold the record for the largest all-ham family. Can any other 100%-amateur family top them in numbers?

QST for
per million, the participants will become eligible for appointment by SCMs as Class I or Class II official observers, respectively. It is only necessary that the individual amateurs have the interest and other qualifications for carrying forward in such League-organization posts.

This ARRL Frequency-Measuring Test will be used to aid qualification of Class I and Class II observers. Observers not demonstrating the requisite average accuracy will be reclassified appropriately until they demonstrate the above-stated minimum required accuracy for these classes of appointment. It is required that all Class I and Class II OO's participate in at least two Frequency-Measuring Tests each year.

**Awards**

All League members (and only members) who take part and who are not connected with the Official Observing System will compete for an electric-clock award by submitting their best measurements on the FMT. It will be presented to the member whose readings show the highest accuracy. A second electric-clock award will be presented to the leading Class I official observer. To be considered for the clock award it is necessary to attach a statement that you, alone, as operator, handled your equipment in making the readings submitted to the Communications Department of the League.

All participants may submit frequency measurements on one or all frequencies listed above. However, no entry consisting of a single measurement will be considered eligible in the prize competitions; at least two readings must be submitted. Awards will be based on the over-all accuracy, as compared with readings submitted by an independent professional frequency-measuring organization. An award committee will examine results to insure fairness to all, and its decisions shall be final.

**FMT RESULTS**

The Second 1949 Frequency Measuring Test, open to both ARRL official observers and other amateurs, was held on September 17th. Entries were received from 134 participants, 58 of whom were OO's and 76 non-OO's. The leader in each category has received as an award an electric clock capable of controlling automatically the on and off switching of 115-volt a.c.-operated equipment.

Each participant received an individual report comparing the accuracy of his measurements of the W1AW FMT transmissions with those made by a commercial frequency-measuring laboratory. Frequencies used in the September FMT were as follows:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Parts/Million</th>
<th>Non-Observers</th>
<th>Parts/Million</th>
</tr>
</thead>
<tbody>
<tr>
<td>3599.066</td>
<td>1.4</td>
<td>W9CIE</td>
<td>1.1</td>
</tr>
<tr>
<td>7170.494</td>
<td>2.6</td>
<td>W2CVY</td>
<td>1.8</td>
</tr>
<tr>
<td>14,079.780</td>
<td>3.8</td>
<td>W3QMM</td>
<td>6.9</td>
</tr>
<tr>
<td>14,150.040</td>
<td>7.3</td>
<td>W3VMG</td>
<td>7.8</td>
</tr>
</tbody>
</table>

Prize winner in the OO group was Robert S. Palmer, W9CIE. Among the non-OO's, the prize-winning entry was submitted by Joseph F. Eckert, jr., W3GEX. The standings of leaders in the test are given below. In accordance with the announced rules, no entry covering a single measurement was considered eligible in the prize competition. Except where indicated, entries consisted of two or more measurements.

**LEADERS**

<table>
<thead>
<tr>
<th>Observer</th>
<th>Parts/Million</th>
</tr>
</thead>
<tbody>
<tr>
<td>W9CIE</td>
<td>1.1</td>
</tr>
<tr>
<td>W2CVY</td>
<td>1.8</td>
</tr>
<tr>
<td>W3QMM</td>
<td>6.9</td>
</tr>
<tr>
<td>W3VMG</td>
<td>7.8</td>
</tr>
</tbody>
</table>

The following ratings are based on a single measurement:

OO's—W7GP 1.2, Non-OO's—D. E. Roberts 0.277, W2FU 6.4.

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

Jan. 13th: CP Qualifying Run
Jan. 15th: V.H.F. Sweepstakes
Jan. 22nd-23rd: ARRL Member Party
Feb. 11th-14th: DX Competition (c.w.)
Feb. 15th: CP Qualifying Run
Feb. 18th-21st: DX Competition (phone)
Mar. 11th-14th: DX Competition (c.w.)
Mar. 16th: CP Qualifying Run
Mar. 18th-21st: DX Competition (phone)

Apr. 18th: CP Qualifying Run

April 23rd-24th: CD QSO Party
May 20th: CP Qualifying Run
June 4th-5th: V.H.F. Contest
June 15th: CP Qualifying Run
June 18th-19th: ARRL Field Day
July 19th: CP Qualifying Run
July 23rd-24th: CD QSO Party

Jan. 1st-Dec. 31st: Most-States V.H.F. Contest
First Saturday night each month: ARRL Official Nets (get-together for SCMs, RMSs, SEAs, ECs, PAMs, HQ, Staff, Directors, Alt. and Asst. Dir.s.)
TRAFFIC TOPICS

The subject of shifting two or more stations five or ten kc. each side of the net frequency is again brought up for discussion. As a result of this practice, several nets are experiencing much undue QRM from nets operating on adjacent channels. If you wish to use this system of operation, your NCS should check the adjacent frequencies during net operation to determine if those spots are clear.

The Teenager Net (TAN) has been formed and will meet on 7150 kc. each Wednesday at 3:45 P.M. EST, and each Saturday at 11:00 A.M. EST. Amateurs in their teens are cordially invited to join the net and are requested to contact W2VXI either by mail or on the air.

The Jersey Net is going great guns, and has made up a complete routing chart to facilitate fast service. The net is operating on 3830 kc. at 9:00 P.M. EST, Monday through Friday. All Traffic Hounds are invited to check in to clear W2VXI either by mail or on the air.

The Buckeye Net of Ohio is proud to have as members four doctors, physicians W8PNY, W8AVB, W8WZ, and oculist W8EBJ. All that is needed now is a dentist!

The ILN Net of Illinois has published a map showing the location and call of each member station. This should prove invaluable to all net members for information, and in particular to the various net control stations for use in routing traffic. It also gives a very nice picture of just what coverage the net enjoys.

A net has been formed on 29,400 kc. called the Marine Corps Net. Operating each day, Monday through Friday, at 2200 GCT, it covers Marine Corps bases throughout the United States and in the Pacific Area. Member stations will monitor the frequency before the net meets to accept traffic for handling via MCN. Call “CQ any Marine Corps Net Station” and you will be cleared. It is requested that you clear prior to 2200 GCT. Additional Marine Corps bases are requested to check into the net for greater coverage.

The Alabama Section now boasts three full-fledged emergency nets: AENB, 3715 kc., operates at 7:00 P.M. CST daily; AENP, 3955 kc., Monday through Friday, 6:00 P.M.; AENZ, 7220 kc., 7:00 P.M., Monday through Friday. Good work, Alabama!

The Ontario Section now sports a 40-meter net called QON, which operates daily on 7267 kc. at 7:30 P.M. EST. Other 40-meter nets are invited to contact V6EATR to arrange schedules for the exchange of traffic.

Reports from the nets are coming in slowly. Please pass along any information regarding your net for inclusion in this column.

SUPPLEMENT TO DIRECTORY OF ACTIVE NETS

This listing is to be added to the directory as published in November, 1948, QST, page 72. Supplements will be published at intervals to keep the directory up to date on all net listings and changes.

<table>
<thead>
<tr>
<th>Call</th>
<th>Orig. Del.</th>
<th>Rel. Del.</th>
<th>Credit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W7CRT1</td>
<td>6</td>
<td>35</td>
<td>1585</td>
<td>30</td>
</tr>
<tr>
<td>W8HMM</td>
<td>10</td>
<td>25</td>
<td>800</td>
<td>9</td>
</tr>
<tr>
<td>W9QMI</td>
<td>60</td>
<td>315</td>
<td>89</td>
<td>314</td>
</tr>
<tr>
<td>W6F6K</td>
<td>45</td>
<td>75</td>
<td>485</td>
<td>67</td>
</tr>
<tr>
<td>W6FDX</td>
<td>31</td>
<td>48</td>
<td>476</td>
<td>46</td>
</tr>
<tr>
<td>W11N</td>
<td>17</td>
<td>274</td>
<td>28</td>
<td>270</td>
</tr>
<tr>
<td>W8REB</td>
<td>10</td>
<td>8</td>
<td>506</td>
<td>6</td>
</tr>
<tr>
<td>W8TQD</td>
<td>3</td>
<td>2</td>
<td>523</td>
<td>0</td>
</tr>
<tr>
<td>W8LJK</td>
<td>24</td>
<td>40</td>
<td>427</td>
<td>32</td>
</tr>
</tbody>
</table>

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

W1A414 W8USU 184 W6KTE 129
W3ECP 259 W1FTX 135 WSTBN 117
W6DU2 246 W3RNR 157 W2WUJ 112
W1NMM 233 W1QIE 133 W8HIL 100
W6DRE 31 48 476 46 601
W1QMI 60 315 89 314 778
W8FDR 31 48 476 46 601
W8RD 17 274 28 270 589
W8REB 10 8 506 6 530
W8TQD 3 2 523 0 523
W8LJK 24 40 427 32 559

A message total of 500 or more or 100 "deliveries plus extra delivery credits" will put I/OU in line for &
Palmetto Net (Fla.)* 3875, 7:00 p.m. EST Mon.-Fri.
3920, 7:30 p.m. EST Mon.-Fri.
Finn Tree Net (Maine)* 3550, 7:00 p.m. EST Mon.-Fri.
GPO (Police Net) 2790-3715
Rhode Island Net 3540, 7:00 p.m. EST Mon.-Fri.
Sea Gull Net (Maine)* 3561, 5:15 p.m. EST Mon.-Fri.
South Texas Emerg. Net 3840, 6:30 p.m. CST Mon.
3860, 6:30 p.m. CST Mon.
Southern Border Net* 3550, 8:00 p.m. PST Daily
Susquehanna Emerg. Net 3610, 8:00 a.m. EST Alt. Sun.
Swing-Shift Net* 7290, 12:30 p.m. EST Mon.-Sat.
Teenager Net (TAN) 7150, 3:45 p.m. EST Wed.
Tri-State Net 3870, 11:00 a.m. EST Sat.
3950, 8:30 a.m. EST Wed.
TLM* 3870, 10:30 p.m. EST Mon., Wed., Fri.
TIN* 3870, 8:00 p.m. MST Mon., Wed., Fri.
Vermont C.W. Net 3740, 7:00 p.m. EST Mon.-Sat.
Virginia Pone Net 3880, 7:30 p.m. EST Mon.-Fri.
West North Dakota Net* 3870, 8:30 p.m. CST Mon., Wed., Fri.

* Change in listing.
† Calif., Ariz., New Mex., Okla.
¶ D. C., Va., W. Va., Ky., Ind., Miss., Colo., Utah, Nev., Calif.
§ Tex., New Mex., Utah, Idaho, Ore., Wash.

RED CROSS TRAFFIC ROUTING

The Disaster Communications Unit of the American National Red Cross is circulating a pamphlet to all Red Cross chapters in which a definite plan for the handling of disaster communications in cooperation with amateur radio is set forth. The plan is built around the three amateur stations which have been provided with teletype connections with the Red Cross coast-to-coast teletype system, K3N 158 W in Washington, D. C., W9DUA in Evanston, Ill., and W6C X O in San Francisco, and instructs local Red Cross personnel to ask amateurs in time of emergency to route Red Cross traffic via those three stations. The frequencies monitored by K3N 158 W , W9DUA and W6CXO — 3850, 7100 and 14,050 kc. — are set forth in the pamphlet, and it is believed that most Red Cross chapters will be able to obtain suitable stand-by facilities in accordance therewith by working through the ARRL emergency coordinator for their community.

In the event that it is impossible for an amateur to work directly into either K3N 158 W , W9DUA or W6CXO, the National Emergency Net, which is alerted during time of communications emergency, and which monitors the frequencies 3850, 3875, and 7100 kc., will be prepared to handle emergency traffic of all types. The National Emergency Net is dedicated to the routing of third-party traffic between emergency nets operating in a disaster area and the normal traffic-routing facilities of the amateur service. They will, as well, provide a sure route into either K3N 158 W , W9DUA or W6CXO.

The following is quoted from the Red Cross pamphlet for your information:

Advance planning is vital if your chapter and the community it serves is to be provided with an emergency radio communications service capable of functioning rapidly and effectively when disaster strikes. The fundamental problem involved is one of coordinating communications personnel and facilities with the permanent chapter disaster preparedness setup. In order to do so, contact the American Radio Relay League emergency coordinator, and through him arrange a meeting with local amateur radio operators. Discussions with this group should include the development of the following essential points:

1. Develop a step-by-step disaster plan covering the use of all available radio facilities that could possibly serve your chapter with particular emphasis on those stations having emergency power sources.
2. Make certain that all concerned have a clear and complete understanding of the above plan of operation. In other words, local radio operators must understand the nationwide radio and teletype communications system described herein and how best to tie in with it locally. At the same time, disaster committee members must be fully acquainted with the communications facilities, both local and national, which are to be used in the event of an emergency.
3. Finally, see that the local radio group have permanent representation on the chapter disaster committee. This integration is best achieved by appointing the emergency coordinator, if he lives within the chapter's jurisdiction, or in any event, a qualified local radio amateur to serve as a liaison member of the disaster committee.

During this meeting, there should be distributed to all participating amateurs copies of Form., which shows the standby frequencies of the three principal radio stations which are permanently connected to strategically located terminals of the American National Red Cross Teletype System (Amcross TC System).

Dick Bischoff, W0QVA, is operator of this business-like station in Burlington, Iowa. Holder of ORS and OOO appointments, W0QVA is active in traffic as alternate NCS for the Iowa Tall Corn Net. The rig consists of BC-696 and BC-459-A units used as VFOs driving a Stanco ST-202-A at 100 watts input. Reception is provided by an HQ-129X working into a "Lazy Man's Q5-er" for added selectivity.

January 1949
THE RST SYSTEM

Headquarters has become increasingly aware of late that our RST system of signal reporting, as correctly detailed on CD Operating Aid of late, that our RST system of signal reporting, as employed nowadays by the majority of hams:

R5 — Got everything, somehow.
R4 — QRM chopping you up, got a little.
R3 — Got practically nothing but squeaks.
R2 — (This is an insult — never use it.)
R1 — I am trying to be funny.

S9 — Strong as heck (or “pse QSL”).
S8 — Above-average signal.
S7 — Average signal (also is the only correct report for use during contests).
S6 — Below-average signal.
S5 — Weak as the devil — don’t want your QSL anyhow.
S4 — I think that’s you in the mud.
S3 — (Never use this report — no receiver can be this punk.)
S2 — (Obsolete term — has not been used since 1938.)
S1 — (Given to S9 locals as a joke.)
T9 — Your signal sounds as though you have a d.c. plate supply.
T8 — Your note is very rough.
T7 — Your note is terrible. Better QRT before FCC catches you.
T6 — (Insult, never use this report.)
T5 — “ “ “ “ “ “
T4 — “ “ “ “ “ “
T3 — “ “ “ “ “ “
T2 — “ “ “ “ “ “
T1 — (Given to locals as a joke.)

CODE-PROFICIENCY CERTIFICATES

The next Code Proficiency Qualifying Run will be made on January 13th at 10:00 P.M. EST. Identical texts will be transmitted simultaneously from W1AW, W60WP and W9TQD. Frequencies of transmission from W60WP will be 3500 and 7248 kc., from W9TQD 3534 kc. W1AW will use the frequencies listed in the schedule elsewhere in this section. Mail your copies of the qualifying run to Headquarters no later than January 23rd. Please indicate the call of the station whose transmissions you copied. If you qualify at one of the five speeds transmitted, 15 through 35 w.p.m., you will receive a certificate. If your initial qualification is for a speed below 35 w.p.m., you may try later for endorsements indicating progress above the first certified speed.

Code-practice transmissions are made from W1AW each evening, Monday through Friday, at 10:00 P.M. EST. References to texts used on several of the transmissions are given below.

These make it possible to check your copy. To get sending practice hook up your own key and buzzer and attempt to send in step with W1AW.

DATE Subject of Practice Text from November QST.
Jan. 4th: A Simple Single-Sideband Transmitter, p. 14
Jan. 7th: A Lightweight 14-Mc. Four-Element Beam, p. 18
Jan. 10th: Improving F. M. Transmission Techniques, p. 21
Jan. 13th: The “Co-ax Twin-Lamp,” p. 25
Jan. 16th: Qualifying Run, 10:00 P.M. EST
Jan. 18th: A VFO/Crystal Exciter, p. 39
Jan. 20th: The “Quad” Antenna, p. 40
Jan. 26th: About Antennas for 80-Meter Mobile, p. 42
Jan. 28th: So It’s Hard to Get on V.H.F., p. 44
Jan. 31st: A Rack-Top Operating Table, p. 58

NO REST FOR THE WEARY

Not one, but two major hurricanes traversed the Florida “hurricane belt” during the past few months. The first, that of September 20–22, found the Florida gang well prepared, with their three emergency nets alerted well ahead of time by SEC Lowery, W4DQW. Key West was the only community of major importance which was not provided with amateur radio for communications when the wires went down. In the potentially-dangerous Okeechobee area, W4ISR of Clewiston, marooned in his shack by high water, provided the sole source of information concerning the status of the dike surrounding Lake Okeechobee. At one stage of the proceedings the Weather Bureau “mislaced” the center of the storm momentarily, and W4GZY of Homestead set them straight on that point.

Torrential rains which accompanied the September 20th–21st storm created high water conditions throughout most of southern Florida, and it is fortunate that a second hurricane, on October 5th, which traversed nearly the same territory, was almost “dry.” Coincidentally, W4GZY was once again responsible for “finding” this hurricane after the Miami Weather Bureau had “mislaced” it. The two storms did comparatively little damage, so the Florida AEC members confined their operations mostly to the handling of weather data and the guarding of the three frequencies used.

As W4JQ of West Palm Beach was heard to say: Two hurricanes in a row “is just too darn much radio — rather play golf.”

WITH THE A.E.C.

Members of the LaCrescenta (Calif.) Amateur Emergency Corps assisted the local sheriff’s office in seeking an airplane which crashed into a near-by mountain on October 19th. Mobile units in cars and 144-Mc. pack rigs which were carried into the hills successfully maintained communications between the searchers and their base of operations. Among the members of the group which assisted in this effort were W6s HMC, VRK, BTX, YGT, YKB, RTR, UBY, BTA.

Clay Griffin, W4DXI, has been appointed regional emergency coordinator for the South-
eastern Area of the American Red Cross. The RC Southeastern Area includes the states of Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina and Tennessee. Acting as liaison man between that RC office and the amateur service, Clay occupies one of the hottest of the EC seats.

The Nutmeg Net, the Connecticut traffic facility, has expanded its operations to a 7-day-a-week schedule. The new Saturday and Sunday evening runs are under the banner “Connecticut Emergency Net,” and are slow-speed sessions. The Connecticut gang have shown that many casual operators who either have insufficient time to get into the week-night operations of the regular section net, or who do not feel themselves sufficiently experienced to operate in a traffic net, welcome the opportunity to train themselves for this.

Operating-Visiting Hours:
Monday through Friday: 1130-0600 (next day).
Sunday: 1600-2200
A mimeographed local map showing how to get from main state highways (or from Hq. office) to WIAW will be sent to amateurs advising their intention to visit the station.

General Operation: Refer to page 71, November, 1948, QST, for a chart showing WIAW general operation. This schedule is still in effect and is not reproduced here for space considerations. Mimeographed complete master schedules of all WIAW operation in EST, CST, MST or PST are still in effect and is not reproduced here for space considerations. Mimeographed complete master schedules of all WIAW operation in EST, CST, MST or PST are available upon request.

Official Bulletin Schedule: Bulletins containing the latest information on matters of general interest to amateurs are transmitted on regular schedules:

### DX CENTURY CLUB AWARDS

<table>
<thead>
<tr>
<th>Honor Roll</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1FH</td>
</tr>
<tr>
<td>W5CBX</td>
</tr>
<tr>
<td>W6JBP</td>
</tr>
<tr>
<td>W3KJ</td>
</tr>
<tr>
<td>W5GHD</td>
</tr>
<tr>
<td>W3CVP</td>
</tr>
<tr>
<td>W3AKX</td>
</tr>
<tr>
<td>W5DI</td>
</tr>
<tr>
<td>W2CYS</td>
</tr>
<tr>
<td>W3KOL</td>
</tr>
<tr>
<td>W5SGT</td>
</tr>
<tr>
<td>W3EUV</td>
</tr>
<tr>
<td>W3TOF</td>
</tr>
<tr>
<td>W2JTC</td>
</tr>
<tr>
<td>W3AOL</td>
</tr>
<tr>
<td>W3WAG</td>
</tr>
<tr>
<td>W6KRU</td>
</tr>
<tr>
<td>W2CWX</td>
</tr>
<tr>
<td>W5EIA</td>
</tr>
<tr>
<td>W5AYS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Endorsements</th>
</tr>
</thead>
<tbody>
<tr>
<td>W3GEX</td>
</tr>
<tr>
<td>W2EKB</td>
</tr>
<tr>
<td>W2GDA</td>
</tr>
<tr>
<td>W2ZKT</td>
</tr>
<tr>
<td>W2CVP</td>
</tr>
<tr>
<td>W3GHD</td>
</tr>
<tr>
<td>W2CYS</td>
</tr>
<tr>
<td>W3KOL</td>
</tr>
<tr>
<td>W3WAG</td>
</tr>
<tr>
<td>W6KRU</td>
</tr>
<tr>
<td>W2CWX</td>
</tr>
<tr>
<td>W5EIA</td>
</tr>
<tr>
<td>W5AYS</td>
</tr>
</tbody>
</table>

### RADIO TELEPHONE

<table>
<thead>
<tr>
<th>Honor Roll</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1FH</td>
</tr>
<tr>
<td>W6JD</td>
</tr>
<tr>
<td>W4CUI</td>
</tr>
<tr>
<td>W1ICX</td>
</tr>
<tr>
<td>W4HAL</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>W6BF</td>
</tr>
</tbody>
</table>

January 1949
ATLANTIC DIVISION

EASTERN PENNSYLVANIA—SCM, Jerry Mathis, W3BES—HNW and KMF lectured to the Chester Radio Club on T.V.I. and harmonic reduction. New officers of the West Philadelphia Radio Assn. are: COZ, pres., BXD, vice-pres., IUD, see-vice.; Wy, secret., West Philly’s 300-watt station, MKA, now is on 28 Mc. n.f.m. NNV is new OPS and makes messages from Greenland. JPR made his first South American contact and the station at present is on 144 Mc. His new QRP activities are on 14 Mc. and worked in the CD Party. “Emzie” also reported at the Club’s vice-president, gave a talk and demonstrated on “Interstage Coupling.” Mr. Cortwright, the Washington Radio Club, Warren Andrew, A.M. the Club’s vice-president, gave a talk and demonstration on “Interstage Coupling.”


eastern Pennsylvania — SCM, Jerry Mathis,

W3BES—HNW and KMF lectured to the Chester Radio Club on T.V.I. and harmonic reduction. New officers of the West Philadelphia Radio Assn. are: COZ, pres., BXD, vice-pres., IUD, see-vice.; Wy, secret., West Philly’s 300-watt station, MKA, now is on 28 Mc. n.f.m. NNV is new OPS and makes messages from Greenland. JPR made his first South American contact and the station at present is on 144 Mc. His new QRP activities are on 14 Mc. and worked in the CD Party. “Emzie” also reported at the Club’s vice-president, gave a talk and demonstrated on “Interstage Coupling.” Mr. Cortwright, the Washington Radio Club, Warren Andrew, A.M. the Club’s vice-president, gave a talk and demonstration on “Interstage Coupling.”


eastern Pennsylvania — SCM, Jerry Mathis,

W3BES—HNW and KMF lectured to the Chester Radio Club on T.V.I. and harmonic reduction. New officers of the West Philadelphia Radio Assn. are: COZ, pres., BXD, vice-pres., IUD, see-vice.; Wy, secret., West Philly’s 300-watt station, MKA, now is on 28 Mc. n.f.m. NNV is new OPS and makes messages from Greenland. JPR made his first South American contact and the station at present is on 144 Mc. His new QRP activities are on 14 Mc. and worked in the CD Party. “Emzie” also reported at the Club’s vice-president, gave a talk and demonstrated on “Interstage Coupling.” Mr. Cortwright, the Washington Radio Club, Warren Andrew, A.M. the Club’s vice-president, gave a talk and demonstration on “Interstage Coupling.”


eastern Pennsylvania — SCM, Jerry Mathis,

W3BES—HNW and KMF lectured to the Chester Radio Club on T.V.I. and harmonic reduction. New officers of the West Philadelphia Radio Assn. are: COZ, pres., BXD, vice-pres., IUD, see-vice.; Wy, secret., West Philly’s 300-watt station, MKA, now is on 28 Mc. n.f.m. NNV is new OPS and makes messages from Greenland. JPR made his first South American contact and the station at present is on 144 Mc. His new QRP activities are on 14 Mc. and worked in the CD Party. “Emzie” also reported at the Club’s vice-president, gave a talk and demonstrated on “Interstage Coupling.” Mr. Cortwright, the Washington Radio Club, Warren Andrew, A.M. the Club’s vice-president, gave a talk and demonstration on “Interstage Coupling.”


eastern Pennsylvania — SCM, Jerry Mathis,

W3BES—HNW and KMF lectured to the Chester Radio Club on T.V.I. and harmonic reduction. New officers of the West Philadelphia Radio Assn. are: COZ, pres., BXD, vice-pres., IUD, see-vice.; Wy, secret., West Philly’s 300-watt station, MKA, now is on 28 Mc. n.f.m. NNV is new OPS and makes messages from Greenland. JPR made his first South American contact and the station at present is on 144 Mc. His new QRP activities are on 14 Mc. and worked in the CD Party. “Emzie” also reported at the Club’s vice-president, gave a talk and demonstrated on “Interstage Coupling.” Mr. Cortwright, the Washington Radio Club, Warren Andrew, A.M. the Club’s vice-president, gave a talk and demonstration on “Interstage Coupling.”
Merry Christmas
and
Happy New Year
from NATIONAL COMPANY

C. L. Gagnebin ........ W1ATD
Herman S. Bradley .... W1BAQ
Lawrence Amann ........ W1BG
James Ciarlone .......... W1BHW
Calvin Hadlock .......... W1CTW
Harvey Poore ........... W1DKM
Seth Card ............... W1DRO
Hollis Peters .......... W1EAB
Albert Porter .......... W1ESI
J. Francis Bartlett .... W1ED
William Osborne ....... W1EXR
George R. Ringland .... W1EYZ
Don Hinds .............. W1FRZ
Robert Murray .......... W1FSN
Dave Smith ............. W1HOH
John Baxter ............. W1HRK
Jack Ivers ............. W1HSV
Edmund Harrington ...... W1JEL
Alfred Zerega .......... W1JMK
Robert Williams ....... W1JOX
Frank Lopez ............ W1KPB
Richard L. Gentry ...... W1LEN
John Stanley .......... W1LFF
Leo Green .............. W1LML
Francis Waden .......... W1LNV
Richard Thurston ....... W1MFZ
Victor Penney .......... W1MTS
Clyde Schryver ......... W6RPE

Donald Poulin .......... W1MXC
Dexter Atkinson ....... W1MYH
Milton Kalashian ....... W1NXT
Martin Oxman ........... W1NYU
Robert Anderson ....... W1ODV
Ralph Hawkins .......... W1OEX
John Prusak ............ W1OPT
Austin Banks .......... W1ORK
William McNamara ...... W1OTK
Harry Harris .......... W1PFF
William Bartell ...... W1PIJ
Charles Coyle .......... W1PME
Harry Paul ............. W1PSM
Richard Brayley ...... W1PRZ
Hyman Kana .......... W1PSJ
George Serzente ....... W1PWG
Raymond Jordan ...... W1QIU
Harry Mayo ............. W1QPF
S. W. Bateman .......... W1RX
Clark Rodimon ....... W1SZ
William S. Doyle ....... W1TV
Edward Braddock ....... W3BAY
Arthur H. Lynch ....... W4DKJ
Raymond Lewis ....... W4JUU
M. B. Patterson ....... W5CI
Herb Becker .......... W6QD
W. Clif McLoud ....... W6AZT

* The above reproduction of the National Tuberculosis Society Christmas Seal symbolizes our customary contribution to this most worthy cause.
Illinois — SCM, Lloyd E. Hopkins, WB9EVI — Net W9FSG; LOC, Joe N., DUS, AR and STY; PM, UQT, JBX in visiting 61EC in Oklahoma. HON is back in traffic. TN is building a 1/4-kw rig. EO is getting things ready for his next 24-Mc QSO. QO is 144 Mc. KRX is building a new three-element beam on 37 Mc. It is on 7 Mc. WA is busy with his duty duties. ZFC worked five new states. RSM is new ORS. L14Q is working on mobile. WQV is new ORS. KPB is building a tower. KQL turns in a fine traffic total. Y7V has been QRL with home on 7 Mc. STY is having a little B.C.I. trouble. EBS has been building a new three-element tower. We are all interested in the new members. The first month of our new term of office expires soon, so let's get the SCM post some thoughts. Remember, it's their job to see that the SCM himself is up to date. Thanks to all for the generous help you have given me. Traffic: W9SBF 45, EKA 40, YDI 32, KRL 21, IAR 18, LIW 13, LWN 1.

CENTRAL DIVISION

ILINOIS — SCM, Lloyd E. Hopkins, WB9EVI — Net W9FSG; LOC, Joe N., DUS, AR and STY; PM, UQT, JBX in visiting 61EC in Oklahoma. HON is back in traffic. TN is building a 1/4-kw rig. EO is getting things ready for his next 24-Mc QSO. QO is 144 Mc. KRX is building a new three-element beam on 37 Mc. It is on 7 Mc. WA is busy with his duty duties. ZFC worked five new states. RSM is new ORS. L14Q is working on mobile. WQV is new ORS. KPB is building a tower. KQL turns in a fine traffic total. Y7V has been QRL with home on 7 Mc. STY is having a little B.C.I. trouble. EBS has been building a new three-element tower. We are all interested in the new members. The first month of our new term of office expires soon, so let's get the SCM post some thoughts. Remember, it's their job to see that the SCM himself is up to date. Thanks to all for the generous help you have given me. Traffic: W9SBF 45, EKA 40, YDI 32, KRL 21, IAR 18, LIW 13, LWN 1.

ILLINOIS — SCM, Lloyd E. Hopkins, WB9EVI — Net W9FSG; LOC, Joe N., DUS, AR and STY; PM, UQT, JBX in visiting 61EC in Oklahoma. HON is back in traffic. TN is building a 1/4-kw rig. EO is getting things ready for his next 24-Mc QSO. QO is 144 Mc. KRX is building a new three-element beam on 37 Mc. It is on 7 Mc. WA is busy with his duty duties. ZFC worked five new states. RSM is new ORS. L14Q is working on mobile. WQV is new ORS. KPB is building a tower. KQL turns in a fine traffic total. Y7V has been QRL with home on 7 Mc. STY is having a little B.C.I. trouble. EBS has been building a new three-element tower. We are all interested in the new members. The first month of our new term of office expires soon, so let's get the SCM post some thoughts. Remember, it's their job to see that the SCM himself is up to date. Thanks to all for the generous help you have given me. Traffic: W9SBF 45, EKA 40, YDI 32, KRL 21, IAR 18, LIW 13, LWN 1.

CENTRAL DIVISION

ILLINOIS — SCM, Lloyd E. Hopkins, WB9EVI — Net W9FSG; LOC, Joe N., DUS, AR and STY; PM, UQT, JBX in visiting 61EC in Oklahoma. HON is back in traffic. TN is building a 1/4-kw rig. EO is getting things ready for his next 24-Mc QSO. QO is 144 Mc. KRX is building a new three-element beam on 37 Mc. It is on 7 Mc. WA is busy with his duty duties. ZFC worked five new states. RSM is new ORS. L14Q is working on mobile. WQV is new ORS. KPB is building a tower. KQL turns in a fine traffic total. Y7V has been QRL with home on 7 Mc. STY is having a little B.C.I. trouble. EBS has been building a new three-element tower. We are all interested in the new members. The first month of our new term of office expires soon, so let's get the SCM post some thoughts. Remember, it's their job to see that the SCM himself is up to date. Thanks to all for the generous help you have given me. Traffic: W9SBF 45, EKA 40, YDI 32, KRL 21, IAR 18, LIW 13, LWN 1.

CENTRAL DIVISION

ILLINOIS — SCM, Lloyd E. Hopkins, WB9EVI — Net W9FSG; LOC, Joe N., DUS, AR and STY; PM, UQT, JBX in visiting 61EC in Oklahoma. HON is back in traffic. TN is building a 1/4-kw rig. EO is getting things ready for his next 24-Mc QSO. QO is 144 Mc. KRX is building a new three-element beam on 37 Mc. It is on 7 Mc. WA is busy with his duty duties. ZFC worked five new states. RSM is new ORS. L14Q is working on mobile. WQV is new ORS. KPB is building a tower. KQL turns in a fine traffic total. Y7V has been QRL with home on 7 Mc. STY is having a little B.C.I. trouble. EBS has been building a new three-element tower. We are all interested in the new members. The first month of our new term of office expires soon, so let's get the SCM post some thoughts. Remember, it's their job to see that the SCM himself is up to date. Thanks to all for the generous help you have given me. Traffic: W9SBF 45, EKA 40, YDI 32, KRL 21, IAR 18, LIW 13, LWN 1.

CENTRAL DIVISION

ILLINOIS — SCM, Lloyd E. Hopkins, WB9EVI — Net W9FSG; LOC, Joe N., DUS, AR and STY; PM, UQT, JBX in visiting 61EC in Oklahoma. HON is back in traffic. TN is building a 1/4-kw rig. EO is getting things ready for his next 24-Mc QSO. QO is 144 Mc. KRX is building a new three-element beam on 37 Mc. It is on 7 Mc. WA is busy with his duty duties. ZFC worked five new states. RSM is new ORS. L14Q is working on mobile. WQV is new ORS. KPB is building a tower. KQL turns in a fine traffic total. Y7V has been QRL with home on 7 Mc. STY is having a little B.C.I. trouble. EBS has been building a new three-element tower. We are all interested in the new members. The first month of our new term of office expires soon, so let's get the SCM post some thoughts. Remember, it's their job to see that the SCM himself is up to date. Thanks to all for the generous help you have given me. Traffic: W9SBF 45, EKA 40, YDI 32, KRL 21, IAR 18, LIW 13, LWN 1.
LAND, SEA and AIR

PRs stand the gaff! Wherever you go you find these fine precision crystals doing their jobs with honor...meriting the praise of engineers, operators and technicians. Yes — you can depend on PR for perfect frequency control...at low cost...for all amateur, commercial and industrial services.

10 METERS, Type Z-5, $5.00 • 20 METERS, Type Z-3, $3.75 • 40 & 80 METERS, Type Z-2, $2.75

PETERSEN RADIO COMPANY, INC., 2800 W. BROADWAY, COUNCIL BLUFFS, IOWA
new president of the SFARC. We wish Tony success and know that he will do a fine job. JEXX is now on with an 813 all bands. KOC: WQCP 88, KQXX 91.

MINNESOTA -- SCM, Walter G. Hasekamp, W5CWB -- FIT and FOH, of Albert Lea, have worked the Twin Cities on 25-Mc. ground wave, 26-Mc. sputtered wire wound sylvania for 20 years and SCM there for 2 terms, now is located in St. Paul and has joined MSN. DOQ is a father for the first time! GRL-3 Duluth, worked Ona Marais of St. Paul, using a dual extended Zepp antenna. Having been interested in ham radio for many years, the 65-year-old father of QNL-3 and BQT took his Class B exam. MSN is a valuable member when Victor Volz, GPH, joined the Silent Keys. MXC is in conducting regular code practice on 28.2 Mc. on Mon. and Wed. Several of the clubs are reorganizing their emergency organizations. The Minneapolis Club now owns an NC-173 receiver, an HT-6 rig, antenna mast, a portable gasoline-electric power unit, and a nightly go-around. The 144-Mc. gang of Anoka, Robbinsdale, St. Cloud, and the Twin Cities were cut in force at a dinner in Anoka. On 144 Mc., HXY has worked 2 districts and 4 states, and KPL each has 2 districts and 2 states, SV has 1 district and 3 states. BOL now is Class A and is on 3.85 Mc. with a 65-Mc. rig. The St. Paul Radio Club has built a new 800-Mc. station for the use of members and the club secretary. HFP is alternate for RJF on TLA, while VPF alternates for QMW. NCDM has called the Shrimp Net to order along the Gulf Coast.

DELTA DIVISION

ARKANSAS -- SCM, Marshall Riggs, W5JIC -- AUU has added a new power control panel to his 815 rig. NBB is doing fine on 14-Mc. phone.OX is on 25-Mc. with 829-B with 75 watts. KYQ is in hibernation at Hendrix. NCM has new TFL for 285-B rig. JH4 is making plans for a new rig. The Conway Club has been very active, doubled its membership. OXL is working on rig with p.p. 826 on 26 Mc. OQG has put up new 800-Mc. antenna. MIVDY is working on chip. 2400 is covering the problem of supply and demand. The p.p. 819s are taking shape. Don't forget the Hot Springs meeting. We'll be looking for you. Traffic: W5NUI 101, BGY 33, VJH 22, JIE 18, CWB 12, RPT 11, BOL 6, KEDAH 3.

FOR THE USE OF MEMBERS AND THE CLUB SECRETARY. HFP IS ALTERNATE FOR RJF ON TLA, WHILE VPF ALTERNATES FOR QMW. NCDM Has Called The Shrimp Net To Order Along The Gulf Coast.
B&W DISTORTION METER MODEL 400

FREQUENCY SHIFT EXCITER—Provides RF drive and frequency shift keying to transmitter

B&W AUDIO OSCILLATOR MODEL 200

B&W AUDIO FREQUENCY METER MODEL 300


CONTROL UNIT—Operates as an electronic repeater in teletype lines.

DUAL DIVERSITY CONVERTER—Provides diversity mixing on frequency shift circuits.

RECEIVER ASSEMBLY—Standard Army BC-342 modified for dual diversity reception.

NOW IN PRODUCTION AT B&W

Complete Radio Transmitters • Dual Diversity Converters, Control Units and Frequency Shift Exciters for Radio Teletype Transmission • Special Test Equipment • Redesign, Modernization and Modification of Existing Equipment • Machine Work • Metal Stamping • Coils • Condensers • Other Electronic Devices in a Wide Range of Types.

THE TRADEMARK THAT GREW through service to you!

Today, the Barker and Williamson trademark is backed by three plants, excellent manufacturing facilities, and a competent technical staff—all because amateurs, through the years, have shown a definite preference for quality products and a willingness to try practical ideas that give promise of improved performance. Today, too, this famous trademark appears on many new items of complete equipment—all produced by an organization that grew because it designed and built the kind of products you wanted. With its improved facilities, B&W pledges to continue to build better and better parts and equipment for amateurs, and to develop and offer only those products which the amateur can use with confidence and pride.

B&R & WILLIAMSON, INC.
237 FAIRFIELD AVE. UPPER DARBY, PA.
Johnson 167 Variables

CERAMIC SOLDERED FOR STABILITY & STRENGTH

PEAK EFFICIENCY, plus permanent maintenance of capacities— even under severest operating conditions such as portable-mobile operation—is assured in Johnson's new line of 167 Variables. The use of perfected ceramic soldering eliminates the need for eyelets, nuts or screws. There is nothing to work loose, causing stator wobble and fluctuations in capacities! Available in .030" and .080" spacings for all types of communications equipment having tuned circuits operating as high as 500 mc.

Single Type—Available in six models: 2.8 to 11 mmf, 3.5 to 27 mmf, 4.6 to 51 mmf, 5.7 to 75 mmf, 6.8 to 99 mmf, 11.6 to 202 mmf.

Dual Type—Available in three models: 3.5 to 27 mmf, 4.6 to 51 mmf, 6.8 to 99 mmf.

Differential Type—Available in three models: 2.8 to 11 mmf, 3.5 to 27 mmf, 4.6 to 51 mmf.

Butterfly Type—Available in three models: 2.8 to 10.5 mmf, 4.3 to 26.5 mmf, 6.5 to 51.5 mmf.

...other capacities and spacings available on special order

Write for new Johnson 167 Variable Catalog

Johnson, a famous name in radio
E. F. Johnson Co., Waseca, Minn.

(Continued on page 80)
Oscillator Switching with the
MALLORY 152L 6 Position Switch

It is surprising how much the sensitivity of the average communication receiver can be improved by the use of a simple variable frequency test oscillator, to "touch up" the I.F. section or to peak the R.F. stages.

An oscillator suitable for most amateur work need not be complicated or difficult to build. It should consist of a reasonably stable circuit similar to the one shown here, and should be roughly calibrated over a range from approximately 400 KC through 30 MC. Some method of modulating its output should be employed, although this is not a necessity if the receiver to be tested is equipped with a carrier level "S" meter.

Bandswitching should be employed for convenience in switching from one range to another. Mallory type 152L is admirably suited for this purpose. It consists of 2 sections and 6 positions. A unique feature of the Mallory 152L switch is its automatic shorting mechanism which shorts out all unused coils, thus eliminating the possibility of harmonic "suck-out" points. In addition, this switch is equipped with an adjustable "stop" so that any number of positions may be used from 2 through the full 6.

Circuit constants and modulation methods for the suggested oscillator schematic may be found in most of the late Amateur Handbooks. The 152L band switch and other parts may be purchased at your nearest Mallory authorized distributor.

You can rely on Mallory Precision manufacturing to supply you with the most dependable line of: ham band switches, push button switches, controls—rheostats—potentiometers—pads, tubular capacitors, transmitting capacitors, dry electrolytics, dry disc rectifiers, vibrators, and vibrator power supplies—practically every component you need to keep your rig in A-1 condition.
moved to new QTH. JIO was lucky ham who won the Motorola mobile rig at the Milwaukee Convention. BGY, GSJ, SCW, TRN, and YDR were active in the CD Party. NY had its first four-element beam. USA's model makes rig deliver this month. GLS and SOX have installed 3,85-Mc. phone rigs in their airplanes and both are enjoying fine results. PM is back on the air with a new rig. Many days and evenings were devoted to the fine cooperation you have shown me in the past year. Keep up the good work. A very Happy New Year to all! The October meeting of the Central Ohio Radio Club has as the principal speaker our SEC, Dr. Harold E. Stricker, W8WZ -- SEC: UPB, PAM, PUN, RM; a new appointee to ARRL appointments; please send in your report every month with some news. I thank one and all of you for your cooperation. As many as 38 stations have been very busy: JU YLF, PDU, SHQ, JWO, and CJZ; CJZ, ADW, and WLS were on 146.24 Mc., while MZB, YPA, ADW, and CJZ were on 3600 kc; EYE chalked up country No. 125. The following officers were elected: AJH, pres.; QV, vice-prec.; MXO, secy.; FBK, treas. The meeting was turned over to ABO, the new president, who outlined his work in emergency organization from 1937 to the present date. The Springfield Amateur Radio Club Publication, Q-4, reports the following new officers were elected: AJH, pres.; VZE, secy.; WAU, treas. The club owns a very good SKVA portable emergency generator set. Excellent code practice transmissions are being made every Tuesday and Thursday night at 8:00 p.m. by WXG on 144 Mc. CDT is working plenty at OX. QVG is back on the air after a six-month's layoff. The October meeting of the Central Ohio Radio Club has as the principal speaker our SEC, Dr. Harold E. Stricker, W8WZ -- SEC: UPB, PAM, PUN, RM; a new appointee to ARRL appointments; please send in your report every month with some news. I thank one and all of you for your cooperation. As many as 38 stations have been very busy: JU YLF, PDU, SHQ, JWO, and CJZ; CJZ, ADW, and WLS were on 146.24 Mc., while MZB, YPA, ADW, and CJZ were on 3600 kc; EYE chalked up country No. 125.
Now, for the first time, a heavy duty transmitting condenser that completely eliminates troublesome closed loops, vastly simplifying the problem of unwanted harmonics. The rotor shaft is completely insulated from the end plates. Absolutely no extraneous capacity! Rigid and stable construction. Long leakage path (higher safety factor). Plates and parts are extra heavy with highly polished rounded edges to prevent flash-over. Adjustable stator plate mounting and end bearings. Multi-fingered spring contact. Center tap ground makes this condenser ideal for push-pull operation. Available in single-stator, double-stator, or double-stator right angle center drive models. Same capacities as National TML Condenser.

The National LMT Condenser is only one of many National precision components. See your dealer or write for catalog.
I
ELECTRONICS, INC.
MASSACHUSETTS
SOUTHERIDGE,

Simulated Emergency Test. Reports indicate that about 150 hams took part.

All the planning was left to the SEC since PP was attending the in operation under the direction of DRA. All licensed amateurs in Monmouth County 144-Mc. stations participated in the Simulated Emergency Test and cleared their traffic just as easy. This net is an excellent outlet for "LAP traffic and all are welcome. LFR handled 71 ARC or ARRL emergency messages under tough conditions. QEM, on furlough for the first time in the CD Party. After visiting LFR, JRV and YVP, operating on 28 Mc., say that they will get on 3.5-Mc. next party, as KUS is also active 14-Mc. c.w. college net on 14,040 kc. at 1200 EST, FSK is doing a good job in the Slow Speed Net, 15 w.p.m. limit. BGO is doing a good job as SEC, but night work keeps Vin pretty busy. Coverage is on 7, 3.5, and 14 Mc, with ART-13. QYZ is active again. VOH has new VFO and expects new receiver shortly. PKE is at Brooklyn College with TUR and QBS. This net is really killing you; OBU has l.t. sec. George still has not forgotten the NLI. EC says TAP takes traffic for Western U. S. from 2100 to 2125 on 3630 kc. RTZ attended the Boston Hamfest and visited IJE and IKJF. Hope has a new rig and shortened antennas. TUR maintains NLI schedule only but manages to run up a good traffic score. VOH has recovered from a recent illness. Traffic: W2TUK 201, VNJ 149, RT2 136, EC 117, OBU 114, PRE 112, BO 103, OUF 92, VOS 91, QYZ 87, VAF 78, RIV 25, ESO 22, KY4AF/216, W2RQ8 14, VHS 13, ESQ 7, URX 7.

NORTHERN NEW JERSEY—SCM, Thomas J. Lydon, W2ANW—The N.N.J. C.W. Net meets daily, except Sunday, on 3630 kc. at 7 P.M. The 40-Meter Net meets Monday, Wednesday, and Friday on 7070 kc. at 7:30 P.M. The J.N., which meets daily, except Saturday, on 3630 kc. at 9:00 P.M., is going full blast. Fifty-one different stations reported during the first month of operation. This is an excellent outlet for TAP traffic and all are welcome. LFR handled 71 ARC or ARRL emergency messages under tough conditions. QEM, on furlough from OEC, checked into the NNJ Net from ANE. QNY had poor results working 28-Mc. mobile on his recent 3000-mile vacation trip, but he visited plenty of hams, including R.S. The 40-Meter Net will operate 28-Mc. 'phone n.f.m. and 14-Mc. c.w. and also is working on 7, 3.5, and 14 Mc, with ART-13. QYZ is active again. VOH has new VFO and expects new receiver shortly. PRE operated 28-Mc. mobile during the recent 3000-Mile Trip, but he visited plenty of hams, including 9FIN. EUS is now reporting into five traffic nets and handling lots of traffic. GFW has about 95 countries confirmed and is looking forward to NDX to that DMC. SCN is monitoring GTTT weekly. OXL is reporting into all three nets regularly. ANG operated 28-Mc. mobile during the recent Simulated Emergency Test, P2, and has kept him off other bands. CWK, with three antennas, hopes to top GFG in the next CD Party. Looks like plenty of competition in the next party. OUS is also interested in being more convenient to QNI the 7-Mc. net and finds he can really kill you: OBU has l.t. sec. George still has not forgotten the NLI. EC says TAP takes traffic for Western U. S. from 2100 to 2125 on 3630 kc. RTZ attended the Boston Hamfest and visited IJE and IKJF. Hope has a new rig and shortened antennas. TUR maintains NLI schedule only but manages to run up a good traffic score. VOH has recovered from a recent illness. Traffic: W2TUK 201, VNJ 149, RT2 136, EC 117, OBU 114, PRE 112, BO 103, OUF 92, VOS 91, QYZ 87, VAF 78, RIV 25, ESO 22, KY4AF/216, W2RQ8 14, VHS 13, ESQ 7, URX 7.

THE NEW TBS-50A
Incorporates a small three tube preamplifier with sufficient gain so that any high impedance microphone having an output level of approximately -50 db can be used. TBS-50A, complete with tubes only $121.25

Send for catalogue describing Harvey-Wells Transformers, Power Supplies, Preamplifiers, and Rack Panels
Belden
CHICAGO
WIRES CORDS
100 FT.
8401
SINGLE CONDUCTOR MICROPHONE CABLE
MAD IN U.S.A.

MORE HOURS OF SERVICE
MICROPHONE CABLES

Every Type for Every Service

Belden
Radio WIRE
Self-Contained to 6000 V
5 Megs, 600 MA, + 70 dB,
with full size 3" Meter
Complete with battery
Packs and test leads.
Net price $24.75

In custom molded carrying case. Series 40 is ideally dimensioned and engineered as a portable, compact test set to withstand the hard usage of amateur radio, service, and engineering as incorporated into their larger test sets. However, it features the ROTARY SELECTION---1½, 3½, and 6½ multimeters—multiplier—2 and 1000 ohms per volt.

**RANGE SPECIFICATIONS**

- **5 A.C.-D.C. & Output Voltage Ranges:**
  - All at 1000 ohms per volt.
  - 0-12-24-30-42-60-120-600 volts.
  - 1 A.C. Current Ranges: 0-5-10-20-40-60 MA.
  - 3 Resistance Ranges: self-contained batteries.
  - 0-5000-500,000 ohms.
  - 6 Decade Ranges from 0 to 6000 ohms.
  - ⅔ Wirewound & Metalized Resistors.
  - Only 3 Pin Jumps save of standard functions.
  - 3 Bacteria, 2½ or 4½.

Resistant to moisture and wear.

See the new "Precision" Test set at all leading radio parts and home equipment distributors. Write the PRECISION 1948 catalog describing quality Electronic Test Instruments for all phases of modern radio-electronics.

**PRECISION APPARATUS COMPANY, INC.**

92-27 Horace Harding Blvd., Elmhurst 13, N.Y.

Obiteur Division: 458 Broadway, N.Y. City, U.S.A.

Cables: MORHANEX

---

The Midwest Division Convention. SEP is sporting new power supply, VQA reports a new 28-Mc. vertical. TIU says he's ready for a heavy schedule on TLCN, FP and HUH is a jr. member of TLCN. OM is developing a new habit:

- He's going to report to the SCM regularly. Fifteen members of the TLCN took an active part in the Simulated Emergency Test. The North Iowa Radio Transmitting Asso. has organized 28-Mc. ground-wave net. Meetings are held each Monday at the first Monday of the month. The roll call is at 8 P.M. ABW renewed OBS appointment. NMA is operating portable from Quad City area. WMU has its 167-YH working on 28 Mc. now. HUH has a report on the activities of the Sioux City gang during the Simulated Emergency Test. AHG will have a pair of 813s in the final. HWM worked BQ23 on 14.5 Mc. and has his BQ7 back on 28-Mc. 'phone after several years' layoff. UPL has a new hand-for his 3.50-Mc. folded dipole. SCV is getting into the air. The Wichita gang is to be congratulated on the fine work on the Midwest Division Convention. BAL has a new three-element beam on 28 Mc. The paper work has the SCM moved, the new rigs, and the renewals and appointments will come through. Thanks a lot. Traffic: WHJMM 904, AUL 325, FP 230, SEP 69, WA 50, PP 40, THF 20, SQV 15, OSS 11, WMU 10, OM 4.

KANSAS — SCM, Earl N. Johnston, W7IVC — Over 400 attended the Midwest Division Convention. "By" Goodin, IDX, stole the show. He's now HT-18 and mobile rig. Wichita Emergency Corps members, using 28-Mc. mobiles, assisted Wichita members. HUH is new EC for Zone 16. Topeka Emergency Corps members held a Simulated Emergency Test the night before going to the Midwest Division Convention. HWM was new OBC, with 3 mobiles and 6 fixed on 20.5 Mc., 1 on 7 Mc., and 1 on 3.5 Mc. The KVRG held a picnic Oct. 31st. SEP has new A.M. in the air, PB, AGC, moved into the basement. HEC has new FAM with 3.50-Mc. A.M. Phone Net, going full swing. NMA new KM at Topeka, reports the Q8A Net in operation in numbers. 10 new Collins stations, DBR and PHN active on 3.85 Mc. YR now on 7 Mc. FAB, our SEC, asks for full support in the Emergency Corps. WOG, new CV, have kw rig on 945 Mc. HR reports for Chautauqua. LXJ has new 30-Mc. beam. NJX has new tower for beam. IFM is working on 144-Mc. rig. OAF is new A.M. for Zone 4. HGR has new FAM equipment. FXL, of KCK, reports CLX is rebuilding. TSA is on 3.5 Mc. WRI has antenna in the attic, BC-445, and 60 watts, M0X is using S-3, and 15 watts on 6, 07 on 28 Mc. GDR has a new final with pair of 304Ts. AHA reports Slow Speed Trunk Line going P.B. Traffic: W8JNC 51, A8 52, IFM 27, W2A 29, W2M 13, KVRG 17, KB 15, CIU 14, ICY 8, VBG 5, FER 4, HEC 3, OAF 2, NFD 1, WPV 1, WMU 1.

MISSOURI — SCM, Ben H. Wendt, W6CID — Both of Missouri's active nets, 3905 kc. and 3755 kc., are in full swing. Traffic-handling is the chief order of business. The Missouri Emergency Net, with 36 active members, is in session on Sundays at 10:00 A.M. and on Mondays, Wednesdays, and Fridays at 7:30 P.M., 3905 kc. The HARO is successfully pulling a ham program on Channel 13 throughout the Kansas City territory, serving some 500 hams. The Ozark Amateur Radio Club elected E120, pres., and 28-Mc. tower. Missouri Emergency Net, with 59 active members, is getting back on the air. The Wichita gang is to be congratulated on the fine work on the Midwest Division Convention. BAL has new three-element beam on 28 Mc. The HWM worked BQ23 on 14.5 Mc. and has his BQ7 back on 28-Mc. 'phone after several years' layoff. UPL is now flying high for his 3.50-Mc. folded dipole. SCV is getting into the air. The Wichita gang is to be congratulated on the fine work on the Midwest Division Convention. BAL has new three-element beam on 28 Mc. The paper work has the SCM moved, the new rigs, and the renewals and appointments will come through. Thanks a lot. Traffic: WHJMM 904, AUL 325, FP 230, SEP 69, WA 50, PP 40, THF 20, SQV 15, OSS 11, WMU 10, OM 4.
PUT YOURSELF
ON YOUR CARRIER

Reproduce the Individuality of Your Voice...
Transmit Your Own Personality
...with an E-V Microphone

With an E-V microphone, you assure accurate reproduction of your own speaking voice. The shading and warmth of your speech arrive at the other end of the QSO undistorted and undiminished. Your carrier is modulated with your exact speech... the individuality of your voice is clearly retained... your personality is on your carrier.

WRITE FOR HELPFUL BULLETINS
Authorized Distributors Everywhere
ELECTRO-VOICE, INC., BUCHANAN, MICH.
Export: 13 East 40th St., N. Y. 16, U. S. A. Cables: Arlab

NO FINER CHOICE THAN

Electro-Voice

E-V Pat. Pend. Licensed under Brush Patents
THE AMERICAN RADIO RELAY LEAGUE

YEARLY BINDERS

CONNECTICUT — SCM, Walter L. Glover, W1VB — C:
The fall meeting of the Nutmeg Net was held on Oct. 31st at the clubrooms of the New Haven Club, with a good attendance. Plans for the season and the formation of the radiation society were discussed. This is to be a combination emergency and slow speed net meeting at 7 P.M. on 3040 kc. on Sat. and Sun. nights. All stations in the section are invited to join. New officers of the Manchester Club are: NMF, pres.; MFN, vice-pres.; QJS, secy.; QXH, treas. LMK is replacing EC in Manchester, the latter having resigned. In the Simulated Emergency Test on Oct. 17th, HCARA reports 295 messages handled and 395 messages received. KAS reports 235 messages handled and 295 messages received, and MRC reports 33 messages with a good turnout. MBK, West Hartford EC, also held a fine drill. BYV is back after 17 years. AW has put QSL cards on 3.5-Mc. cw. CTI is having receiver troubles. Night work is still interfering with the 71 Mc. hamming. The Mattatuck Amateur Radio Society held its regular meeting Oct. 1st. President OMW presided. Several new members were admitted and the membership now totals 97. Interest in the organization is at a high pitch. Cordial invitations are extended to any clubs or organizations to attend meetings. For particulars contact the secretary, Hill-Stewart, QKI, 220 No. Main, Waterbury. CB is on 3.85-Mc. phone. RMS has new four-element wide-spaced beam. PGX is operating 28-Mc. mobile, 500 watts. QKJ, QXH, CTVY and VPI will be go-to QTHs if and when the snow passes and they are building a tower to the skies to support some thin metal tubes for some purpose or other. QBF is leaving soon for W6 Land. QIG, QHF, QXH and QIP will be soon. QZI is on 144-Mc. phone. TQR is leaving for W6 Land. QIG, QHF, QXH and QIP will be soon. QZI is on 144-Mc. phone. TQR is leaving for W6 Land.

NEW ENGLAND DIVISION

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — OMI is a new ORS. The following ORS have changed their addresses: MEG, HXK, AAR, GOU, and RP, QIC, PZG, and BHD. The following have renewed appointments: ORS — MEG, AQQ, HKX, and PTM, OPS — HKX, hHJ, EFO, MFL, HXK, and BHD. The following have renewed appointments: ORS — MEG, AQQ, HKX, and PTM, OPS — HKX, hHJ, EFO, MFL, HXK, and BHD. MPP is now XYL of PS. They reside in Lovell, maine, having moved there from Massachusetts. LAO has Signal Shifter driving an 813 final at 300 watts. RSB is new amateur in Saco and has a 200-watt rig with a 5514 in the final modulated by 811s. QJB is on 144-Mc. portable. LAO, CAU, and QHI are on 3.5-Mc. phone. RMS has new four-element wide-spaced beam. PGX is operating 28-Mc. mobile, 500 watts. QKJ, QXH, CTVY and VPI will be go-to QTHs if and when the snow passes and they are building a tower to the skies to support some thin metal tubes for some purpose or other. QBF is leaving soon for W6 Land. QIG, QHF, QXH and QIP will be soon. QZI is on 144-Mc. phone. TQR is leaving for W6 Land. QIG, QHF, QXH and QIP will be soon. QZI is on 144-Mc. phone. TQR is leaving for W6 Land.

WESTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — OMI is a new ORS. The following ORS have changed their addresses: MEG, HXK, AAR, GOU, and RP, QIC, PZG, and BHD. The following have renewed appointments: ORS — MEG, AQQ, HKX, and PTM, OPS — HKX, hHJ, EFO, MFL, HXK, and BHD. The following have renewed appointments: ORS — MEG, AQQ, HKX, and PTM, OPS — HKX, hHJ, EFO, MFL, HXK, and BHD. MPP is now XYL of PS. They reside in Lovell, maine, having moved there from Massachusetts. LAO has Signal Shifter driving an 813 final at 300 watts. RSB is new amateur in Saco and has a 200-watt rig with a 5514 in the final modulated by 811s. QJB is on 144-Mc. portable. LAO, CAU, and QHI are on 3.5-Mc. phone. RMS has new four-element wide-spaced beam. PGX is operating 28-Mc. mobile, 500 watts. QKJ, QXH, CTVY and VPI will be go-to QTHs if and when the snow passes and they are building a tower to the skies to support some thin metal tubes for some purpose or other. QBF is leaving soon for W6 Land. QIG, QHF, QXH and QIP will be soon. QZI is on 144-Mc. phone. TQR is leaving for W6 Land. QIG, QHF, QXH and QIP will be soon. QZI is on 144-Mc. phone. TQR is leaving for W6 Land.
HiVolt Supplies are self-contained in hermetically sealed metal containers. They are designed to transform low voltage AC to high voltage — low current DC.

**Specifications:**

- **PS-30**
  - 30,000 VDC; 1 Ma.;
  - Dimen. 7" x 7" x 7"

- **PS-10**
  - 10,000 VDC; 2 Ma.;
  - Dimen. 3¾" x 4½" x 8"

- **PS-5**
  - 5000 VDC; 5 Ma.;
  - Dimen. 3¾" x 4½" x 6"

- **PS-2**
  - 2400 VDC; 5 Ma.;
  - Dimen. 3¾" x 3½" x 5½"

- **PS-1**
  - 2400 VDC — Capacitor load; dimen. 3¼" x 3½" x 5½"

**High Voltage — Low Current DC Power Supplies for:**

- Television
- Radiation Counters
- Photoflash Devices
- Electrostatic Precipitators
- Spectrographic Analyzers
- Oscilloscopes, etc.

**Write for descriptive literature**

Plasticon Capacitors, Pulse Forming Networks and HiVolt Power Supplies are available at all leading jobbers.
Heavier Windings

ON NEW

JOHNSON HAM INDUCTORS

Lower Loss — High Efficiency

If it's efficiency you want, you'll insist on the new JOHNSON Ham Inductors. Coil windings are a wire size larger than on most available inductors — resulting in less heating, lower loss and consequently higher efficiency.

For instance, the 1000 watt twenty meter inductor, pictured above, is wound with .250" diameter copper tubing, not wire. It is intended to match low voltage high current tubes — efficiently! Extra heavy size steel plate and jack conductors — resulting in less heating, lower loss and consequently higher efficiency.

JOHNSON "plug-in" swinging link assemblies fit all conventional plastic-also result in additional efficiency. The new JOHNSON Ham Inductors. Coil windings match coil to tube. Another exclusive feature is the matching of link to line with the new JOHNSON "plug-in" swinging link assembly. These outstanding inductors are also available in semi-fixed models.

Remember, too, that the new JOHNSON Inductors and Plug-In Link Assemblies fit all traditional inductor assemblies.

LOADED WITH FACTS

The new JOHNSON "Air Wound Ham Inductor Catalog" contains information and tables which will enable you to select the correct inductor, link or links for your individual application. The booklet is a virtual storehouse of information on Q considerations, tuning, matching antennas, link-line impedance matching, antenna coupling, etc. Get it at your dealer or write JOHNSON for a copy of this important reference manual today. It's yours for the asking.

JOHNSON

a famous name in Radio

E. F. JOHNSON CO. WASECA, MINN.

(Continued on page 90)
NEWS ABOUT AUTO-TRANSFORMER TAP SWITCHING

We have developed a series of Tap Switches that are particularly suited to auto-transformer switching applications. If you now use a tapped auto-transformer for controlling the voltage output of the power supplies in your rig, investigate the possibilities of these tap switches. Illustrated are some typical applications of the Ohmite 10- and 15-ampere switches. Model 111 for 10 amperes and Model 212 for 15 amperes.

The tapped transformer below is wired so the secondary voltage is 180° out of phase with the line voltage and bucks the line voltage down to as low as 55 volts.

If you are tired of running outside to look at your beam antenna to determine the direction it's pointed, you should investigate the Ohmite RB-2 Direction Indicating Potentiometer. This unit, with a 0-1 ma. meter, two resistors, and 6-volt battery, provides an inexpensive means of direction indication. The circuit diagram for this unit is shown here; however, for complete details, write for Bulletin No. 128.

NEW DUMMY ANTENNAS ANNOUNCED

All amateurs will be glad to hear about the new line of Dummy Antennas recently announced by Ohmite. They're particularly useful in transmission-line work, and have been improved so the reactance is kept to a low value at frequencies up to 28 megacycles. The higher resistance units can be used to even higher frequencies. And remember to consider one of these Ohmite Dummy Antennas when choosing a terminating resistor for a 14- or 28-megacycle Rhombic. Ohmite Bulletin No. 136 gives the analysis of tests conducted on these new units.

Write for Bulletin 137
"Ohmite Ham Hints"

OHMITE MANUFACTURING CO.
4863 Flournoy St. Chicago 44, Illinois

Be Right with OHMITE
RHEOSTATS • RESISTORS • TAP SWITCHES
Now—Plan for a Good-Paying Career Job in TELEVISION

New CREI Home-Study Course in Practical Television

Be in a position to command a "key" job in the growing TELEVISION Industry by preparing now with the type of thorough, practical TELEVISION Engineering training that the industry requires. The new CREI TELEVISION Engineering course is (1) A complete well-coordinated course of study that covers the entire field of practical TELEVISION Engineering, (2) Presented in CREI's professional and proven home study form, (3) Prepared by CREI's experienced staff, based on actual experience in our own TELEVISION Studios and Laboratories, plus years of close contact with leaders in television development. Here's your opportunity to be prepared for television well ahead of competition, if you start NOW!

JUST OFF THE PRESS!
WRITE FOR FREE BOOKLET

Let us prove to you we have the training you need to qualify for a better radio job. To help us answer intelligently your inquiry — please state briefly your background of experience, education and present position.

VETERANS! CREI TRAINING AVAILABLE Under G. I. Bill

CAPITOL RADIO ENGINEERING INSTITUTE
Dept. 1616, 16th & Park Road, N. W.
Washington 10, D. C.

Mail me your FREE 32 page booklet.

Check field of greatest interest:
☐ TELEVISION ☐ PRACTICAL RADIO-ELECTRONICS
☐ BROADCASTING ☐ AERONAUTICAL RADIO ENGINEERING
☐ RECEIVER SERVICING

Name __________________________
Street _________________________
City __________________________ Zone ______ State __________
☐ I am entitled to training under the G. I. Bill.
MERIT PLATE TRANSFORMERS

MERIT LEADS AGAIN!

Now! Merit Plate Transformers, open and sealed types, for small transmitters, amateur, or experimental use, provide you with transformer equipment unequalled. . . . For dependability — for economy. Shown below are four more leaders in the Merit quality line — your best buy, by all odds!

BUY THEM FROM YOUR MERIT DISTRIBUTOR TODAY!

OPEN TYPE MOUNTING "D"

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Net Price</th>
<th>Sec. Rms.</th>
<th>Sec. DC</th>
<th>Volts</th>
<th>Sec. Rms.</th>
<th>Sec. DC</th>
<th>Volts</th>
<th>MA</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-3157</td>
<td>$6.90</td>
<td></td>
<td></td>
<td>660-660</td>
<td>(600)</td>
<td></td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>P-3159</td>
<td>8.10</td>
<td></td>
<td></td>
<td>550-550</td>
<td>(400)</td>
<td></td>
<td>225</td>
<td></td>
</tr>
</tbody>
</table>

† Has 40 volt bias tap

SEALED-IN TYPE MOUNTING "H"

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Net Price</th>
<th>Sec. Rms.</th>
<th>Sec. DC</th>
<th>Sec. DC</th>
<th>Volts</th>
<th>Sec. Rms.</th>
<th>Sec. DC</th>
<th>Volts</th>
<th>MA</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-4057</td>
<td>$9.60</td>
<td></td>
<td></td>
<td></td>
<td>660-660</td>
<td><strong>500</strong></td>
<td></td>
<td>225</td>
<td></td>
</tr>
<tr>
<td>P-4059</td>
<td>10.80</td>
<td></td>
<td></td>
<td></td>
<td>550-550</td>
<td>400</td>
<td></td>
<td>225</td>
<td></td>
</tr>
</tbody>
</table>

** Has 40 volt bias tap

MERIT COIL & TRANSFORMER CORP.

4427 North Clark St.  Long Beach 6311  CHICAGO 40 ILL.
The very latest from SREPCO

Thermal Time Delay Relay
Set for 2 minutes but adjustable over a range of 15 seconds to 2 minutes. Delay accomplished by a bi-metallic thermal element which automatically compensates for changes in room temperature. 110 V 60 CY coil. SPD T 4 amp 110 V silver contacts. Additional set of contacts disconnects thermal circuit when relay closes.

Plate Transformer

Power Transformers
Primary - 115 volt 50/60 cycle. Sec. 6 - 9 volt 6 amperes (Term. 7, 8) 6 - 3 volt 3 amperes. Hermetically sealed gray case, 4½" sq. x 5½" high. Four 8-32 mounting studs. Net wt. 10 lb.

We can still supply these transformers as advertised in June and September QST's.

The above are only a few of the many money saving items in our 1949 SREPCO Catalog. Write for your free copy.

SREPCO has been the radio parts distributor for over 16 years and carries all the well known lines such as Amphenol, G & W, Johnson, Milles, National, Stanton, etc. Include your standard parts requirements on your orders for surplus. Your orders and inquiries will receive our prompt and personal service.

TERMS - cash with order or 20% deposit, balance C.O.D.

The very latest from SREPCO

The very latest from SREPCO
DEAR FELLOW AMATEUR:—

“A very serious situation has arisen. Unless all of us amateurs act quickly, a law will be passed in Washington which will wipe Amateur Wireless completely out. . . .”

Thus in 1918 a four-year-old ARRL, already the guardian of a struggling amateur radio in legislative and regulatory matters, wrote each amateur in the United States seeking help to prevent the extinction of “amateur wireless.”

Wouldn’t you be astounded to receive such an urgent call from ARRL today?

Certainly you would, because you know that today amateur radio is a strong, healthy and stable group. You know that ARRL is the organized body of amateur radio, its capable representative in this country and abroad, its experienced champion against attack by foreign government or opposing interests.

You know that such alert representation, coupled with a strong, united membership, alone has kept amateur radio on the air and enabled amateurs to make their maximum contribution to the public interest.

Are you doing your part to ensure a continued healthy and bright future for amateur radio? The first step is to take your place in the ranks of organized amateurs. Join the League today!

ARRL, 38 LASALLE ROAD
WEST HARTFORD 7, CONNECTICUT
Enclosed is $........ ($4 in the U. S. and possessions; $4.50 in Canada; $5 elsewhere) for ARRL membership dues for one year. Start QST with the.................issue. I prefer a membership □ certificate □ card.

Name..........................Call.................................

Street and Number................................................

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

93
THE RADIO SHACK IS PRIVILEGED TO PRESENT

HALLICRAFTERS HT-17 XMTR
Complete with 80-40-20-15-10
Meter Coils

Originally sold for $60.50 with
RADIO SHACK
Sale Price $39.50

Save $21 on this famous low
power xmtr which provides 10-20
watts of crystal-controlled CW
output on the amateur 3.5, 7, 14,
21 and 28 mc. bands! Self-con-
tained power supply for 105-120
volts AC, with 5Y3-GT rectifier
A never-before value you may
never see again!

EXTRA! ACCESSORY KIT
FOR IMMEDIATE
HT-17 OPERATION
Includes: 80 meter crystal, 40 (20,
15 & 10) meter crystal, 100 ft. #14
antenna, quality CW key and 3 ft. zip
cord connection, 2 antenna insulators
and 1 feed-thru insulator.
COMPLETE KIT ONLY $7.50
Kit with 40 or 80 meter crystal $4.75

LUCKY YOU! Hallicrafters is con-
centrating its 1949 production on
other models and has to discon-
tinue these 4 wanted styles. Alert
purchasing by THE RADIO SHACK
saves you (as usual) up to $80!

A SMASHING SALE OF
HALICRAFTERS GEAR
(JUST DISCONTINUED FROM THEIR LINE)

“ECHOPHONE” EX-102
3 BAND - 5 TUBE
SUPERHET RECEIVER

Originally sold for $50.00
RADIO SHACK
Sale Price $24.95
(IN WALNUT
EX-102 IN IVORY $26.45)

- Electrical Bandspread Tuning!
- 535-1625, 2200-7100,
6900-22000 KC.
- 4 Controls, Airplane Duplex Dial!
- Vibrationless Rubber-Mount Chassis.

Completely enclosed in smooth
plastic, it’s a 3-band set you’ll be
proud to own! Five-inch dynamic
speaker; built-in loop antenna;
operates on 50-60 cycle AC or DC
on either 105/125 or 210/250
volts. Save 25 big dollars!
OUR MOST SPECTACULAR OFFER IN YEARS...

HALICRAFTERS
S-55 FM-AM - HIGH FIDELITY RECEIVER

Originally sold for $129.50
RADIO SHACK
Sale Price $49.50

Exactly as advertised in December QST by Hallicrafters for $129.50, this magnificent receiver is the biggest new set value ever offered! Ten tubes plus rectifier, operates on 115 V, 60 cycles AC. Two bands: FM 88-108 mc, AM 540-1700 kc. Complete with all tubes in metal cabinet but less speaker.

SPECIAL SPEAKER PURCHASE

To go with your new S-55... a national famous-name 12-inch coaxial speaker at less than half of its regular list price... NOW ONLY $11.95

HALICRAFTERS
S-58 FM-AM RECEIVER
• METAL CABINET!
• INTERNAL SPEAKER!

 Originally sold for $59.50
RADIO SHACK
Sale Price $34.95

Save $24.55! Note these Hallicrafters quality features: 6 tubes plus rectifier... 5-inch PM speaker... high impedance phono input... FM 88-108 mc, AM 540-1600 kc... 105-125 volts, DC or 60 cycles AC. Advertised for $59.50 in December QST by Hallicrafters!

RUSH YOUR ORDER! When the "word" gets around, our ample but limited stock of these amazing bargains will go but fast! Immediate delivery guaranteed, on our usual first-come first-served basis!
VETERANS! CREI TRAINING AVAILABLE Under subjects (for the man with greater experience). No experience) to advanced training and specialized introductory basic principles (for the man with limited experience). You can find out what CREI home study training can do for you.

matter what your experience, CREI has a course to keep ahead of the man who is waiting for your job - to plan for the better job that can be yours. petition into a better radio job with CREI technical training. Enjoy security and good pay! Step ahead of competition with CREI.

Don’t let others put you out of the picture!

CREI Courses for Every Radioman Keep You Ahead of Competition—Earn You More!

Enjoy security and good pay! Step ahead of competition into a better radio job with CREI technical home study training. Protect your future today — keep ahead of the man who is waiting for your job — plan for the better job that can be yours.

You may have “gotten by” up to this point. But, if you are like many other radiomen, many of the recent technical advances have passed you by.

We invite you to see, without obligation, just what CREI home study training can do for you. You can “go all the way with CREI” from introductory basic principles (for the man with limited experience) to advanced training and specialized subjects (for the man with greater experience). No matter what your experience, CREI has a course for you.

JUST OFF THE PRESS!

WRITE FOR FREE BOOKLET

Let us prove to you we have the training you need to qualify for a better radio job. Help us answer intelligently your inquiry — please state briefly your background of experience, education and present position.

SAN FRANCISCO — SCM: Samuel C. Van Liew, W6NL — Phone JU 7-6457. SEC: DOT, CEC: BYS. UDY is back in San Francisco after a year and a half in the Pacific. His latest fixed portable QTH is in Missoula, Mont., from where he worked several San Francisco hams, including YZP. He is now on the air with 28-Mc. mobile, five watts. YZP is back on 1.8Mc. c.w. after being off since Feb. ’48. He is running 75 watts to a pair of 807s. JWF is looking for a “Test” order on the ART-13. Frank says the Mission Trail Net expects to operate once a month on emergency power at as many stations as possible to insure that the emergency power and equipment is kept in service. We know Frank’s equipment is ready to go at any time as we have called on him several times without advance notice, 9DSF still is at the University of Minnesota although he is not very active on the air at this time. ZUB and VEJ traded stations the other day. Now they know what we hear when they switch on their cards. Both have a rebuilding program on now. N1Q and DNY are on the Mission Trail G.W. Net nightly on 29Mc. ADV again proves the leadership of the West Coast band by breaking the East Coast. He has just worked Mars on 29 Mc. and is waiting for a QSL card. That shouldn’t take too long as Mars, 2F, went to the same radio club. The National Simulated Emergency Test was held Oct. 17th and the following took an active part: ANY, 3LQ, AQV, DNZ, VYC, RBQ, NL, BYS, DOT, CHF, JWF, CDT, WRM, and WCM. The fellows were representatives from the Golden West Frequency Modula- tion Club and the San Francisco Naval Shipyard. 28-Mc. f.m. and 144-Mc. a.m. were used by the mobile rigs. Three fixed stations aided as controls. By the time this appears in print we will be well along with the installation of both the San Francisco Red Cross Chapter station and the regional Red Cross station. Oct. 1st was Navy Day at Hunter’s Point N.F., and a wonderful display was given. Special interest to hams was the display in the new electronics building. The Naval Shipy ard Radio Club had an amateur club station installed with transmitters for both the San Francisco Red Cross Chapter station and the regional Red Cross station. Oct. 1st was Navy Day at Hunter’s Point N.F., and a wonderful display was given. Special interest to hams was the display in the new electronics building. The Naval Shipy ard Radio Club had an amateur club station installed with transmitters for amateur amateurs in operation all day. Greeting messages were handled from the fair throughout the day and any traffic remaining was put on the following evenings. The bulk of the traffic was handled by BYS and NL. The Marin Radio Club met Oct. 8th at the Engineers’ Club, College of Marin. The speaker was O. G. Villard, j.qt., Stanford Engineering Dept. His topic was “New Developments in Single Side- Band Trans­ mission and Reception.” An expert on the subject, Villard talked like a pro. It was a most enjoyable evening. The San Francisco Radio Club held its meeting Oct. 22nd at the American Legion Hall.1241 Taraval St., San Francisco. speaker of the evening was Clayton Bane, WB, who gave an excellent talk on the latest design on loop antennas leading up to the installation into a better radio job with CREI technical training. Enjoy security and good pay! Step ahead of competition with CREI.

VETERANS! CREI TRAINING AVAILABLE Under G. I. Bill

CAPITOL CREI TRAINING AVAILABLE Under G. I. Bill

Check field of greatest interest:

[ ] PRACTICAL RADIO-ELECTRONICS [ ] TELEVISION

[ ] BROADCASTING [ ] AERONAUTICAL RADIO ENGINEERING [ ] RECEIVER SERVICING

Name ___________________________
Street ___________________________
City _____________________________ Zone . . . . State . . . .
[ ] I am entitled to training under the G.I. Bill.
Happy New Year from all the gang at

HARVEY

NATIONAL NC-57
$89.50

MILLEN 92105 SSSR
Selective single sideband reception will remove 95% of your QRM difficulties. Use with any recr having 455/456 IF. Otherby changing crystals to your IF. Shpg. Wt. 10 lbs.
$75.00

HALLICRAFTERS TV
Push-button tuning covers all 13 channels. Model T-54 in steel cabinet with 7" kine tube. Shpg. Wt. 50 lbs.
$189.50
Model 61. With 10" kine tube. Shpg. Wt. 65 lbs.
$289.50
Model T-60, projects 12" x 16" picture. Shpg. Wt. 125 lbs.
$595.00

NATIONAL TV
All channels, 2 speakers, automatic gain control. Verier fine tuning. Model 7-M, steel cabinet. Shpg. Wt. 50 lbs.
$189.50
Model 7-W, same in fine mahogany cabinet. Shpg. Wt. 50 lbs.
$199.50

RADIO CRAFTSMEN TUNER
$110.00
Model RC-2 Hi-Fi audio amplifier. Shpg. Wt. 30 lbs.
$39.00

TECHMASTER TV KIT
Exactly the same as the RCA 630T5 chassis, complete kit of parts, including pre-wired and aligned RCA front end, condensers, resistors, punched chassis, new and improved sockets mounted, etc., all tubes including line, complete manual, with service notes, all RCA. Free circuit and parts list on request. Shpg. Wt. 85 lbs.
$198.50

SUBRACO
10 meter XMITTR
Compact mobile xmittr for "dashboard" mounting. Measures only 5½" x 4½" x 6½", weighs only 6 lbs. Designed to operate at 30 wts. Input. Uses 6V6 Triode xtal oscillator from 7 to 28 mc driving 2E26 Class C mod. amp. High level Class B modulator capable 17 watts audio. Built-in Coax antenna relay p.t.t. switch. All controls front panel including illuminated meter, xtal jack, etc. Plate requirements: 300-400 volts at 140-180 ma. Shpg. wt. 8 lbs. Less tubes $79.95: including complete set tubes $87.50

GE FM TUNER
Only a few left of this unusual buy. Covers 88-108 mc range, uses gullotine tuning. Designed for export and tropicalized, has power inputs for 110 to 250 volts 60 cya. Shpg. Wt. 30 lbs.

HARVEY SPECIAL PRICE
$49.50

COLLINS 32V-1
Desk xmittr, VFO controlled, band switching, gang tuned, rated 150 watts input on CW, 120 on phone. Shpg. Wt. 133 lbs. Complete $475.00

NOTE: All prices are Net, F.O.B. New York, and are subject to change without notice.

103 West 43rd St., New York 18, N. Y.
NEW... ALL ALUMINUM SELF-SUPPORTING TOWER

The new, roof-mounted, all aluminum RADIODYNE® TV TOWER and top-mast exert less pressure per square inch on your roof than would the weight of a child! This structure of graceful curves and shining beauty accommodates up to 4 arrays... holds antennas high up in the "blue" where signals are stronger and where interference is weaker, forged steel fastening bolts and two-piece "universal joint" feet are heavily zing plated to withstand long outdoor service. All angle pieces are made of strong, heat-treated corrosion-resisting aluminum alloys which possess great strength. The RADIODYNE TV TOWER is easy to erect and easy to climb for servicing arrays.

* TRADEMARK REGISTRED

RADIODYNE TV TOWER MODEL 44
(Illustrated)

- Overall Height (To Top of Mast) 44'
- Height (Tower Only) 35'
- Mast Height (Above Tower) 9'
- Mast Length (Inside Tower) 3'
- Mast Outside Diameter 2'
- Number of Tower Sections 3
- Length of Tower Sections 12'
- Base 4'6"x4'6" Top of Framework 8"x8"

"EIFFEL TOWER" EFFECT GIVES GREATER STRENGTH

The "Eiffel Tower" effect of RADIODYNE® "44" is not merely beautiful. It is actually designed this way to give a preloaded to vi­tal structural members... thus making the whole tower considerably stronger.

WRITE TODAY!

For Complete Information on
RADIODYNE TV TOWERS
send a card to:

WESTERN COIL & ELECTRICAL COMPANY
(Established 1915)

215 STATE ST.
RACINE, WIS.

Club meets the 1st Thurs. of each month at the City Hall, Mt. Shasta City. Officers are CAT, pres.; ARR, secy.; NCV, alt. mgt. Traffic: W6ERS 530, P1V 37.

PHILIPPINES — Petitions for SOM received in the Philippine election named only M/Sgt. Stanley J. Gier, KALA1, and ARR1., in accordance with the provisions of the By-Laws, is awaiting final word from Sgt. Gier before announcing his election. The following has been received in a radiogram from KALA1B (Clark Field) where numerous Philippine stationners are being heard: [REQUEST AND TEURS BE ADVISED 80 METER BAND PHILIPPINE ISLANDS AS FOLLOWS 3500 TO 3540 TYPE A1.]

SAN JOAQUIN VALLEY — SCM, Ted R. Souza, W6PK. — Asc. SCM, James F. Wheelock, 6FSQ. SEC: JSR, ECA, Gl. PHL. EPH is in California making it a father-daughter combination with 2KD. MET is communications officer for one of the local CAP organizations. JPS is a big help. ZHR is GO, OER, and SJF whipped his new rig into shape. ZYR is on 7 Mc. with new 300-watt rig. BEI is busy with several traffic schedules. KUF is easing off DX since he received the DXCC and WAZ. SRU is using long wire at new location. LOS has his 28-Mc. antenna troubles whipped. GQZ reports the following: BCI has new ham shack completed; EXH has new 28-Mc. beam and is going to increase power. AJE is chasing the elusive DX on 14 Mc. NFT is revamping his 144-Mc. rig. EKF can be heard on 7 and 144 Mc. DWH goes after DX on 7 Mc. ZNL is active again. VKD is on after summer layoff. PFF and PIF are building new 28-Mc. and PIF is out to make WAS-3, YL on 28 Mc. OYF is all set on 28 Mc. UWY is active on 3.85 Mc. MDQ can be heard on 28- and 144-Mc. mobile. EXH is new OBS. The following is gleaned from the Stockton Amateur Radio Club Fly Sheet: DBH and HIP are building Meisner VP0s. UWY acquired HIP's old VP0. EK has been on 28 Mc. WV2 has a 28-Mc. rig on 28-Mc. "phone. BNW and RAH are going strong on 28 Mc. VPV and WHO are building cubical quad antennas. PII is planning mobile rig for 3.85 Mc. OIE and PDI are active on 3.85 Mc. PSQ is building video equipment. JCB is on mobile on 28 Mc. Traffic: W6BH 113.

ROANOKE DIVISION

NORTH CAROLINA — SCM, W. J. Wortman, W4CIMB. — SEC: KJB. The North Carolina State College Radio Club is under way. LJD is faculty advisor and the following are officers: LJD, pres.; HLM, vice-pres.; JGA, secy.; GDF, technician; and JQO, alt. mgt. ILM is active on 28- Mc. "phone and is getting out with a four-element beam. LJD is busy as Acting NCS with the Black Eye Peas now operating on 28 Mc. NEA and JGA keep 7 Mc. going. JQO is working in the NCN on 3005 kc. DSO works 28-Mc. "phone nightly, and reports that stick and eight round tables are the order of the day. AIT is proud papa of a new Jr. operator, LEH loves his new Collins exciter. ZLH is back home in Greensboro. DTE is active on 28-Mc. "phone. GNF, Greensboro Club, held an auction and raised enough money to add a modulator to the club transmitter. GQZ still chasing those elusive boys on 14 Mc. KUT has a new transmitter. GG, still doing a grand job with traffic. EYF conducted a drill on the Simulated Emergency Test with net control being from aero-mobile. Traffic: W4CFL 355, IMH 119, JPO 95, EJS 7, JNO 46, CYB 18.

VIRGINIA — SCM, Victor C. Clark, W4KFC. — SEC: KJB. The Virginia State College Radio Club is under way. LJD is faculty advisor and the following are officers: LJD, pres.; HLM, vice-pres.; JGA, secy.; GDF, technician; and JQO, alt. mgt. ILM is active on 28-Mc. "phone and is getting out with a four-element beam. LJD is busy as Acting NCS with the Black Eye Peas now operating on 28 Mc. NEA and JGA keep 7 Mc. going. JQO is working in the NCN on 3005 kc. DSO works 28-Mc. "phone nightly, and reports that stick and eight round tables are the order of the day. AIT is proud papa of a new Jr. operator, LEH loves his new Collins exciter. ZLH is back home in Greensboro. DTE is active on 28-Mc. "phone. GNF, Greensboro Club, held an auction and raised enough money to add a modulator to the club transmitter. GQZ still chasing those elusive boys on 14 Mc. KUT has a new transmitter. GG, still doing a grand job with traffic. EYF conducted a drill on the Simulated Emergency Test with net control being from aero-mobile. Traffic: W4CFL 355, IMH 119, JPO 95, EJS 7, JNO 46, CYB 18.

THE "EIFFEL TOWER" EFFECT GIVES GREATER STRENGTH

The "Eiffel Tower" effect of RADIODYNE® "44" is not merely beautiful. It is actually designed this way to give a preloaded to vital structural members... thus making the whole tower considerably stronger.

WRITE TODAY!

For Complete Information on
RADIODYNE TV TOWERS
send a card to:

WESTERN COIL & ELECTRICAL COMPANY
(Established 1915)

215 STATE ST.
RACINE, WIS.
The ALLIED 20 Watt Phono Amplifier
An Engineer’s Dream—Sensibly Priced

Here’s the audio amplifier experts appreciate. It’s the big buy in high fidelity. Check the curves: Note the range of the two tone controls, offering flexible compensation. Look at the facts: Less than 2% harmonic distortion at full 20 watts, virtually none at room levels. Up to 10 db adjustable volume expansion independent of volume control setting. 8 db of inverse feedback. Hum is ‘way down—80 db below 20 watts. Dual phono input with 78 db gain. Matches anything—output impedances 4, 8, 16, 250 and 500 ohms. For record reproduction or for operation with a radio tuner, there’s nothing finer at anywhere near this low price!

93-103. 20 Watt Amplifier complete with tubes. NET, f.o.b. Chicago ........ $59.95
Terms: $11.99 down, $5.09 monthly for 10 months

Send for the Leading Amateur Buying Guide

You’ll find everything you want in receivers, transmitters, instruments, parts and station equipment in our up-to-the-minute 180-page Catalog. Get it today. And get every buying advantage at ALLIED—fast shipment, money-saving values, top-quality equipment, ideal easy-payment terms, square trade-in deals and down-to-earth help from ALLIED’s old-time Hams. For full satisfaction, get and use the ALLIED Catalog!

Have Every Buying Advantage
• World’s Largest Stocks
• Top-Quality Gear
• Money-Saving Prices
• Ideal Time Payments
• Square Trade-In Deals
• Speedy Shipment
• Ham-to-Ham Service

Keep Your ALLIED Catalog Handy

ALLIED RADIO CORP., D. L. Warner, WYIBC
833 W. Jackson Blvd., Chicago 7, Ill., Dept. 15-A-9
☐ Send FREE 1949 ALLIED Catalog
☐ Enter order for 20 Watt High-Fidelity Amplifier
Enclosed $ ................... ☐ Full Payment
☐ Part Payment (Bal. C.O.D.)
☐ Send Time Payment details and order blank.

Name...........................................
Address...........................................
City............................................. Zone....... State........
100 volts, .030" picing. Screwdriver slot for tuning, with shaft lock. Silver plated contacts can be shifted to 3 position for shortest possible leads. #Made by Johnson.

Type HFD137, size 1 1/16 x 1 1/2 x 3 1/8. Stock No. 14-A880, 11/16" mmf., 11 plates per section. SPECIAL EACH: $0.99c.

Type HFD138, size 2 5/8 x 1/8 x 1/2. Stock No. 14-A881, 11/16" mmf., 15 plates per section. SPECIAL EACH: $1.19.

Johnson Dual 207 Mmfd. Type 200FD20 .045" spacing, Hammarlund Type "HFD" Micro*. Double spaced, 1500 Hz. The ordinary #6 dry cell make of 2 volts. Shipped Dry. Uses standard battery 1 24AH. Gangs nicely for other voltages in multiples square ond any other standard voltage. Willard 2 volt, compact rechargeable storage battery in Spill-proot Clear Plastic Case only 2¾" square. The ordinary #6 dry cell make of 2 volts. Shipped Dry. Uses standard battery 1 24AH. Gangs nicely for other voltages in multiples square ond any other standard voltage.


Johnson Type 200FD20. 52 max.-6 mmfd., 9 plates per section. Stock No. 14-A679, 11/16" mmf., 0.045" spacing, 1 1/32" long otherwise as above. SPECIAL EACH: $0.99c.

100 Mmfd. ceramic insulated APC type, 1/4" short., 40 Mfd. Stock No. 18-A692, SPECIAL EACH: 40c.

140 Mfd., as above, No. 18-A880, EACH: 35c.


Type HFD137, size 2 5/8 x 1/8 x 1/2. Stock No. 14-A880, 11/16" mmf., 15 plates per section. SPECIAL EACH: $1.19.


improved design assures unvarri­
ing, brilliantly clear pictures and
perfectly synchronized FM sound. 7"v
video tube plus 18 tubes and 3 recti­
flers. Tapped primary autoaun•
transformer adjusts line voltages from
105-130 volts, 50-60 cycles. Two
6/" PM speakers provide realistic
and instructions ••••
"Model TV-7W-Same as above,
and clearly labeled for following
All parts are Individually packaged
alignment required when completed.
1chassis.
firrnly riveted in position on RCA
FAMOUS RCA 630TS DESIGN!
剩余 unwired tube sockets are
mounted, wired and aligned; even
and 3 rectifiers. Tapped primary autoaun•
transformer adjusts line voltages from
105-130 volts, 50-60 cycles. Two
6/" PM speakers provide realistic
tone qualities to FM sound. Automatic
pam control keeps picture and
radio at constant level. All-channel
coverage, vernier fine tuning. In
grams are properly tuned before
shipping. Your cost...
NATIONAL TV-7
INK STOCK!
prices the Lowest!
NATIONAL TV-7 IN STOCK!

FAMOUS TV-KIT
FAMOUS RCA 630TS DESIGN!

10/" kit is furnished with 13-channel
pre-tuned RF and IF sections already
mounted, wired and aligned; even
remaining unwired tube sockets are
firmly riveted in position on RCA
chassis. No instruments needed or
alignment required when completed.
All parts are individually packaged
and clearly labeled for following the
complete step-by-step, well
illustrated instruction manual. Kit
includes all parts, 30 RCA tubes
including 10B/4 picture tube, and in
structions. Your cost
205.00

13-Channel TV ANTENNA—Hi-low folded dipoles and
reflectors may be oriented separately for best all-channel
reception. Features all-aluminum construction, excellent
performance and rapid assembly. Includes 6 ft. mast, insulators, hardware and instructions. Supplied
less 300 ohm lead-in. A real Terminal special, only...
8.45
300 Ohm Twin-Lead—high quality, weather-proof lead-
in wire recommended for Televisio., FM and
other high frequency dipole applications. Per
100 ft. roll...
1.49

1 Efficient low-power rig—ideal also as an auxiliary
transmitter! This attractive, compact CW transmitter delivers
fully 10 watts output on 80, 40, 20 and 10 meters. 6V6
crystal oscillator, 807 power amplifier, 3U4G rectifier. Has
matching network for any antenna or for driving a high
powered RF amplifier. Panel light tuning indicator can be
replaced with meter. Controls: Plate Tuning, Antenna Load-
ing, Standby Meter Switch, Power on-off. Terminals at rear
for antennas, ground, key and external modulator. For
105-125 volts, 50-60 cycles AC. Complete

model 808—* Twin-Trax* cuts
tape costs in half by use of twin
recording and erase heads for
forward and reverse tape travel. Au-
tomatic reverse is fast and smooth,
does not interrupt continuity. Will
also play back single track re-
cordings made on any tape re-
corder. Flutter and "wvow" guaran-
teed less than 0.1%. No capstan
tape slippage, nor can rubber
rimmed drive develop "flats". You
can use this chassis with any ampli-
ifier with minor changes for record-
ing and playback. Optional acces-
ories (at extra cost) include
amplifier and pickup
parts. Built-In phonograph
with tubes, key and 40 motor coils, less
crystal...
29.95

TWIN-TRAX RECORDER
ASSEMBLY—Build your Own
Magnetic Tape Recorder!

Model H—No other wire recorder
offers so much for so little! Pro-
fessional-type wire recorder, can
record and plays up to one hour
spools. May be played through self-
contained speaker; built-in wireless
oscillator or direct connection.
7-tube amplifier specially designed
for wide-range (50-10,000 cps on
wire). Built-in phonograph with
lightweight arm plays up to 1/2"
record for listening and "dubbing"
on wire. In attractive mahogany or
walnut cabinet, complete with mi-
icrophone, recording wire and phonograph
needles. Net...
42.50

WIREMASTER RECORDER

EXTRA! WEEKLY STORE
SPECIALS SAVE YOU $$$!

Seeing is believing! Hold your breath when you see
the many brand-new items we offer each week at
practically give-away prices! Don’t miss these terrific
bargains! Come in at least once a week—what you
save will more than make your visit worthwhile!

The Wisest Choice of All
is to Choose It at TERMINAL

NEW YORK’S LEADING DISTRIBUTOR OF RADIO & ELECTRONIC EQUIPMENT
Where Every Item is Quality-Proven, Fully Guaranteed and Priced the Lowest!

TERMINAL
RADIO CORPORATION
85 CORTLANDT ST.—NEW YORK 7, N. Y. • Phone—Worth 4-3311 • Cable—TERM RADIO
CONDENSER SPECIAL

They're going fast Famous make double-bearing condensers, regularly listing at $2.70 and $3.00, isolantite insulation, semi-circular plates (straight-line capacity) .024", all 100 mmf, either size, brand new. ONLY

BC-221 CRYSTAL

1000 kc crystal, in Ft-243 holder, ground to exact frequency to duplicate performance of original crystal in BC-221 frequency meter. $3.50

2MFD 1000 VOLT

Oil-filled capacitor, single mounting hole, negative can, with nut... 59c

10 HENRY 300 MA. CHOKE

A terrific bargain. Audio Development Co. High-quality 10 henry 300 M.H. filter choke. All black-crackle finish, new, 100 ohms DC resistence, very compact, 3/4" x 3/4" x 4", 10 lbs. only. $3.50

STRUTHERS-DUNN RELAY

110 VOLT AC

Control all of your equipment with this one relay, 110 VAC coil, 4-pole, 2 double throw, 2 single throw, 6 Amp. contacts, screw terminals, insulated base, 3 1/2" x 3 1/2" x 3 1/2". Complete, crystal, tube and all parts $2.00

STEINBERGS

633 WALNUT STREET • CINCINNATI 2, OHIO

ART/13 in his car. GBP works 28-Mc, mobile and gains steady 3.85-Mc, at home location. GYD has 76 counties confirmed on 14 Mc, Dothan's Ben Lane Amateur Radio Club in that area is associated with FYB as president, LUK as vice-president, and OJ as secretory-treasurer. ECI has moved around the corner on 3rd Ave., Birmingham. Newcomers are urged to join the ARC. We send slowly for you; just request a QRS. Traffic: (Sept. and Oct.) W4JYB 62, (Oct.) W4JW 52, Jan 14, LEZ 14.

EASTERN FLORIDA — SCM, John W. Hollister, W4FWZ — Happy New Year to all, and a thought; let's all resolve to take a more active interest in ARC, activities, and let's have more applicants for QRS, OPS, and the like. Appointment, Clermont: AYX wants 144-Mc. QSOs to try out his new-sixth-element vertical beam. Deland: WS reports that S0QI is at it again, and K0A needs 180 watts to operate 28 Mc. Deland: PEK works four Florida nets plus T1CS and NTL, but will not take the luck of Jacksonville's c.w. traffic stations. Jacksonville: O.J.C. See the g.p.o. at W4VX, W4XK and W4Z, held got L1AEX, M98AB, ZC6X, MD4JG, ZB1S, FA9IH, HIBEC for 60 countries and 31 zones. JCK got AP2R and TAPAS for 109 countries and 3 zones. OLO finds out QSOs for DXCC. PX works KKM at Gainesville nightly on 28-Mc ground wave. D1Y dropped by on the way to R4 and sent a terrific QSY. Famous condenser, BC-221, with nut... 59c. Compilers Special for 144-Mc. QSOs, but plenty. Miami: F1YI crashed emergency traffic on 14 and 28 Mc. BXL reports his beam is back up. OI4 is now a DXer. His 28-Mc, condenser, M1KP now is certified Knight of the Kilocycle, plus FB, NGS on Gator. Port Arthur: KJ has new interest for more "batteries and phone and c.w. and f.m. troubles." Orlando: The OARC Bulletin is the tops in club claps, but who was that who stumbled into the W85 Work shop in Orlando stations and got a work ten Update Card. The OARC address is P.O. Box 2067, Palatka: Secretary Crowell reports the officers of ACWC are OOB, OHG, OQ, OR, and P5Q. Address them at W4VX, W4VY, and W4VZ, Qso calls at Palatka are OOB, ODB, and OIEG. West Palm Beach: QJ finally conciles that an antenna on the ground is as good as anything above. LAX is up to 144 Mc, "just a matter of time." IJU beam was another of a long list of storm casualties. TH is vertical on 14 Mc. From Jagna comes a QSO. Traffic: W4VX, W4VY, W4VZ, W4VY, W4VZ, W4VY, W4VZ, W4VY, and W4VZ.

Georgia 144-Mc, record is KPQ, Bremen, to FQI/4, Petros, Tenn. FQI also worked KIP and LNG. KXX is back on 144 Mc. Cochran: The OARC's address is P.O. Box 2067. Palatka: Secretary Crowell reports the officers of ACWC are OOB, OHG, OQ, OR, and P5Q. Address them at W4VX, W4VY, and W4VZ. Qso calls at Palatka are OOB, ODB, and OIEG. West Palm Beach: QJ finally conciles that an antenna on the ground is as good as anything above. LAX is up to 144 Mc, "just a matter of time." IJU beam was another of a long list of storm casualties. TH is vertical on 14 Mc. From Jagna comes a QSO. Traffic: W4VX, W4VY, W4VZ, W4VY, W4VZ, W4VY, W4VZ, W4VY, and W4VZ.

We do not export. All prices net. F.O.B. CINCINNATI, OHIO.

On this page, we only discussed a few items. The document includes a variety of electronic components and accessories with prices and descriptions. It appears to be a catalog page for electronic supplies, with specific focus on condensers, crystals, and relay components. The text also contains some amateur radio activity reports and notices, as well as a mention of amateur radio operators who are active and their callsigns.
BOB HENRY HAS IT IN STOCK AND OFFERS YOU A BETTER DEAL!

Henry Radio stores in Butler, Missouri and 11240 West Olympic Blvd., Los Angeles, California have complete stocks of amateur, FM, Television, Short Wave, Communications, Recording, and other radio equipment. I promise you lowest prices, complete stocks, quick delivery, easy terms, generous trade-ins. I promise that you will be satisfied on every detail. Write, wire, phone or visit either store today.

A FEW OF THE ITEMS I STOCK ARE:

- Collins 75A
- Collins 39V
- Collins 3108-1
- Collins 3108-3
- Collins 30K-1
- National NC-57
- National NC-179
- National NC-183
- National HRO-7T
- National HRO-7C
- National HFS
- National NC240D
- Hallcrafters S38
- Hallcrafters S53
- Hallcrafters S40A
- Hallcrafters SX43
- Hallcrafters SX42
- Hallcrafters SX52
- Hallcrafters S47
- Hallcrafters S51
- Hallcrafters S58
- Hallcrafters S56
- Hallcrafters T54
- Hallcrafters HT18
- Hallcrafters HT19
- RME HF-10-20
- RME VHF-152A
- RME DB22A
- Hammarlund HQ129X
- Gas-Set 10-11 converter
- Standby ST-203-A
- Hunter Cyclomaster

Some prices slightly higher on the west coast.

LOW PRICES
I guarantee to sell to you as cheap as you can buy anywhere.

COMPLETE STOCKS
Hallicrafters, National, Hammarlund, Collins, Millen, RME, Meissner, Meck, Gordon, Amphenol-Mims, RCA, Vibroplexes, Sonar, all other amateur receivers, transmitters, beams, parts, etc. If it is amateur or communications equipment—I can supply it.

QUICK DELIVERY
Mail, phone, or wire your order. Shipment at once.

EASY TERMS
I have the world’s best time sale plan because I finance the terms myself. I save you time and money. I cooperate with you. Write for details.

LIBERAL TRADE-IN ALLOWANCE
Other jobbers say I allow too much. Tell me what you have to trade and what you want.

TEN DAY FREE TRIAL
Try any receiver ten days, return it for full refund if not satisfied.

FREE NINETY DAY SERVICE
I service everything I sell free for 90 days. At a reasonable price after 90 days.

FREE TECHNICAL ADVICE
and personal attention and help on your inquiries and problems.

HENRY RADIO STORES
"WORLD'S LARGEST DISTRIBUTORS OF SHORT WAVE RECEIVERS"
each 25 KPs4 over the WPR-50 are available for certificates. Congrats to BQ, CJ, FJ, and FP on brand-new Class A tickets. All are on 3.85-Mc. "phone on the net. AQ is working hard with ICM, and has not really been operating on 28-Mc. phone. Ex-KPFM is now W4OLC in Miami awaiting his gear from KP4. KD’s daily schedule with W4RBQ is going strong.

I’m working O7 on 12X, TFO. CANAL ZONE — SCM, Everett K. Kimmel, KZ5AS — AD, GD, the U.S. Air Force, a mobile marine, and KH8 and WD stations have teamed up in a mobile project, and now can handle all communications and feed progress bulletins to his faculty. AD commanded the flight mission. GD is SEC, and the EO of West Bank. He places SW as vice-president of the CZARA. The CZARA now meets on the 58 Barracuda, a Sea Scout Ship moored at Duluth, having acquired a private crane and a nice social meeting room. The call KZ5AS was reserved for use at special public events. New calls are CO, ET, FL, GT, and TM. FJ’s initial was VO2G5, PA schedule was W0LPW. Weekly, AX and GD are shooting for 00 Class A appointments. AK passed a state-side police outfit switching from a.m. to f.m. and acquired a mobile rig for a song. URE, ORS, and ORS applications are needed from both sides of the Americas.

SOUTHWESTERN DIVISION

LOS ANGELES — SCM, Vincent J. Haggerty, W6IOX — La Crescenta AEC members were standing by within 12 minutes after EC BTA notified them of an aircraft crash on a fog-shrouded mountain at La Crescenta, Oct. 19th. Working in conjunction with sheriff’s rescue squads, 144-Mc. AEC pack units entered the search area and established communication with APCs 29- and 144-Mc. mobile units which were standing by to relay instructions. The following AEC members participated: HMO, VRX, KSO, YKB, RTR, UBY, and BTA. Nice work! IWWU and PJ keep busy as OMs. SCN needs outlets in Riverside and San Bernadino and an additional station in Los Angeles. The net operates on 3765 kc. Contact BAD if interested. QIW is back on the air after six weeks hospitalization. NAZ has an FM rig and is operating on 144 Mc. It is really a great show. I hope everyone is still waiting for T.V.I. I might as well be a part of it !!"

PRB is rebuilding his kw. BYT, G0J, and CNE are on 7 Mc. COG has a new frequency meter. The Golden State reports a successful outing, also good AEC drills. ZQV works on Southern Border Net. AM has worked 10 countries and 45 states with his mobile rig in his car. BOP also has a mobile rig and is doing well. RPO is working on a signal generator and trance. YSK is building an auxiliary rig. YVJ has new 200-watt rig. BEB is using new tubes for more time on 40 Mc. OMR has an AEC rig and has an S-meter. MAM is working 3.5-Mc. bugs. Plans for a get-together of the Paso Robles, Santa Maria, and San Luis Obispo Clubs are in the offing. DDE, ZAJZ, and CMN reported by radio this month.

The section PAM, MVK, is busy recruiting OIs. He has organized a v.f.d. net sponsored by the Two Meter and Down Club of Los Angeles. WKO is NOS and MJ is Alternate Net Control. Stations checking in on the first drill were BWY, CJQ, DMG, ESK, EMM, MJ, WHV, WKO, WWP, WYH, W4LX, and W6LX. This is a perfect 144-Mc. stations in the Los Angeles area are invited to join. Training in disaster and emergency work is stressed. Net crystals of 3 watts are hit into 147.5 Mc. at 45 watts for 75% efficiency. This is a nice improvement. The Golden State Net Control is moving ahead. Stations checking in on the first drill were BWY, CJQ, DMG, ESK, EMM, MJ, WHV, WKO, WWP, WYH, W4LX, and W6LX. This is a perfect 144-Mc. stations in the Los Angeles area are invited to join. Training in disaster and emergency work is stressed. Net crystals of 3 watts are hit into 147.5 Mc. at 45 watts for 75% efficiency. This is a nice improvement.
FAMOUS HALLICRAFTERS
HT-17 TRANSMITTER
Regular
$71.50 Velvet
REDUCED TO
$39.95
WITH ALL COILS

The HT-17 alone was always a grand buy at $49.50. Now Newark brings you the whole works — Complete Transmitter Kit with Full Set of Coils for 10, 15, 20, 40 and 80 meters . . . All for the Amazing Low Price of $39.95. Save $32! The HT-17 is a high quality transmi.
AMAZING NEW Improved
Super De Luxe
Reg. Trade Mark: Vibroplex, Lighting Bug, Bug

"PRESENTATION"

MODEL

24-Karat Gold-Plated Base, Top

INTRODUCTORY OFFER! $25.00

Here's the latest word in sending ease and enjoyment. With this amazing New Vibroplex key you can send faster, better and easier. No special skill necessary. No iding arm effort. Suit any hand or any style of sending. Acclaimed for beauty and operating ease. Super-speed Control Main spring provides range of speed from 10 wpm to 40 wpm and beyond. Polished chromium machine parts. 24-carat gold plated base. Colorful red switch knob, finger and thumb piece. Extra large contacts. Non-reflecting finish. Order yours today! See how easy sending can be! Money order or registered mail. FREE catalog.

THE VIBROPLEX CO., Inc.

106
ELECTRONIC WHOLESALERS INC.

Exclusive Distributor for

A complete line of Collins transmitters and receivers is always on display in our spacious new showrooms. We invite your inspection of this famous equipment... Just more proof that Electronic Wholesalers has all the greatest names in radio.

- 30K-1 500 WATT TRANSMITTER
- 32V-1 150 WATT TRANSMITTER
- 70E-8A VFO
- 75A-1 RECEIVER
- 310B EXCITER UNITS

Now Ready for Delivery!

Specials:

- 4½" Flexible Shaft... 29¢ each
- ½" Coupler for above... 35¢ pair
- 3½" Pillar Insulator... 5 for 89¢
- 1½" Pillar Insulator... 5 for 69¢
- Hand Keys... 49¢ each
- Honey Comb Coil A.C. Line Filter... 39¢ each
- 4 Mfd—600V Oil Filled... 69¢ each

Chassis, Panels, Cabinets in stock

- Products of all National Manufacturers in stock—25% deposit on C.O.D. orders, F.O.B. Washington, D.C.

Complete Lines of Steel and Aluminum Chassis in Stock

Washington's Big New Radio Parts Distributor Has All the Greatest Names in Radio

Electronic wholesalers, inc.

2010 14th STREET, N. W. • WASHINGTON 9, D. C.
and his XYL on Nov. 6th. NVR now has his s.s.b. receiver in operation. AGC now has his new dual new equipment. Traffic: W5NXE 141, ZU 130, SMA 25, NJR 17, ZM 3.

CANADA

MARITIME DIVISION

MARI الاسلام -- SCM, A. M. Crowell, VE1DQ -- RM: GM. SEC: FQ. It is our duty to report the passing of one of our old and most popular 3.8-Mc. Hams, Hal Ward, GR. Hal will be greatly missed by all his fellow hams. GM sends in a nice traffic total. QC is doing some 00 work and now has his new antenna. DJ has a new antenna. DJ handles a few; MD is now in operation. RCEM, HJ has a 348 receiver now and has the V.T. keyer going. BK has schedules with BO on Sable Island. ES has new NC-170 VJT that he will be experimenting with. FD was operating the net. MK has nice traffic total due to net activity. DB and FB attended the Montreal Convention, QC made a 28-Mc. WAC recently in 7 hours plus! HQ, Yarmouth, has 87 countries with an 807 final. CO, IA, IS, IB, PI, NH, OG, JF, NB, UF, QW, CR, SE, and OM are active on 28 Mc. The Halifax and Dartmouth gangs are running their nightly round tables to swap the past day's DX and discuss the ever present topics. n.f.m. vs s.m. HD and TA have increased power and Gerry has the new speech clipper. Many of the gang have acquired ART-5s as extra rig for portable-mobile on 3.8-Mc. Traffic: VE1GL 181, HJ 58, HT 45, MK 37, DB 7, Q4 3.

ONTARIO DIVISION

ONTARIO -- SCM, Thomas Hunter, Jr., VE6CQ -- Ass't. SCM, M. J. McDonald, AWJ, SEC: HJ, RMAs: ATR, AWE, BUR, DU, GI, and TM, PAMA: DD, FQ, and RC. ATR is looking for additional stations for the Ontario 7-Mc. Net, especially stations in the northern and western parts of the Province. O1 is back on ONB. BBQ is looking for contacts on 144 Mc. The Nortown Club, Toronto, reports RBU and BQP are on 28 Mc. BKW is on 17 Mc. and APA is experimenting with quad antennas. The Kirkland Lake gang spent a busy October studying for the R.I.'s. VU reports the Air Force Net is going FB on 37 55 kc. at 8:00 P.M. MJ and CP returned from the Montreal Convention. QC is doing some 00 work and Gerry has the new speech clipper. Many of the gang have acquired ART-5s as extra rig for portable-mobile on 3.8-Mc. Traffic: VEU3ATR 106, AW, 8.5, CP 78, BUR 75, AWE 71, IA 65, RG 59, GI 57, and APA 49, KM 38, AQB 33, NI 27, TM 27, DU 25, VP 21, IL 19, WR 19, YJ 15, BCP 14, FQ 14, DD 9, HK 5, DH 4, ZD 3.

QUEBEC DIVISION

QUEBEC -- SCM, Gordon A. Lynn, VE2GL -- SEC: 2QQ, ECs: BB, TA, and ZZ. RM: BB, PAM: DX. The Eastern Canada ARRL Convention took place in Montreal Oct. 8th and 9th with an attendance of about 500 from VE1, 2, 3, and 4, and W1, 2, 3, and 8. On Oct. 16th the St. Maurice Valley Amateur Radio Assoc. celebrated its 25th anniversary with a banquet at Cap de la Madeleine attended by forty. Interesting talks were given by EK and AT, charter members of the club. Visitors attended from Montreal, Quebec City, and several other points. The Quebec City Club has a new president, EC reports. Quebec Police Net continues active with himself, EV, RM, AEM, OD, AB, TB, and ACI, AIN, a new-comer, is very active on 144-Mc. net with ZG and EC. DD had a fire; his induction rotary beam went out. DR manages to get on the air occasionally and schedules TX twice weekly in Ungava on 7 Mc. BB continues to be very active with traffic and reports success in the Simulated Emergency Test by himself. BB, GM, LO, NR, XB, and XR, GM is OBS and is keeping regular schedules on several nets. He has SC, ACD, XR, AF, WP, and AR lined up for formation of Quebec o.w. net and invites any other VE interested to drop him a line. WZ is operating from Pointe Coteau Oct. 14 and 7 Mc. MG is having trouble with his power and has a new low power doing a swell job. AGG is very active on 3.5 and 7 Mc. LO continues schedules and handles quite a bit of traffic. What about some reports from Quebec City? Traffic: VE2BB 273, XB 68, EC 48, GM 47, GL 37, LO 26.
HERE COMES LEO!

And he's offering the MOST COMPLETE HAM CATALOG ever assembled! Just off the press—write for your FREE copy today!

WORLD FAMOUS WRL XMTRS!

GLOBE TROTTER
Unconditionally guaranteed 40 watt input kit including all parts, power supply, chassis panel and streamlined cabinet.
Less Tubes $69.95
Wired $79.50
(1 set of Coils, Meters, Tubes, $17.49 extra)

GLOBE KING
Unconditionally guaranteed 275 Watts phone and CW. An advanced design XMT giving efficient performance on 10 - 11 - 15 - 20 - 40 and 80 meter bands.
Ready to go— $379.45
Kit form $399.45

Write for information on NEW 150 Watt Globe Champion.

E-Z PAYMENTS
WRL offers the lowest E-Z Payment Plan in the country. Any responsible person with a steady job can buy on time from Leo. No red tape—no delays! Financing our own paper saves you money!

LIBERAL TRADE-INS
Leo offers more—use your present equipment as a trade-in. Tell me what equipment you have—what equipment you want—let's trade.

PERSONAL SERVICE
WRL is the World's Most Personalized Radio Supply House for the amateur. Getting acquainted with Leo will help you get on the air faster and for less money.

Save Money On Reconditioned Equipment—Write For Our Big List!

FAST SERVICE ON FOREIGN ORDERS

WRITE—WIRE
PHONE 7795

WORLD RADIO LABORATORIES
744 West Broadway
Council Bluffs, Iowa

Please send me:
[ ] Radio Map
[ ] New Catalog

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

GLOBE TROTTER
Wired $399.45

GLOBE CHAMPION
Wired $79.50

LEO I. MEYERSON
W6GFQ
ON 20 - 10 & 75 METERS
From practice keys for beginners to the very finest commercial equipment, perfect performance calls for Signal. Send for FREE descriptive literature today!

**STEEL TOWERS**
For Rotary Beams, FM, TV

**ATTRACTION—NO GUY WIRES!**
- 4-Post Construction for Greater Strength!
- Galvanized Steel—Will Last A Lifetime!
- SAFE—Ladder to Top Platform
- COMPLETE—Ready to Assemble
- Easy to Erect or Move
- Withstands Heaviest Winds

(We will supply stress diagrams for your building inspector)

**EASY MONTHLY PAYMENTS**
Up to 12 Months to Pay!
All Vesto Towers are available on a special monthly payment plan which requires only 1/2 down. Write for free details.

**MORE SIGNALS PER DOLLAR**
From Money Invested in an Antenna

**VANALTA DIVISION**

**ALBERTA**—SCM, Sydney T. Jones, VE6MJ—ED
attended the hamfest in Montreal and visited W9ALL on the way. CC is building a converter for 28 Mc. HM visited old friends in Vancouver and Victoria. BN, BW, EA, and LC stopped at the AEC in Edmonton. EL had his pointed EC for Camrose. XX worked 3.8-Mc. mobile on trip to Lac La Biche. JP and EO visited MJ. The Alberta Net is active on 3.8 Mc. using a QRV in the car and kept contact with his home station during 160-mile trip to Edmonton and return. AE is active on 3.8-Mc. 'phone and announced the joining of a new Jr. operator. LC and W9 have been appointed ORS. BW demonstrated mobile possibilities to NARC at a recent meeting. WQ is Alberta representative on T.L., "LZ qualified for QC Class L."

**PRAIRIE DIVISION**

**MANITOBA**—SCM, A. W. Morley, VE4AM—BZ,
a new ham at Gimli, is using 813s and a Super-Pro receiver and and the first two weeks on worked South America, Europe, and England. Time is spent on 7 and 14 Mc. Rivers has SW active with 813s and an AR77. AR, at Pine Falls, is busy tuning things up again. JO was awarded a safe-driving prize. QV and NI are still arguing about antennas. NI is due for overhaul since it is getting hot. JO has two 3.8-Mc. 'phone boys, leaving for VE7 Land. LC had his tower broken while in the process of moving but it's up again. BG is a.f.m. UC ran into some B.C.I. but cleaned it up. AD is pleased with his 14-Mc. vertical which is 72 feet high. GW's rig still is in pieces and is all over the door. Jerry will have it rebuilt one of these days. JO, at Waskada, is heard on 3.8-Mc. 'phone and 7-Mc. c.w. FU was busy with Simulated Emergency Test. Remember Emerson! Get in touch with Frank and join the AEC. JM is doing a lot of c.w. practice lately. Thanks for the reports, fellows. How about a few others? Season's Greeting and the best to all in '49. Traffic: VE4AM 53.

**SASKATCHEWAN**—SCM, Norman Thompson, VECBO — MK is running 30 watts to his 807 final, while LD is running 5 watts to a 6V6 crystal oscillator. BW is on 28-Mc. 'phone and is looking for Toronto contacts. FG is working on 7-Mc. c.w. EE is on 3.8-, 14-, and 28-Mc. 'phone and c.w. AJ is keeping schedule with ZL3AI on 14-Mc. c.w. EW is working c.w. on 3.5, 7, and 14 Mc. MQ is working 14 and 28 Mc. using n.f.m. OB is on 28 Mc. using n.f.m. OB is on 3.8 and 28 Mc. CR is on 7-Mc. c.w. FL and RJ are low-power enthusiasts. RQ is rebuilding for 27 and 38 Mc. UZ is putting out a good signal on 3.8 Mc. using 150 watts and a speech clipper. FD has a converter for 28 Mc., also a 10 over 20 beam, both two-element wire jobs. BF is on 14 and 28 Mc. using n.f.m. and 28 Mc. using a three-element beam. Saskatchewan hams, please send news for X7AL to BF, Gus Cox, 237 — 5th Ave., Saskatoon. XF is going strong on 3.5-, 14-, and 28-Mc. c.w. JD has an all-Pierce oscillator driving his 807. KD made contact with an S51 station. WB is building a grid-dip frequency meter. GP can be found on 14 Mc. in the wee small hours of the morning. OM has a two-element rotary beam for 14 and 28 Mc. HR made 62 QSOs in the CD Party. Traffic: VESHR 40.

**I Will Do it in '49**

(Continued from page 47)

"Hello, "TK,"" Jim shouted from across the room. "How'd ya' do?"

I managed a wry smile, and replied, "Oh, I worked a few, but I wasn't out to win. I understand you had a fair score."

Our new place is only a mile from the bus line, and Betty always did want room enough to put in a garden. And look! Aren't those 80-meter Vacs beatiful? It will be different in 1949!"
I ARRISON HAS IT / '73 FOR YOUR MOST HAPPY AND SUCCESSFUL 1949 AD! / ...And we can make you happy by giving you the best service for all your requirements—every standard item that's made and FB bargains in Harrison Select Surplus, too.

Remember — Harrison Has It!

SAVE 50% ON THIS FB HALICRAFTER XMTR!
Yes, that's right! The famous HT-17 which regularly sold for $49.50 is yours for only $24.75 with the purchase of any new receiver selling for $100.00 or more. A complete, compact, CW transmitter — 6V6 xtal osc., 807 final, 10 to 20 watts of conservatively rated output on 10 to 60 meters—antenna matching network. An FB rig for the beginner or a 'swell standby. Complete with tubes and 40 meter coils. Ready to plug into 110 AC line. Quantity limited—send your order today!

HARRISON HAS IT!
HALICRAFTERS AMAZING HT-19
A brand new, high efficiency transmitter — 125 watts, 10 to 80 meters, CW or NBFM phone, VFO built right in! Provision for external AM modulation. Complete with coils for all bands and tubes. All you need is a new crystal microphone.

Ready to Operate $359.50
Harrison Has It — In Stock!!
Crystal mike — Famous Asiatic D-104 — favorite of Ham operators for years. $14.47

IS ELECTRONICS YOUR BUSINESS?
Do you purchase or influence the purchase of electronic parts and equipment that are needed in a hurry? Our INDUSTRIAL SALES DEPARTMENT is one of the best in the country, saving time and money for thousands of industrial accounts.

Wire, write or phone the Lucky 7's — BARclay 7-7777
Cordially yours,
BERT SCHREINER, Industrial Sales Manager

DIRECTION INDICATOR KIT
Great circle maps centered on Topeka, N.Y.C., San Francisco or a compass rose for rear illumination — slewing front desk cabinet or rack panel (specify choice) — complete with remote transmitter and 120 volt motor (Unused). $14.75

WE SHIP TO ALL PARTS OF THE WORLD!
Please send ample for postage. We refund every cent not used. Deposit required on all C.O.D. orders unless you are one of my regular customers. Happy to fill any order but please try to make them more than $3.00.

HARRISON HAM-A-LOG
Don’t miss another issue of the Ham-A-Log. Pages packed with ham news and hints. Outstanding ham buys in standard and HSS and parts and equipment. Send us your name and call today!

JAMAICA BRANCH
Ham Headquarters since 1925
HARRISON
Radio Corporation
12 West Broadway,
New York 7, N. Y.

OPEN NIGHTS
New York — Wednesdays
Jamaica — Fridays
UNTIL 9:00

111
**MM-2 MODULATION MONITOR**

3" x 5" x 10"

... SEE YOUR SIGNAL AS OTHERS HEAR YOUR SIGNAL

with this basic oscilloscope featuring calibrated modulation percentage scale, linear 60 cy sweep with return trace blanking, trace intensifier window, complete controls, reversible panel, rack mounting provisions and many other outstanding features. See the MM-2 at your dealer or write Dept 1-9.

**LAMBDAM ELECTRONICS CORP.**
BOX No. 55
CORONA, N. Y.

---

**This Profitable Chassis Replacement Market**

- Here is a fine radio, in chassis form, to please the most discriminating music lovers.
- Easy to install in any console cabinet old or new, the Espey 511 AM-FM radio chassis embodies the latest engineering refinements for lasting high quality at a price that defies competition.
- Features: 12 tubes plus rectifier and tuning indicator; drift compensated circuit for high frequency stability; tuned RF on AM and FM, high fidelity push-pull audio; 13 watts power output; wide range 12" FM speaker; smooth wheel tuning; phone input provision; separate AM and FM antennas.

Sold through your favorite parts distributor. Write for catalogue E-1 containing complete specifications.

**ESPEY MANUFACTURING COMPANY, INC.**
528 EAST 72nd STREET, NEW YORK 21, N. Y.

---

**Happenings**
(Continued from page 24)

... SEE YOUR SIGNAL AS OTHERS HEAR YOUR SIGNAL

with this basic oscilloscope featuring calibrated modulation percentage scale, linear 60 cy sweep with return trace blanking, trace intensifier window, complete controls, reversible panel, rack mounting provisions and many other outstanding features. See the MM-2 at your dealer or write Dept 1-9.

**CUSTOM BUILDERS**

**BUILD YOUR RADIO SALES AROUND THIS QUALITY CHASSIS**

**NEW**
**ESPEY MODEL 511 AM-FM CUSTOM BUILT**

**This Profitable Chassis Replacement Market**

- Here is a fine radio, in chassis form, to please the most discriminating music lovers.
- Easy to install in any console cabinet old or new, the Espey 511 AM-FM radio chassis embodies the latest engineering refinements for lasting high quality at a price that defies competition.
- Features: 12 tubes plus rectifier and tuning indicator; drift compensated circuit for high frequency stability; tuned RF on AM and FM, high fidelity push-pull audio; 13 watts power output; wide range 12" FM speaker; smooth wheel tuning; phone input provision; separate AM and FM antennas.

Sold through your favorite parts distributor. Write for catalogue E-1 containing complete specifications.

**ESPEY MANUFACTURING COMPANY, INC.**
528 EAST 72nd STREET, NEW YORK 21, N. Y.

---

**How’s DX?**
(Continued from page 37)

... SEE YOUR SIGNAL AS OTHERS HEAR YOUR SIGNAL

with this basic oscilloscope featuring calibrated modulation percentage scale, linear 60 cy sweep with return trace blanking, trace intensifier window, complete controls, reversible panel, rack mounting provisions and many other outstanding features. See the MM-2 at your dealer or write Dept 1-9.

**LAMBDAM ELECTRONICS CORP.**
BOX No. 55
CORONA, N. Y.

---

**This Profitable Chassis Replacement Market**

- Here is a fine radio, in chassis form, to please the most discriminating music lovers.
- Easy to install in any console cabinet old or new, the Espey 511 AM-FM radio chassis embodies the latest engineering refinements for lasting high quality at a price that defies competition.
- Features: 12 tubes plus rectifier and tuning indicator; drift compensated circuit for high frequency stability; tuned RF on AM and FM, high fidelity push-pull audio; 13 watts power output; wide range 12" FM speaker; smooth wheel tuning; phone input provision; separate AM and FM antennas.

Sold through your favorite parts distributor. Write for catalogue E-1 containing complete specifications.

**ESPEY MANUFACTURING COMPANY, INC.**
528 EAST 72nd STREET, NEW YORK 21, N. Y.

---

**Happenings**
(Continued from page 24)

... SEE YOUR SIGNAL AS OTHERS HEAR YOUR SIGNAL

with this basic oscilloscope featuring calibrated modulation percentage scale, linear 60 cy sweep with return trace blanking, trace intensifier window, complete controls, reversible panel, rack mounting provisions and many other outstanding features. See the MM-2 at your dealer or write Dept 1-9.

**LAMBDAM ELECTRONICS CORP.**
BOX No. 55
CORONA, N. Y.

---

**This Profitable Chassis Replacement Market**

- Here is a fine radio, in chassis form, to please the most discriminating music lovers.
- Easy to install in any console cabinet old or new, the Espey 511 AM-FM radio chassis embodies the latest engineering refinements for lasting high quality at a price that defies competition.
- Features: 12 tubes plus rectifier and tuning indicator; drift compensated circuit for high frequency stability; tuned RF on AM and FM, high fidelity push-pull audio; 13 watts power output; wide range 12" FM speaker; smooth wheel tuning; phone input provision; separate AM and FM antennas.

Sold through your favorite parts distributor. Write for catalogue E-1 containing complete specifications.

**ESPEY MANUFACTURING COMPANY, INC.**
528 EAST 72nd STREET, NEW YORK 21, N. Y.

---

**Happenings**
(Continued from page 24)

... SEE YOUR SIGNAL AS OTHERS HEAR YOUR SIGNAL

with this basic oscilloscope featuring calibrated modulation percentage scale, linear 60 cy sweep with return trace blanking, trace intensifier window, complete controls, reversible panel, rack mounting provisions and many other outstanding features. See the MM-2 at your dealer or write Dept 1-9.

**LAMBDAM ELECTRONICS CORP.**
BOX No. 55
CORONA, N. Y.

---

**This Profitable Chassis Replacement Market**

- Here is a fine radio, in chassis form, to please the most discriminating music lovers.
- Easy to install in any console cabinet old or new, the Espey 511 AM-FM radio chassis embodies the latest engineering refinements for lasting high quality at a price that defies competition.
- Features: 12 tubes plus rectifier and tuning indicator; drift compensated circuit for high frequency stability; tuned RF on AM and FM, high fidelity push-pull audio; 13 watts power output; wide range 12" FM speaker; smooth wheel tuning; phone input provision; separate AM and FM antennas.

Sold through your favorite parts distributor. Write for catalogue E-1 containing complete specifications.

**ESPEY MANUFACTURING COMPANY, INC.**
528 EAST 72nd STREET, NEW YORK 21, N. Y.

---

**Happenings**
(Continued from page 24)

... SEE YOUR SIGNAL AS OTHERS HEAR YOUR SIGNAL

with this basic oscilloscope featuring calibrated modulation percentage scale, linear 60 cy sweep with return trace blanking, trace intensifier window, complete controls, reversible panel, rack mounting provisions and many other outstanding features. See the MM-2 at your dealer or write Dept 1-9.

**LAMBDAM ELECTRONICS CORP.**
BOX No. 55
CORONA, N. Y.

---

**This Profitable Chassis Replacement Market**

- Here is a fine radio, in chassis form, to please the most discriminating music lovers.
- Easy to install in any console cabinet old or new, the Espey 511 AM-FM radio chassis embodies the latest engineering refinements for lasting high quality at a price that defies competition.
- Features: 12 tubes plus rectifier and tuning indicator; drift compensated circuit for high frequency stability; tuned RF on AM and FM, high fidelity push-pull audio; 13 watts power output; wide range 12" FM speaker; smooth wheel tuning; phone input provision; separate AM and FM antennas.

Sold through your favorite parts distributor. Write for catalogue E-1 containing complete specifications.

**ESPEY MANUFACTURING COMPANY, INC.**
528 EAST 72nd STREET, NEW YORK 21, N. Y.

---

**Happenings**
(Continued from page 24)

... SEE YOUR SIGNAL AS OTHERS HEAR YOUR SIGNAL

with this basic oscilloscope featuring calibrated modulation percentage scale, linear 60 cy sweep with return trace blanking, trace intensifier window, complete controls, reversible panel, rack mounting provisions and many other outstanding features. See the MM-2 at your dealer or write Dept 1-9.

**LAMBDAM ELECTRONICS CORP.**
BOX No. 55
CORONA, N. Y.

---

**This Profitable Chassis Replacement Market**

- Here is a fine radio, in chassis form, to please the most discriminating music lovers.
- Easy to install in any console cabinet old or new, the Espey 511 AM-FM radio chassis embodies the latest engineering refinements for lasting high quality at a price that defies competition.
- Features: 12 tubes plus rectifier and tuning indicator; drift compensated circuit for high frequency stability; tuned RF on AM and FM, high fidelity push-pull audio; 13 watts power output; wide range 12" FM speaker; smooth wheel tuning; phone input provision; separate AM and FM antennas.

Sold through your favorite parts distributor. Write for catalogue E-1 containing complete specifications.

**ESPEY MANUFACTURING COMPANY, INC.**
528 EAST 72nd STREET, NEW YORK 21, N. Y.
CRYSTALS!

All crystals have Army MC harmonic ratings but has not been released to the public. For deriving the correct fundamental frequency in kilocycles.

CRYSTALS WITH A MILLION USES

Fractons Omitted

<table>
<thead>
<tr>
<th>Frequency Standards</th>
<th>Crystals from BC 6 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>kHz</td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>820</td>
</tr>
<tr>
<td>430</td>
<td>800</td>
</tr>
<tr>
<td>410</td>
<td>780</td>
</tr>
<tr>
<td>400</td>
<td>770</td>
</tr>
<tr>
<td>390</td>
<td>760</td>
</tr>
<tr>
<td>380</td>
<td>750</td>
</tr>
<tr>
<td>370</td>
<td>740</td>
</tr>
<tr>
<td>360</td>
<td>730</td>
</tr>
<tr>
<td>350</td>
<td>720</td>
</tr>
<tr>
<td>340</td>
<td>710</td>
</tr>
<tr>
<td>330</td>
<td>700</td>
</tr>
<tr>
<td>320</td>
<td>690</td>
</tr>
<tr>
<td>310</td>
<td>680</td>
</tr>
<tr>
<td>300</td>
<td>670</td>
</tr>
<tr>
<td>290</td>
<td>660</td>
</tr>
<tr>
<td>280</td>
<td>650</td>
</tr>
<tr>
<td>270</td>
<td>640</td>
</tr>
<tr>
<td>260</td>
<td>630</td>
</tr>
<tr>
<td>250</td>
<td>620</td>
</tr>
<tr>
<td>240</td>
<td>610</td>
</tr>
<tr>
<td>230</td>
<td>600</td>
</tr>
<tr>
<td>220</td>
<td>590</td>
</tr>
<tr>
<td>210</td>
<td>580</td>
</tr>
<tr>
<td>200</td>
<td>570</td>
</tr>
<tr>
<td>190</td>
<td>560</td>
</tr>
<tr>
<td>180</td>
<td>550</td>
</tr>
<tr>
<td>170</td>
<td>540</td>
</tr>
<tr>
<td>160</td>
<td>530</td>
</tr>
<tr>
<td>150</td>
<td>520</td>
</tr>
<tr>
<td>140</td>
<td>510</td>
</tr>
<tr>
<td>130</td>
<td>500</td>
</tr>
<tr>
<td>120</td>
<td>490</td>
</tr>
<tr>
<td>110</td>
<td>480</td>
</tr>
<tr>
<td>100</td>
<td>470</td>
</tr>
<tr>
<td>90</td>
<td>460</td>
</tr>
<tr>
<td>80</td>
<td>450</td>
</tr>
<tr>
<td>70</td>
<td>440</td>
</tr>
<tr>
<td>60</td>
<td>430</td>
</tr>
<tr>
<td>50</td>
<td>420</td>
</tr>
<tr>
<td>40</td>
<td>410</td>
</tr>
<tr>
<td>30</td>
<td>400</td>
</tr>
<tr>
<td>20</td>
<td>390</td>
</tr>
<tr>
<td>10</td>
<td>380</td>
</tr>
<tr>
<td>0</td>
<td>370</td>
</tr>
<tr>
<td>1</td>
<td>360</td>
</tr>
<tr>
<td>2</td>
<td>350</td>
</tr>
<tr>
<td>3</td>
<td>340</td>
</tr>
<tr>
<td>4</td>
<td>330</td>
</tr>
<tr>
<td>5</td>
<td>320</td>
</tr>
<tr>
<td>6</td>
<td>310</td>
</tr>
<tr>
<td>7</td>
<td>300</td>
</tr>
<tr>
<td>8</td>
<td>290</td>
</tr>
<tr>
<td>9</td>
<td>280</td>
</tr>
<tr>
<td>10</td>
<td>270</td>
</tr>
<tr>
<td>11</td>
<td>260</td>
</tr>
<tr>
<td>12</td>
<td>250</td>
</tr>
<tr>
<td>13</td>
<td>240</td>
</tr>
<tr>
<td>14</td>
<td>230</td>
</tr>
<tr>
<td>15</td>
<td>220</td>
</tr>
<tr>
<td>16</td>
<td>210</td>
</tr>
<tr>
<td>17</td>
<td>200</td>
</tr>
<tr>
<td>18</td>
<td>190</td>
</tr>
<tr>
<td>19</td>
<td>180</td>
</tr>
<tr>
<td>20</td>
<td>170</td>
</tr>
<tr>
<td>21</td>
<td>160</td>
</tr>
<tr>
<td>22</td>
<td>150</td>
</tr>
<tr>
<td>23</td>
<td>140</td>
</tr>
<tr>
<td>24</td>
<td>130</td>
</tr>
<tr>
<td>25</td>
<td>120</td>
</tr>
<tr>
<td>26</td>
<td>110</td>
</tr>
<tr>
<td>27</td>
<td>100</td>
</tr>
<tr>
<td>28</td>
<td>90</td>
</tr>
<tr>
<td>29</td>
<td>80</td>
</tr>
<tr>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>31</td>
<td>60</td>
</tr>
<tr>
<td>32</td>
<td>50</td>
</tr>
<tr>
<td>33</td>
<td>40</td>
</tr>
<tr>
<td>34</td>
<td>30</td>
</tr>
<tr>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td>36</td>
<td>10</td>
</tr>
<tr>
<td>37</td>
<td>0</td>
</tr>
</tbody>
</table>

For Crystal Controlled Signal Generators

$5.95 each

ATTENTION! CLOSEOUT SPECIALS

PART KITS!

KIT 1 Astd Mica Condensers—Unmarked, 100 for...$1.50
KIT 2 Astd Resistor J5W-1 W, 100 for...1.00
KIT 3 Astd Condensers—Tubular Bypass, 25 for...1.00
KIT 4 Astd Condensers— Electrolytic, 25 for...2.00
KIT 5 Astd Potentiometers—with or without switch,1.00
10 for...1.00
KIT 6 Astd Ballast Tubes— Line Ballasts, 10 for...1.00
KIT 7 Octal Sockets—Wafers, 25 for...1.00
KIT 8 Octal Sockets—Plastic with Flange, 20 for...1.00

SPECIAL! All 8 Kits for $8.00

MAGNETIC HEADPHONES

Brand new SC 4000 ohm Magnetic phones with 8" cord and standard phone plug. Headphones are adjustable to size A—$14.50 value...$2.49

SPERRY AMPLIFIER

Brand new servo amplifier containing two beam power output tubes (152) similar to 256L, two twin triodes (1633 and 1634) similar to 6SC7, two mica condensers, dozens of color coded half watt resistors, two dual and four section batoh condensers, three transformers, two water switchers, one volume control, four octal sockets. Easily convertible.

$3.95

RADAR RECEIVER BC1068A

Guaranteed excellent condition. It is a "Hot" receiver for the "Ham" and short wave experimentor covering the 174 to 210 MC television band. Has individually slug tuned antenna R.F., Detector and oscillator circuits resulting in maximum sensitivity; contains 2 R.F. and 5 L.F. stages detector and video amplifier complete with 110 volt AC power supply and 14 tubes...

$39.50

SCR-195 WALKIE-TALKIES

$59.95

Price per set of 2

$115

ANTENNAS

(A) Small four section telescopic aerial ideal for portable receivers, transceivers or test equipment...

$99c

(B) 22" tapered high frequency aerial covering 150 to 200 MC. Ideal for mobile or fixed station use...

$2.69

TERMS

All items F.O.B., Washington, D. C. All orders $30.00 or less, cash with order. Above $30.00, 25 per cent with order, balance C.O.D. Foreign orders cash with orders, plus exchange rate.
**DON'T LOSE THOSE GOOD QSO'S**
While Turning Your Beam by Hand

**MUNGER**

**Electro-Beam ROTATOR**

Hold those rare DX contacts right through QRM by peaking up your own signals in a few seconds. Ruggedly built. Powerful reversible motor. 115 v—60 cycles. Swings your beam at 1 r.p.m.

- Price Includes Reversible Electro-Beam Rotator and Accurate Direction Indicator.
- Footproof Potentiometer and Meter Circuit. Calibrations in Both Degrees and Directions.

**Free Inspection Offer!**

Order today. If not satisfied, return rotator within 10 days for refund. (Control-power cable supplied at 10c per ft. In 50' or 100' lengths.)

**MANUFACTURED AND SOLD EXCLUSIVELY BY**

REX L. MUNGER COMPANY
4701 Sheridan Road, Chicago 40, Ill.

---

**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. Course 6 to 18 months' duration. In RADIO AND ELECTRONICS. Approved Veteran training in Radio. Write for Particulars.

**EXCELLENT OPPORTUNITY for ADVERTISING ASSISTANT**

Must be licensed amateur capable of writing good copy and preparing rough layouts for trade magazine ads, data sheets and catalogs.

Experience with radio jobber or manufacturer highly desirable. Some experience as sales correspondent, copy writer or as author of amateur constructional articles essential.

There will be competent supervision but applicant must be capable of working out details independently. This is not a full time advertising job and applicant will be required to do some sales correspondence.

In reply, state qualifications, experience, salary required and how soon available. Address FRANK C. MANN, Sales Manager.

E. F. JOHNSON CO.
Waseca, Minnesota

---

**About Antennas**

The pi-section output circuit used in this transmitter will permit full loading, even when short lengths of wire and whip antennas are used. The effectiveness of the antenna, however, does not depend solely on how well it loads the amplifier! It is a difficult problem to get a short antenna to do much of a job at either 80 or 40 meters, but good results are being obtained in both of these bands with top-loaded whip antennas. The
**Our 26th Year**

**FILAMENT TRANSFORMER**
Primary 115-230 Volt 60 cycle. Secondary 4 volts 1 amp. 5000 volt isolation. Swells to 525 Mfd. 75Mfd. 100TH, 250TH, HK-54, etc. Completely shielded dimensions 4 1/2 x 3 x 5/8. Weight 10 lbs. Special... $3.95

**ISOLATION TRANSFORMERS**
All 117 Volts to 117 Volts 60 Cy. P-96, 40 watts. 5.60 P-98, 100 watts $9.30. P-97, 80 watts. 5.10 P-99, 200 watts $17.70.

**POWERTRANS VARIABLE TRANSFORMERS**
Type 20: 115 V. input, O-135 V. output. (ii. 9.0 amps. 2.4 KVA. Type 1126: 115 V. input, 0-135 V. output. (ii. 15.0 amps. 2.0 KVA.) Type 20: 115 V. input, 0-135 V. output. (ii. 10.0 amps. 2.5 KVA.)

**PLATE TRANSFORMERS**
For Small Transmitters. DC Voltage Ratings are Approx. Values Obtained at Output of a section choke input filter. Using Mercury Vapor Rectifier Tubes Pri. is for 115 V. 60 cy.

**STANDARD STEEL CHASSIS**

**GOLDNITE—**
Little Devil Assortment in all-plastic cabinet. Includes 12 selected 1/2 watt Resistors in 40 different values (10 ohms to 10 meg. ohms). Cabinet is 9" long x 4 1/2" high x 5/4" deep. These boxes can be stacked. We also carry a complete line of Ohmite rheostats, variable resistors, dummy antennas, etc. $10.00

**METERS**
100 amp.—6 volt D.C. 3 inch scale, 4½" square, Grey finish, supplied with 110 volt. Brand New. Each as Illustrated $2.95. 0—100 Ma. 2½" Rd. McClintock. 1.95. 0-9 amp. R.F. 2½" Round... $2.45. 5-0-5 amp. ch. & dls. 2½" Rd... 69c

**RELAYS CS DIFFERENTIAL**
Dual coil with armature pivoted normally open. Operates 220-250 Volts. 8000 ohms each coil, contacts S.P.D.T. Controls rated 2 amps. at 110 Volt A.C. Ideally suited for balanced or bridge type circuits where limited current or power is available. 88c

**BIAS TRANSFORMER TYPE K58779**
Completely shielded. Insulator Terminal. Primary 115 Volts 60 cycle 0-50 Ma.

**STEEL CASES**
Black Crackle 11/16" $2.33. 1" $2.19. 1½" $2.50. 2" $2.88. 2½" $3.23. 3" $3.60. We carry a complete line of all other sizes of push巴巴up to 3½" diameter. $5.50.

**OIL FILLED CONDENSERS**
4 Mfd 600 Volt D.C. Sprague... $4.95. 6 Mfd 1000 Volt D.C. $16.65. 6 Mfd 330 Volt A.C. G.E. $9.85. 2 Mfd 10,000 Volt D.C., G.E. $13.95. 1 Mfd 750 Volt Sprague... $25. Dual 1 Mfd 600 Volt. CD Type DYE each 19c, per 100, $10.00.

**CHOICES**
SMOOTHING SWINGING PRICE EACH
TYPE Hy Hy Hy Hy
C-80 10 C-87 4-16 150 $3.09
C-81 10 C-88 4-16 200 $3.82
C-82 10 C-89 4-16 250 $5.29
C-83 10 C-90 4-16 300 $5.95
All above 3000 Volts Insulation

**ALUMINUM PANELS**
16" x 24"... $1.95. 16" x 16"... $1.85. 12" x 12"... $1.65. 10" x 10"... $1.35.

**DC TRANSFORMER**
Primary Dual 110 V. A.C. Each. Secondary 0—35, 34½ Volt at 3 Special 0-70, 75 Volt at 3 Special. This transformer is completely shielded. DM—43A DYNAMOTOR G.E. New, Input 24 V. 23 amps. 7500 RPM; output 215/103/2/8 V. or 215/260 milliamps; filtered. Special... $2.95

**PLATE TRANSFORMERS**
Primary 115/230 Volt, 25-60 cycle. Secondary 280 volts center tapped at 775 Ma. Hardly any voltage drop at 950 Ma. Completely shielded. Dimensions 6½ x 6½ x 7½. Weight 36 lbs. Special... $7.95

**ALUMINUM CHASSIS—**
Heavy Duty 7 x 7 x 2... $0.94. 7 x 7 x 3... $1.06. 5 x 10 x 3... $1.30. 11 x 7 x 2... $1.02. 7 x 12 x 2... $1.23. 10 x 17 x 3... $1.88.

**STANDARD STEEL CHASSIS**

**ITEMS YOU MAY BE LOOKING FOR**

**YOU MAY BE LOOKING FOR**

**Dimensions**
<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
<th>Filtered</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-60</td>
<td>Special</td>
<td>3500</td>
<td>36 lbs</td>
</tr>
</tbody>
</table>

**LEEDS RADIO CO.**
75 Vesey Street Dept. QS 1
Cortlandt 7-2612 New York City 7
transmitting range is shortened considerably as compared with the results that would be obtained with a wire a half-wavelength or more long, but entirely adequate local coverage can be obtained with the short antennas. For some suggested antennas, see “Technical Topics” in QST for November, 1948.

While primarily designed for use with end-fed antennas, the pi-section output circuit can also be used to feed balanced antenna systems, such as a center-fed half-wave, by connecting a link line between the antenna post and the chassis, and running the link to a separate antenna coupler, such as would be used in any normal home-station installation. As a makeshift means, one feeder of the balanced system can be connected to the antenna post, and the other grounded to the chassis. It will load very well, but it may not give the results that could be obtained if an antenna coupler were used as described above. If it is desired to use coaxial line with the transmitter, the shield braid should be connected to the chassis, and the inner conductor to the antenna post.

Installation

The design of this transmitter is such that it is easy to install in almost any automobile, including some of the “midget” models. By using standard steel angle brackets, the transmitter unit may be supported under the dashboard, against the bulkhead, or any place where it will fit. The control box, as mentioned before, clamps onto the steering post. The power supply should be mounted as close to the car battery as possible, to reduce the voltage drop in the 6-volt input lead. All three units may be mounted in such a fashion that they can be removed from the car with ease, to be used in a semipermanent location, or in the home station, without having to rebuild completely! This can be made possible if the angle-bracket idea suggested above is used, with self-tapping screws being used to hold the equipment to the brackets. Then, to remove the set-up from the car, merely back out the screws and lift. If there is enough space left over under the dash to permit it, small plastic or metal handles may be bolted to the tops of the utility boxes used as cabinets, thus making it a lot easier to carry them when you decide to go portable.

The transmitter has had several on-the-air checks at the writer’s home QTH, and has performed nobly for its size. With a half-wave antenna, 75-meter ‘phone has been used successfully to cover distances up to 150 miles, and listeners’ reports indicate that it actually put a signal well beyond that range, too. On 40-meter c.w., contacts have been made with almost any station that could be heard, day or night, and the same held true for 80-meter c.w. It proved a little futile to try operating at night in the 75-meter ‘phone band with 20 watts input, but if you are in a location where not more than 5 or 10 miles separates you from the nearest 75-meter ‘phone neighbor, you’ll probably be able to work him in spite of the congestion and competition from the

(Continued on page 118)
**WORKSHOP**

10 over 20 Stacked Array with Rotator and Indicator

This combination is the last word in amateur antenna equipment:

- High Gain
- Light Weight
- Rugged Construction
- Aluminum Alloy Elements
- New Model Rotator with Solenoid Brake
- Matches Directly to 72 Ohm Line

**THE WORKSHOP ASSOCIATES, Inc.**

Specialists in High-Frequency Antennas

63 NEEDHAM ST., NEWTON HIGHLANDS 61, MASSACHUSETTS

---

**Definitely MORE DX**

... less fading

With the DM-430

The Diverse Adaptor, another Decimeter “first”, brings diversity reception to the amateur rig at low cost. The DM-430 feeds the signal from either of two antennas through one stage of broad-band amplification, and then to the antenna terminals of any standard communications receiver. It instantaneously switches antennas to follow the strongest signal. Pilot lights indicate the antenna in use. The DM-430 can be used without tuning on any frequency from 3 to 30 MC.

In minimizing the deep fading which often occurs in high frequency communications, the Diverse Adaptor will select the proper antenna on as little as .05 volts of signal at second detector. It is suitable for balanced or unbalanced antennas, and for FM or AM phone signals. Sensitivity is easily adjusted to receiving conditions.

For further information, write for bulletin 15-B.

---

THE DM-430 DIVERSE ADAPTOR

- Minimizes fading
- Very low power drain
- Combines best features of two antennas
- Completely automatic electronic action—no relays

---

1430 MARKET ST.

INC. DENVER 2, COLO

117
ELINCOR
ALL ALUMINUM BEAMS

Model 300-EA
5-ELEMENT FOLDED DI-POLE 10 METER BEAM. Aluminum tubing construction. Boom ¼" elements ½" telescoping to ¼". All elements and spacing adjustable. Furnished with 5 ft. mast. Feed with RG8/U coaxial cable. Amateur net price... $24.90

Model 200-EA
5-ELEMENT FOLDED DI-POLE 2 METER BEAM. Vertical or horizontal polarization. Can be stacked. Feed with RG8/U coaxial cable. Elements ¼" tube. Amateur net price... $8.40

Model 400-EA
3-ELEMENT FOLDED DI-POLE 10 METER BEAM. Feed with RG8/U coaxial cable. Amateur net price... $34.80

Model 400-R.A
3-ELEMENT 10 METER BEAM. Feed with 300 ohm twinax cable...

10 meter beams furnished with all aluminum supporting ladder and 2½" standoff insulators. Adjustable elements are ¼" aluminum tubing telescoping to ¼".
We also manufacture a complete line of F.M. Television, Broadcast and shortwave antennas. Send for new catalog.

ELECTRONIC INDICATOR CORP.
53 WYCKOFF STREET • • BROOKLYN, N. Y.

WANTED
Teltypewriters complete, components or parts.
Any quantity and condition.
Box 138, QST

RADIO TELEPHONY
RADIO TELEGRAPHY

Courses ranging in length from 7 to 12 months. Dormitory accommodations on campus. The college owns KPAC, 5 KW broadcast station with studios located on campus. 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
PORT ARTHUR, TEXAS

"kilowatt boys." If you have a crystal on your neighbor's frequency, he may even be able to cut you in on the net that he is a part of, and when you have all of the big boys listening for you instead of competing with you, shucks, it's easy! So, get on the air, whether it be from your car, or from your country cabin, or from your home station. You'll be surprised at what you can do with 20 or 30 watts, especially if you've been used to using much more than that. I was, and you'll be, too!

Notes on the Clapp Oscillator

(Continued from page 45)

have none of these difficulties, it was decided to allow the oscillator to run continuously and to take advantage of the mechanical construction to accomplish the necessary shielding. This proved to be a practical solution; no trace of the oscillator can be heard on anything but the fundamental (3.5 Mc.) and this is not objectionable. The unit is keyed in the Class A 6AC7 following the oscillator.

No measurements have been taken on the stability of the VFO. After a warm-up period of 15 to 20 minutes the oscillator will stay in zero beat with a 100- kc. crystal for long periods of time. The main source of drift seems to be the expansion of the inductance. This could be compensated by negative temperature-coefficient capacitance but was not thought worth while for the desired results.

The Clapp oscillator is most certainly superior to previously-used types. It is not a cure-all for VFO troubles, though, and considerable care must be used in construction to realize its capabilities.

50 Mc.

(Continued from page 65)

Up in the Boston area W1OOP and W1PRZ have been working crossband, 144 to 445 Mc., with W1PRZ running an 8012 grounded-grid doubler, driven by his 220-Mc. 829 amplifier. Modulation is applied to both these stages. W1OOP has a revamped BC-645, using a push-pull 6J6 mixer, 955 oscillator and three stages of 7H7 i.f.

Not all the 420-Mc. activity is in metropolitan areas. It takes only two interested hams to make a communications circuit, and there have been that many in Regina, Sask. for more than a year. VE5JK and VE5BL work almost nightly at 7 p.m., with converted BC-645s.

Here's one fellow who is about two bands ahead of most of us. As soon as the 420-Mc. band was released, W1BBM, North Harwich, Mass., was in there, seeing what could be done. Then, almost before others got interested in 420, he was up on 1215 Mc.; then 2400 Mc., and now 3800 Mc. He finds that, with suitable cavities, ordinary lighthouse tubes will operate satisfactorily as high as 3500 Mc., and he would like to hear from other interested workers. He suggests that the i.f. for microwave work be standardized at 30 Mc., making it simpler for all who build for duplex to coordinate their efforts.
distinctive performance

TURNER
MODEL 33
Crystal or Dynamic

Here's a smooth performer you can depend upon for all-around communications, public address, and recording work. The Turner Model 33 combines high output with smooth response over a wide frequency range. Attractively styled with satin chrome finish.

All these performance features
- Moisture sealed crystal or rugged dynamic circuit
- 90° tilting head for semi- or non-directional operation
- 20 ft. removable cable set
- Barometric compensation
- No blasting from close speaking
- Low feedback

THE TURNER COMPANY
917 17th STREET, N. E. • • • CEDAR RAPIDS, IOWA

Microphones BY TURNER

NOW! PEAK VHF PERFORMANCE

The NEW NATIONAL HFS Receiver-Converter

Enjoy amazing reception on the VHF bands with the new NATIONAL HFS Receiver-Converter. There's nothing finer for snagging 6 meter DX!

- Complete Coverage—27 to 250 MCS in 6 bands
- AM-FM-CW—Optimum signal to noise ratio
- Mobile-Portable-Fixed—National 6865 vibrator supply—5886 power supply—or "A" and "B" batteries.
- Receiver or Converter—Makes features of connected receiver usable on VHF.

$142.00 (Power Supply Extra)

Distributors for All National Parts and Receivers

Write for descriptive literature

CENTRAL RADIO PARTS CO.
1723 W. Fond Du Lac Ave., Milwaukee 5, Wisconsin

Wendell Ciganek • W9SYT

ALUMINUM CHASSIS

Any size or shape, built to order. Angles, brackets, sheet, special assemblies. Two-day service on most orders.

JOHN H. HEIM • W3UFF

MONTOURSVILLE R. D. No. 2 PENNSYLVANIA

WANTED...


Box 132 • QST

Hints and Kinks

(Continued from page 68)

"Scotchlite" is a sheet of waterproof flexible material covered with ground glass. The call letters are stenciled on, using thick paint pigment from the bottom of the can so that the paint will not run. Most sign shops now carry this material. If you have a sign made up, be sure to take along a sheet of tin or aluminum to use as the backing plate so that the sign maker can fasten the "Scotchlite" to it with the special waterproof glue that is provided. A variety of colors is available. I use a similar sign (with the name of my town on it) when hitchhiking back from club meetings late at night. — George C. Robinson, W2RCX/4

PLUG-IN SHIELD CANS

While building a new exciter, I found it necessary to shield one plug-in coil, but that meant a plug-in shield would be needed. After some thought the solution shown in Fig. 4 presented itself. It is passed along to others who may like to have good-looking gear but who can't afford the commercially-built refinements.

The shield is a square aluminum coil shield from a defunct b.c. set. The two square brass pieces are drilled as shown, mounted inside the can, and the whole works then plugs onto a pair of banana pins mounted on the chassis. — Bill Wildenhein, W8YTB

Correspondence

(Continued from page 68)

striven for is an efficient antenna. Most of the boats around here are around 40 feet in length and a quarter-wave antenna would look rather bulky, to say the least. We have been using the customary "whip"-type antenna with lengths approximating 22 feet, with fair success. We have tried the antenna mentioned with the hat and top-loading coil, and found it to work substantially better. It does make an odd-looking arrangement, however, and we have more-or-less discarded the "hat" idea for center- or top-loading only, and have found results to be about the same.

For example, the 19-foot center-loaded antenna shows a 6-db. gain over the customary base-loaded antenna of equal length, at the high end of the marine band (3000 kc.). This is equivalent to quadrupling the transmitter output. Thus, a 10-watt transmitter will produce a signal equal to that of
Harvey Wells Receiver AR-3-A
A 5 tube super-het with 1 stage of R.F. designed for Aircraft, but with many Ham applications. Operates from dry batteries. Freq. range, 105 Kc. to 405 Kc. and 550 Kc. to 1500 Kc. in two bands. Has fixed freq. position at 275 Kc. for tower reception and 1020 Kc. filter for Range voice reception. Ideal for use with a converter or modified for portable or mobile work. Brand new and at a bargain price. Complete with tubes, battery, connecting cable and instruction manual.

Stock No. 4-F-7 Model AR-3-A
Shpg. Wt. 13½ lbs. Regular price $79.50, Our Price ONLY $24.95 DEL.

Harvey Wells Transmitter AT-3-B
A crystal controlled transmitter designed for aircraft, but easily adapted to Ham applications with slight modifications. Operates from 6 Volts D. C. 10-12 watts R. F. output. Crystal freq. 3105 Kc. Completely self contained including power supply. Push to talk operation. 7C5 final amp., PP 705 Class A.B modulator. Brand new and at a price that is right. Complete with tubes, Xtal, 6 Volt D. C. vibrator power supply, connecting cables and instruction manual.

Stock No. 4-E-4 Model AT-3-B Shpg. Wt. 17 lbs. Regular price $79.50. Our Price ONLY $24.95 DEL.

Harvey Wells Transceiver ATR-3
This unit is a combination transmitter and receiver of the same general description as the AT-3-B emitter and the AR-3-A Rec. except the receiver utilizes 6 volt tubes for use on 6 volts D. C. and vibrator pack operation. Completely self contained. An ideal setup for Ham portable or mobile operation by modifying circuit. Brand new and at a price that can't be passed up. 7C5 R. F. output, PP 705's A.B. output and Modulator. Complete with tubes, Xtal, 6 volt D. C. vibrator power supply, connecting cables and instruction manual.

Stock No. 4-F-2 Model ATR-3 Shpg. Wt. 14½ lbs. Regular price $159.95. Our Price ONLY $49.95 DEL.

SHIPPED PREPAID ANYWHERE IN CONTINENTAL U. S. Not Surplus But Brand New, Post-War Design and Manufacture!

THE HOUSE OF "SURPRISE" TRADE-INS
1125 PINE ST. • ST. LOUIS 1, MO.
Editor, QST:

I have been reading QST for many years and can say it's the one magazine I always look forward to receiving. . . .

—Forest Richardson, W6UTG

“QUICKIES”

Squad TN-7, Scott Air Force Base, Belleville, Ill.

Editor, QST:

I find a large percentage of fellows making flimsy excuses for terminating QSOs. How about a CQ-plus-something to mean only a report, names, addresses and possibly QSLs are desired? It sounds silly for a fellow, trying to find out just what a new antenna will do, to tell about ten stations that his XYL is calling him for supper.

—Fred W. Rommermann, W9YMD

A VISIT TO HQ.

Shepherd, Tenn.

Editor, QST:

Much has been printed about the physical and technical aspects of ARRL headquarters. A recent visit moves me to testify to the entirely human and hamlike atmosphere prevailing there as well.

I have been a League member for over two decades. I like traffic and handle it with some measure of success, but I have never held any elective office and I hold no League appointment higher than ORS. What I am getting at is that I was no big shot to make a fuss over. I had anticipated seeing the head of the Communications Department, Mr. Handy, and having a key for the national emergency coordinator, "Doc" Hayes, because we had seen a good deal of each other during the Florida and Gulf Storms of 1947. I estimated that thirty minutes with each would not wear me out and behind the scenes of many enterprises, and you can pretty well tell when men of executive ability are in charge of a business. It is my considered opinion that such men are in charge at West Hartford. I hope that as opportunity offers other hams, especially those living in other sections of the country, will visit Headquarters. —Benton White, W4PL

THE RADIO AMATEUR’S LICENSE MANUAL

Before you can operate an amateur transmitter, you must have a government license and an officially assigned call. These cost nothing—but you must be able to pass the examination. The examinations are based on the multiple-choice type of questions. The “License Manual” has been written to make it as easy as possible for the individual to acquire the necessary knowledge to pass the examination with flying colors. Whether you are going up for your Class C, B or your Class A ticket, “The License Manual” will provide the most direct path to getting that ticket. If you are one of the thousands who always want a “License Manual” around the shack for ready reference for amateur regulations, it will please you to know that the regulations are very thoroughly indexed. 25 cents • POSTPAID ANYWHERE (No Stamps, Please)

AMERICAN RADIO RELAY LEAGUE
WEST HARTFORD, CONNECTICUT

SWITCH TO SAFETY!

510 W. Elm St., Compton, Calif.

Editor, QST:

I have been reading QST for many years and can say it’s the one magazine I always look forward to receiving. . . .

—Garner A. Hadland
Owned with Pride by the Majority of Amateurs

ASTATIC MICROPHONES

SENDING AND RECEIVING — and doing it well — never loses its flavor as one of man’s noble ventures. That’s why few human experiences are more gratifying than the proud ownership of a fine amateur rig. It is also the reason amateur operators are so discriminating in their choice of equipment. When it comes to microphones, the great majority still choose Astatic. These truly superior instruments have been passing the acid test of actual usage more often, for more years, than any other make. For complete information, please feel free to write.

Astatic Crystal Devices manufactured under Brush Development Co. patents

Wanted

... TRC1 equipment, T14 transmitters, R19 receivers, AM and amplifiers, PP13 power units.

Box 141 QST

THE KEY TO PERFECT CW

Electronic Monitor and Key

Flawless CW — smooth, rhythmic as a tape — can be quickly achieved by anyone who uses the new MON-KEY.

FEATURES

- Automatic dots and dashes
- Dashes equal to three dots in duration
- Speed approx. 8 to 45 words per minute
- No weights to adjust
- Monitor with volume control
- Operation 115 v AC or DC

ONLY $29.95

Amateur Net

If your dealer can’t supply you, send check for $29.95 direct to us. Immediate shipment on Money Back Guarantee.

ELECTRIC EYE EQUIPMENT CO.
6 West Fairchild Street, Danville, Ill.

EXPORT: Rock e International Corp., 13 E. 40th St., New York 16, New York

- Owner

2219 Mechanic Street

GALVESTON, TEXAS

LEARN CODE!

SPEED UP Your RECEIVING with G-C Automatic Sender

Type E

$24.00 Postpaid in U. S. A.

Housed in Aluminum Case, Black Instrument Finished. Small—Compact—Quiet Induction type motor, 110 Volt—60 Cycle A.C.

Adjustable speed control, maintains constant speed at any Setting. Complete with ten rolls of double perforated tape. A wide variety of other practice tapes available at 50c per roll.

GARDINER & COMPANY

STRATFORD • NEW JERSEY

QSL RUBBER STAMP

As advertised Oct. QST, page 129. We are swamped with orders. Get your name on our list now.

J. V. LOVE & COMPANY
E. E. Joel (W5APP) Owner
2219 Mechanic Street
GALVESTON, TEXAS
HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in the pursuit of the art.

(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters be used which would tend to make one advertisement stand out from the others.

(3) Each advertisement shall be limited to 74 words or sentences in any one issue or more than one ad in one issue.

HAMS

1.0: METER

124

Our business! Buying and selling amateur radio transmitters. QSLs, Quality printing: M. P. Schlachter, W2LNT, 111 Center St., Cleveland, Ohio.

2.0: METER

Our surplus equipment owned, used and for sale by an individual member of the Radio Relay League. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual member of the Radio Relay League, will be allowed. Nevertheless, the Radio Relay League reserves the right to refuse advertising of any surplus equipment owned, used and for sale by an individual member of the Radio Relay League.

3.0: METER


4.0: METER

Sell: BC312G in good condition. Has crystal phasing, AC power supply, tube 12s00. Super complete, $725.00 Bargain. A. P. Schlachter, W2LNT, 2864 May Ave., Cincinnati, Ohio.

5.0: METER

Sell: BC132G in good condition. Has crystal phasing, AC power supply, 12s00 power, $600.00. Arthur Sterman, W3KFS, 3620 Hobart Ave., Cleveland, Ohio.

6.0: METER


7.0: METER

WANTED: LC-3, complete with matching speaker, packed in original carton. $250.00. F. A. Witte, Ex-W9PDJ, 5644 W. Huron St., Chicago 44, Ill.

8.0: METER

Buck Manor or RiderChannel; will pay cash or swap W9AUY, 347 Naperville Road, Westmont, Ill.

9.0: METER

WANTED: Tele-5, 4132-A, Super-Pro, in good condition. $250.00. F. A. Witte, Ex-W9PDJ, 5644 W. Huron St., Chicago 44, Ill.

10.0: METER

SALE: MEISSNER 150-B transmitter modified for 10 M. with separate power supply for 800 ft. $125.00. F. A. Witte, Ex-W9PDJ, 5644 W. Huron St., Chicago 44, Ill.

11.0: METER

Super-Pro, in good condition. Have 20-meter band requires slight adjustment. $275.00 Bargain. A. P. Schlachter, W2LNT, 2864 May Ave., Cincinnati, Ohio.

12.0: METER


13.0: METER

MEISSNER 150-B transmitter modified for 10 M. with separate power supply for 800 ft. many other desirable features added. $200.00. F. A. Witte, Ex-W9PDJ, 5644 W. Huron St., Chicago 44, Ill.

14.0: METER

Super-Pro, in good condition. Have 20-meter band requires slight adjustment. $275.00 Bargain. A. P. Schlachter, W2LNT, 2864 May Ave., Cincinnati, Ohio.

15.0: METER


16.0: METER

FOR SALE: HT9, 1947 model, with 10, 20, 40, and 80 meters. Used, in excellent condition. $95.00. W. H. C. Craig, 914 E. 12th St., Bridgeport, Conn.

17.0: METER

FOR SALE: HT9, 1947 model, with 10, 20, 40, and 80 meters. Used, in excellent condition. $95.00. W. H. C. Craig, 914 E. 12th St., Bridgeport, Conn.

18.0: METER

WANTED: Call Book magazines for year 1931, your price. L. Guinn, 37 Lynwood Ave., Temple, Texas.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR TRADE: 10 M excavator, complete, sealed in overseas crate, $12.50. H. L. Knapp, 429 Shore Drive, Brooklyn 29, N. Y.

FOR SALE: 2 indicator, $104.90. W2QXG, 1124 Cumberland St., Philadelphia 23, Penna.


FOR SALE: Military surplus, complete, $145.00. W1KC, 240 Moreland St., Wheeling, W. Va.

FOR SALE: Converted Navy aircraft GF12 transmitter, RU17 receiver, $40.00. B. J. Parisi, Onset, Mass.

FOR SALE: Converted Navy aircraft GF12 transmitter, RU17 receiver, $40.00. B. J. Parisi, Onset, Mass.

FOR SALE: BC459A with power supply. 10 meter phone/cw receiver for 420 Mc. W2PVG, 99 Evergreen Ave., Emilla, N. Y.

FOR SALE: BC-344D (A.C.), 150-1500 Kc., $35.00; McMurdo Silver 10-11 meter converter. Excellent condition for $100.00. W1JAI, 115 30th St., College Point, N. Y.

FOR SALE:蓝天门 fat receiver, complete, and used only a few hours. Condition perfect. In original carton. $145.00. W1KC, 240 Moreland St., Wheeling, W. Va.

FOR SALE: 25-watt transmitter, Skybuddy receiver, many parts. Library. War surplus electronic keyer. Write for detailed list. C. R. Englund, Jr., 160 Vanna Vista Road, Bridgport, Conn.

FOR SALE: Triplett modulation monitor model 159B-A, 100 watt Varic 300 V power supply, Meissner receiver, 1-4885 meter, blank header cabinet. Excellent condition $95.00. W3EFT, 2174 R., Cumberland St., Philadelphia 16, Penna.

FOR SALE: New NC-173 receiver, complete. and used only a few hours. Condition perfect. In original carton. $145.00. W1KC, 240 Moreland St., Wheeling, W. Va.

FOR SALE: Converted RT-7/APN-1 transceiver for 420 Mc. W2PVG, 99 Evergreen Ave., Emilla, N. Y.

FOR SALE: Skybuddy receiver. many parts. Library. War surplus electronic keyer. Write for detailed list. C. R. Englund, Jr., 160 Vanna Vista Road, Bridgport, Conn.

FOR SALE: QST’s July 1932 to 1935, complete. With some errors in some issues. $15.00. G. C. Taylor, Sumrall, Miss.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.

FOR SALE: QST’s January 1928 to date, $11.00. C. R. Englund, 89 Lynnwood Ave., Wheeling, II.
THE No. 90902, No. 90903 and No. 90905 Rack Panel Oscilloscopes, for two, three and five inch tubes, respectively, are inexpensive basic units comprising power supply, brilliance and centering controls, safety features, magnetic shielding, switches, etc. As a transmitter monitor, no additional equipment or accessories are required. The well-known trapezoidal monitoring patterns are secured by feeding modulated carrier voltage from a pickup loop directly to vertical plates of the cathode ray tube and audio modulating voltage to horizontal plates. By the addition of such units as sweeps, pulse generators, amplifiers, servo sweeps, etc., all of which can be conveniently and neatly constructed on companion rack panels, the original basic scope unit may be expanded to serve any conceivable industrial or laboratory application.
FOR GREATER LISTENING PLEASURE

-MATCH YOUR SPEAKER RESPONSE TO THE PROGRAM

Complete listening enjoyment of the quality inherent in FM broadcasts and high-fidelity phonograph recordings may require loudspeaker response up to 12,000 cycles or more. AM broadcasts may demand response of 5,000 cycles or less, while other program material may call for other high-frequency cut-off points. Matching loudspeaker response to today's wide range of program material is essential for real listening pleasure.

Jensen Coaxial speakers (Models HNP-51, JAP-60 and JHP-52) meet this need simply and positively.

A 4-position high-frequency selector switch adjusts the speaker response to suit listener preference and a level control adjusts the overall volume of the program. These two controls are exclusive JENSEN features.

JENSEN MANUFACTURING COMPANY, 6611 S. LARAMIE AVE., CHICAGO 38, ILL
IN CANADA: COPPER WIRE PRODUCTS, LTD., 11 KING ST., W., TORONTO

Model HNP-51 Coaxial
Without doubt the finest existing 15-inch Coaxial loudspeaker regardless of price. Compression-type horn unit contributes to an exceptional polar pattern and realistic "presence". Frequency response, in a Bass Reflex enclosure, extends through the entire useful frequency range. Power rating 25 watts maximum speech and music signal input. Input impedance 500-600 ohms. List price . . . . . . . $125.00

Model JAP-60 Coaxial
A superior quality 15-inch Coaxial loudspeaker with excellent polar pattern. Response, in a Bass Reflex enclosure, extends through the entire useful frequency range. Power rating 20 watts maximum speech and music signal input. Input impedance 500-600 ohms. List price . . . . . . . $85.00

Model JHP-52 Coaxial
A high-quality 15-inch Coaxial loudspeaker at an economy price. Frequency response, in a Bass Reflex enclosure, extends through the entire useful frequency range. Power rating 16 watts maximum speech and music signal input. Input impedance 500-600 ohms. List price . . . . . . . $72.00

Model JRP-40 Coaxial
The ultimate in 12-inch Coaxial value. Frequency range, in a Bass Reflex enclosure, from 30 to 12,000 cycles. Power rating 12 watts maximum speech and music signal input. Input impedance 6-8 ohms. "Bridging" type network. H-F range control not included but "shelving" type control (ST-606) may be added by user. List price . . . . . . . $30.00
Which Better Pay
Do You
Want?

A Nice Home
A New Car
Greater Security
Happy Vacations
and Travel

Make Your Hobby Into a Good Paying Job

Get Your FCC LICENCE
in a Few Short Weeks

It's EASY if you use CIRE Simplified Training and Coaching AT HOME in SPARE TIME

Get your license easily and quickly and be ready for the $3000 to $7500 jobs that are open to ticket holders. CIRE training is the only planned course of coaching and training that leads directly to an FCC license.

YOUR FCC TICKET IS RECOGNIZED IN ALL RADIO FIELDS AS PROOF OF YOUR TECHNICAL ABILITY

CIRE Graduates Find FCC License Pays Off

"I now hold ticket P-10-3787, and holding the license has helped me to obtain the type of job I've always dreamed of having. Yes, thanks to CIRE, I am now working for CAA as Radio Maintenance Technician, at a far better salary than I've ever had before. I am deeply grateful." — Student No. 3319N12

"I was issued License P-1-1188 on November 4. The next day I was signed on board a tanker as Radio Operator-Purser. Besides radio operating, I handle the payrolls, etc., which is all over-time and brings my monthly pay up to between $300 and $650." — Student No. 2355N12

CLEVELAND INSTITUTE OF RADIO ELECTRONICS
4900 Euclid Bldg., Cleveland 3, Ohio

GET THIS AMAZING NEW BOOKLET

1. Tells of thousands of brand-new, better-paying radio jobs now open to FCC License Holders.
2. Tells how you will benefit by holding an FCC Commercial License.
3. Tells how YOU can get your FCC Commercial Radio Operators' License IN A FEW SHORT WEEKS — EASILY AND QUICKLY, by using CIRE simplified training and coaching AT HOME in your SPARE TIME.
4. Tells of hundreds of our successful students who now have licenses and new, better-paying jobs.
5. Tells how we prepare you to pass the new FCC Commercial License Examinations, which now include FM and Television.
6. Tells how we guarantee to train and coach you until you get your license.
7. Tells how we help you to get a better-paying, licensed job, with our free and exclusive service, which prepares your employment application for mailing to hundreds of employers, including FM, AM and Television Broadcast Stations, Radio Manufacturers, Police Radio Stations, and Radio-Equipped Taxi, Bus and Public Utility Companies.

CLEVELAND INSTITUTE OF RADIO ELECTRONICS
Desk QT-1 4900 Euclid Bldg., Cleveland 3, Ohio (Address to Desk No. to avoid delay)

I want to know how I can get my FCC ticket in a few short weeks by training at home in spare time. Send me your FREE booklet, "Money Making FCC License Information," as well as a sample FCC-type exam and free booklet, "How to Pass FCC License Examination" (does not cover exams for Amateur License).

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

☑ Veterans check for enrollment information under G.I. Bill

NO OBLIGATION — NO SALESMAH
on the WORLD-FAMOUS NATIONAL HRO-7

Subjected to the severest tests of government, commercial and amateur use for 14 years, the basic HRO design has set a new high in receiver performance. Now, here it is in its newest, finest form. As always the major components are National designed and made.

RANGE: 1.7 to 30 mcs. (Additional coils available for 50 to 430 kcs, 480 to 2,050 kcs, 30 to 35 mcs.)

SENSITIVITY: 1 microvolt or better.

IMAGE REJECTION: Better than 30 db at 30 mcs.

SIGNAL-TO-NOISE RATIO: Exceeds 16 db with 5 microvolts input.

AVC Characteristic: to ± 10 db between 1.0 and 100,000 microvolts input.

$312.86 (Complete with coils and power supply, less speaker)
Still unmatched... 

in price—power—performance

No wonder RCA 807 and 813 beam power tubes are today's favorites for finals! These huskies require less drive and deliver more output at lower plate voltage, than any other similar tube types within a comparable price range. You get the same results with fewer stages, smaller driver tubes, and a less elaborate power supply.

What's more, RCA 807's and 813's—like all RCA beam power tubes—are excellent for quick-change, multi-band transmitters because they seldom require stabilization in well-designed circuits. Where difficulties may arise, permanent stabilization on all bands is simply achieved by neutralization or degeneration... at no sacrifice in efficiency.

To get the most out of your beam power tubes, be sure to read the article on stabilization in the May-June 1947 issue of *Ham Tips*. See your RCA Tube supplier for a copy, or write RCA, Commercial Engineering, Section 48AM, Harrison, N.J.