The New Fourth Edition of
The Radio Amateur's Handbook
By HANDY and HULL

FOR THOSE WHO DON'T KNOW IT:
The Handbook is a practical manual of amateur radio in all its phases, published by the American Radio Relay League, the amateur's own organization. It starts at the beginning and tells the whole story: What amateur radio is, How to be a radio amateur, How to obtain your licenses, How to build the simple apparatus of a simple station, How to build the best known apparatus for the most modern station, How to operate the station. Enough information to keep you busy and interested for five years.

FOR THOSE WHO DO KNOW IT:
For years the Handbook has been the practical working guide of successful amateurs the world over. Now it has been completely revised in terms of 1929, by Mr. Handy, the League's Communication Manager, as to all the aspects of operating procedure, and by Mr. Hull, the director of the League's current Technical Development Program, as to all its features of apparatus and technical matters. Everything in it is on a 1929 basis, replacing the 1928 methods which used to be good enough but aren't any more.

MUCH THAT IS NEW — ALL THAT IS GOOD
Like QST, "Devoted Entirely to Amateur Radio"
Now in its 43rd thousand
240 pages, 6½ x 9½, 188 illustrations

In wealth of treatment and profusity of illustration the Handbook is a big book. Printed in usual textbook style it would bulk 500 pages and cost at least $1, but its publication in the familiar QST format makes for handiness and enables its distribution at very modest cost.

ALGERIAN PAPER COVER $1
STIFF BUCKRAM BINDING $2

Postpaid anywhere in the World

American Radio Relay League, Hartford, Conn., U.S.A.
RCA RADIOTRON UV-211

An excellent Oscillator, Modulator and Power Amplifier

For the amateur who has his transmitter working at frequencies below 3000 kilocycles (wave lengths above 100 meters), Radiotron UV-211 may be advantageously used.

Tested and tried through years of service, it has proved its worth as a general purpose transmitting tube. It is stable as an oscillator, excellent as a modulator, and powerful as an amplifier.

Filament Volts .......... 10
Filament Amperes ...... 3.25
Amplification Factor .... 12

Oscillator and RF Power Amplifier

Max. Operating Plate Voltage
Modulated DC Plate Volts 1000
Non-modulated DC Plate Volts 1250
AC Plate Volts (RMS) 1500
Max. DC Plate Current (milliamperes) 175
Max. Plate Dissipation (watts) 100

A. F. Power Amplifier

Normal Operating Plate Volts..... 1000
Grid Bias Volts............ -55
DC Plate Current (m.a.) .... 72
Plate Resistance (ohms)..... 3100
Plate Dissipation............ 72
Undistorted Power Output
(watts) ..................... 10

Modulator

Normal Operating Plate Volts..... 1000
Grid Bias Volts ............. -70
DC Plate Current (m.a.) ...... 20
Plate Dissipation (watts) .... 20

Radiotron UV-211 may, for certain amateur use, be obtained through the RCA District Office nearest you.

Firm Net Price (subject to change without notice) ....... 30.00

RADIO CORPORATION OF AMERICA

New York, - - 261 Fifth Ave. San Francisco, 235 Montgomery Street
Chicago, 100 West Monroe Street Atlanta, - - 101 Marietta Street
Dallas, Santa Fe Building, Unit No. 1
Most Astounding Value Ever Offered!

KOLOSTER

ELECTRO-DYNAMIC REPRODUCER

Combined with 210 Power Amplifier and "B" Supply Unit

THESE Dynamic Reproducers are Kolster built, packed in the original Kolster cases and cartons, shipped direct to us from the Kolster factory from whom we have purchased all of these Dynamic Reproducers. Every Dynamic Reproducer is brand new, each bears the Kolster guarantee tag and the original serial number.

Such opportunity as herein presented is seldom available. And they won't last long at this low price. We suggest quick action — there's quality here — at a price heretofore unknown.

THIS finely matched, rugged unit, comprises a complete heavy duty Electro-Dynamic Reproducer, including a 210 Power Amplifier with "B" supply unit, all self-contained on a steel frame. It weight 45 pounds without the cabinet. The cabinet itself is of pencil-striped walnut, beautifully designed with Cathedral grille. It is equipped with switch for control of house current to reproducer, power unit and amplifier. A pilot light indicates when the Reproducer is in operation.

If desired the 210 Power Amplifier will also supply 22-07 and 90 volts "B" current, sufficient for any set using up to 8 tubes. An automatic voltage regulator tube, UX-874, maintains the "B" voltage silent and steady.

This Electro-Dynamic Reproducer can be used with any battery or A.C. set, replacing the last audio stage or be used with all tubes of the set. Wherever used, it will bring out every shading and range of tone: every note is reproduced with utmost faithfulness, pure and undistorted. It will modernize any radio receiver.

The following tubes are required for its operation: 2-UX-281 (for full-wave rectification); 1-UX-210 (for super power amplification); 1-UX-874 (for voltage regulation). For use with phonograph pick-up, one additional audio stage is recommended between the pick-up and the Reproducer.

A 20-ft. cable is included with each instrument, Operates direct from 50-60 cycle, 110-120 volt A.C. current.

Licensed under patents of the RCA and Lektophone Corp.

MODEL K-5

Height ..................... 42"
Width ..................... 25½"
Depth ..................... 19"

Features:
1. Electro-Dynamic Reproducer (10¼-in. dia.).
3. Supplies "B" voltage, if desired.
4. Can be used with any electric or battery set.
5. Complete A.C. Electric operation.

List Price $175.00  Never Before $54.00
(Without Tubes)

Terms: 20% cash with order, balance C.O.D., F.O.B. New York

AMERICAN SALES CO., 19-21 Warren Street, New York City

Say You Saw It in QST -- It Identifies You and Helps QST
P. T. 537
FILAMENT RHEOSTATS
Rated to carry 15 amps.

LIST
$10.60

Special $3.75 ea.

ROTARY GRID CHOPPER WHEEL
MODEL P.X. 1638
and Contact Brush Model P.T. 1642
For use with C.W. Vacuum Tube Transmitters. Gives 100 per cent modulation since oscillation can be completely started and stopped at audio frequencies. The note obtained can be varied to any desired pitch by changing the driving motor speed. Complete with shaft bushing for 5-16" or 1/4" motor shaft. When ordering mention size wanted.

LIST
$7.45

Special $1.25 ea.

VARIABLE
MICA CONDENSER
MODEL U.C. 1819
Capacity 0.001 to 0.005 Mfd.
A Mica Condenser which may be varied continuously from a minimum to a maximum value. Its capacity curve is a straight line, it has a very low electric loss, used as a grid, antenna, or secondary tuning condenser.

LIST
$8.75

Special $1.75 ea.

PORCELAIN LOW-LOSS
SOCKETS
MODEL U.R. 542
For use with U.X. 856, 855, 855, 860, 245, 210 and 250 tubes
On account of its low specific inductive capacity and its high insulating qualities, these sockets are excellent for Short wave work and especially adapted to the above tubes.

LIST
$1.00

Special 50¢ ea.

**Dubilier High-Voltage Filter Condensers**
(Nearest Types, Nos. 902 and 903)
These Dubilier Filter Condensers are tested from 3 to 5 times their rated value, thus assuring a sturdy, scientifically designed product, far exceeding the average filter Condensers now being used. Widely separated soldering lugs are provided to insure long leakage path and to facilitate next wiring. Each condenser brand new and packed in individual carton.

**TYPE No. 902**
Rated D.C. Working Voltage 400 V.
Capacity: 1 Mfd.
List Price $2.50 ea. .......... SPECIAL 75¢ ea.

Capacity: 2 Mfd.
List Price $3.50 ea. .......... SPECIAL 1.05¢ ea.

Capacity: 4 Mfd.
List Price $5.50 ea. .......... SPECIAL 1.65¢ ea.

**TYPE No. 903**
Rated D.C. Working Voltage 600 V.
Capacity: 1 Mfd.
List Price $3.00 ea. .......... SPECIAL 90¢ ea.

Capacity: 2 Mfd.
List Price $5.00 ea. .......... SPECIAL 1.65¢ ea.

Capacity: 4 Mfd.
List Price $9.00 ea. .......... SPECIAL 2.85¢ ea.

**FILTER CHOKES**
20 HENRIES — 250 MILLS
Just what you want for obtaining a pure D. C. note for your Transmitter. Also can be used in "A" or "B" Eliminators.
Weight 5 pounds. Wiring heavily insulated. New and packed in individual cartons.

SPECIAL $2.50 ea.

**LAST MINUTE SPECIALS**
R.C.A. Uni-Rectron Power Amplifiers — Model A P. 935 List 88.50 ea. ... SPECIAL 19.75 ea.
U.S. ARMY Autoplane Spark Transmitters, Gov. lot $47 ea. .......... 1.60 "
G. E. Kenotron Rectifying Tubes (Type T.B.I.) .......... 4.25 "
G. E. V.T. 14 — 5 watt Transmitting Tubes (A good power amplifying tube) .......... 1.50 "
Western Electric Type 2A. Filters .......... 2.50 "

AMERICAN SALES CO., 19-21 Warren Street, New York City
ALUMINUM SHIELDING

A notable contribution to radio design

Since the beginning of 1929, five more prominent manufacturers have adopted Aluminum Shielding. Twenty-seven leading sets are now designed for Aluminum Shielding—an almost universal acceptance.

The reason is evident. Aluminum is highly efficient electrically—especially at radio frequencies. It works easily and well in the shop. It appeals to both purchaser and producer—because it is attractive in appearance, light in weight and non-corrosive.

And Aluminum Shields are economical, from the standpoint of first cost—in production—and in finishing. We solicit your inquiries.

ALUMINUM COMPANY OF AMERICA
2439 Oliver Building, Pittsburgh, Pa.
Offices in 18 Principal American Cities

ALUMINUM

The mark of quality in Radio
Section Communications Managers of
THE COMMUNICATIONS DEPARTMENT, A. R. L. R.

**ATLANTIC DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>J. B. Morgan, 2nd</td>
</tr>
<tr>
<td>New England</td>
<td>Dr. H. H. Layton</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>M. D. Lashley</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>J. C. Taylor</td>
</tr>
<tr>
<td>Connecticut</td>
<td>A. W. Macy</td>
</tr>
</tbody>
</table>

**CENTRAL DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>Fred J. Hinds</td>
</tr>
<tr>
<td>Indiana</td>
<td>D. L. James</td>
</tr>
<tr>
<td>Kentucky</td>
<td>J. B. Warner, III</td>
</tr>
<tr>
<td>Michigan</td>
<td>G. C. Stobbe</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>C. C. Crete</td>
</tr>
</tbody>
</table>

**DAKOTA DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Dakota</td>
<td>H. S. Warner</td>
</tr>
<tr>
<td>South Dakota</td>
<td>D. M. Fueck</td>
</tr>
<tr>
<td>Minnesota</td>
<td>J. L. Lobe</td>
</tr>
<tr>
<td>South Dakota</td>
<td>J. C. Pohelshek</td>
</tr>
</tbody>
</table>

**DELTA DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas</td>
<td>H. E. Valte</td>
</tr>
<tr>
<td>Louisiana</td>
<td>M. M. Hild</td>
</tr>
<tr>
<td>Mississippi</td>
<td>L. W. Gillett</td>
</tr>
<tr>
<td>Nevada</td>
<td>Police Purdine</td>
</tr>
</tbody>
</table>

**HUDSON DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>K. H. Holbrook</td>
</tr>
<tr>
<td>New Jersey</td>
<td>M. K. Keff</td>
</tr>
<tr>
<td>New Jersey</td>
<td>A. G. Wester, Jr.</td>
</tr>
<tr>
<td>New Jersey</td>
<td>S. V. Warner</td>
</tr>
</tbody>
</table>

**NEW ENGLAND DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Hampshire</td>
<td>E. A. White</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>H. W. Kerr</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>H. L. Amos</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>C. B. Deitl</td>
</tr>
</tbody>
</table>

**NORTHERN DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maine</td>
<td>W. B. Wilson</td>
</tr>
<tr>
<td>Maine</td>
<td>W. B. Wilson</td>
</tr>
<tr>
<td>Maine</td>
<td>W. B. Wilson</td>
</tr>
<tr>
<td>Maine</td>
<td>W. B. Wilson</td>
</tr>
<tr>
<td>Maine</td>
<td>W. B. Wilson</td>
</tr>
<tr>
<td>Maine</td>
<td>W. B. Wilson</td>
</tr>
</tbody>
</table>

**PACIFIC DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nevada</td>
<td>F. L. Fullaway</td>
</tr>
<tr>
<td>Nevada</td>
<td>L. H. Newcomb</td>
</tr>
<tr>
<td>California</td>
<td>D. C. Wallace</td>
</tr>
<tr>
<td>California</td>
<td>J. W. Knowles</td>
</tr>
<tr>
<td>California</td>
<td>J. W. Knowles</td>
</tr>
<tr>
<td>California</td>
<td>J. W. Knowles</td>
</tr>
<tr>
<td>California</td>
<td>J. W. Knowles</td>
</tr>
<tr>
<td>California</td>
<td>J. W. Knowles</td>
</tr>
</tbody>
</table>

**ROANOKE DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virginia</td>
<td>L. H. Wilson</td>
</tr>
<tr>
<td>Virginia</td>
<td>F. D. Reynolds</td>
</tr>
</tbody>
</table>

**ROCKY MOUNTAIN DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>C. R. Steedman</td>
</tr>
<tr>
<td>Colorado</td>
<td>W. J. James</td>
</tr>
<tr>
<td>Colorado</td>
<td>W. J. James</td>
</tr>
<tr>
<td>Colorado</td>
<td>W. J. James</td>
</tr>
<tr>
<td>Colorado</td>
<td>W. J. James</td>
</tr>
<tr>
<td>Colorado</td>
<td>W. J. James</td>
</tr>
</tbody>
</table>

**SOUTHEASTERN DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Carolina</td>
<td>G. R. Steedman</td>
</tr>
<tr>
<td>South Carolina</td>
<td>W. J. James</td>
</tr>
<tr>
<td>South Carolina</td>
<td>W. J. James</td>
</tr>
<tr>
<td>South Carolina</td>
<td>W. J. James</td>
</tr>
<tr>
<td>South Carolina</td>
<td>W. J. James</td>
</tr>
<tr>
<td>South Carolina</td>
<td>W. J. James</td>
</tr>
</tbody>
</table>

**WEST GULF DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>E. H. Robinson, Jr.</td>
</tr>
<tr>
<td>Texas</td>
<td>W. J. Gentry</td>
</tr>
<tr>
<td>Texas</td>
<td>R. E. Franklin</td>
</tr>
<tr>
<td>Texas</td>
<td>L. E. Roska</td>
</tr>
</tbody>
</table>

**MARITIME DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maine</td>
<td>J. L. Reid</td>
</tr>
<tr>
<td>Maine</td>
<td>J. L. Reid</td>
</tr>
<tr>
<td>Maine</td>
<td>J. L. Reid</td>
</tr>
<tr>
<td>Maine</td>
<td>J. L. Reid</td>
</tr>
<tr>
<td>Maine</td>
<td>J. L. Reid</td>
</tr>
<tr>
<td>Maine</td>
<td>J. L. Reid</td>
</tr>
</tbody>
</table>

**ONTARIO DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario</td>
<td>E. C. Thompson</td>
</tr>
<tr>
<td>Ontario</td>
<td>E. C. Thompson</td>
</tr>
<tr>
<td>Ontario</td>
<td>E. C. Thompson</td>
</tr>
<tr>
<td>Ontario</td>
<td>E. C. Thompson</td>
</tr>
<tr>
<td>Ontario</td>
<td>E. C. Thompson</td>
</tr>
<tr>
<td>Ontario</td>
<td>E. C. Thompson</td>
</tr>
</tbody>
</table>

**QUEBEC DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quebec</td>
<td>Alex Reid</td>
</tr>
<tr>
<td>Quebec</td>
<td>Alex Reid</td>
</tr>
<tr>
<td>Quebec</td>
<td>Alex Reid</td>
</tr>
<tr>
<td>Quebec</td>
<td>Alex Reid</td>
</tr>
<tr>
<td>Quebec</td>
<td>Alex Reid</td>
</tr>
</tbody>
</table>

**PRAIRIE DIVISION**

<table>
<thead>
<tr>
<th>State</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minnesota</td>
<td>D. B. Sinclair</td>
</tr>
<tr>
<td>Minnesota</td>
<td>W. J. Pickering</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>D. B. Sinclair</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>W. J. Pickering</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>W. J. Pickering</td>
</tr>
</tbody>
</table>

*Temporary official appointed to act until the membership of the Section concerned choose permanent SCM by renomination and election.
One Frequency Meter
for
Five Amateur Bands

The Type 558-P Amateur-Band Frequency Meter does give you five instruments for the price of one, but there are other just as important reasons for your choosing it.

It's handy and easy to operate. Hold it in one hand and tune it with the other. The vernier tuning control makes exact adjustment possible.

But, above all, it is calibrated with an accuracy of ¼ of 1% against the same laboratory standard used to calibrate the General Radio line of Precision Frequency Meters.

Price $18.00

Ask to see Bulletin P-1

GENERAL RADIO COMPANY
30 STATE STREET
CAMBRIDGE, MASSACHUSETTS

274 BRANNAN STREET
SAN FRANCISCO, CALIFORNIA
Editorials ................................................. 9
Standard Frequency Transmissions of WWV ................. 10
Rocking the Boat ........................................ 10
Hiram Percy Maxim
WSARO ................................................... 11
Another "1929-Type" Receiver ................................ 15
P. S. Hendricks
Some Changes in Our Staff .................................. 18
Wired Wireless ........................................... 19
J. E. Smith
The Glutton ................................................ 21
"Felix"
Concerning the Super-Heterodyne .............................. 22
J. M. Grigg
Single Control for the High-Beat Super-Heterodyne ........... 23
Hull Returns to Australia .................................. 26
William M. Smith
The Governors-President Relay ............................... 27
C. L. Loudon
Keying the Oscillator-Amplifier .............................. 30
Official Frequency System .................................. 32
R. J. Keyler
Alternating Current Rectification as Applied to Radio — Part II
Commission Doings ......................................... 40
Experimenter's Section ..................................... 41
Hudson Division Convention ................................ 45
The Communications Department ............................... 46
I.A.R.U. News .............................................. 62
Calls Heard ................................................. 63
Correspondence Department .................................. 64
QST's Station Cup ......................................... 89
Roanoke Division Convention ................................. 90
Statement of Ownership ..................................... 91
Ham-Ads and QRA's ....................................... 92
QST Index of Advertisers .................................... 94
The American Radio Relay League

The American Radio Relay League, Inc., is a non-commercial 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 fraternity 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 non-commercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worthwhile amateur in the world 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. Correspondence should be addressed to the Secretary.

**DIRECTORS**

- **President**: HIRAM PERCY MAXIM
  - Drawer 2402
  - Hartford, Conn.

- **Vice-President**: CHARLES H. STEWART
  - St. David's, Pa.

- **Canadian General Manager**: A. H. K. RUSSELL
  - 8 Mait Bldg.
  - Toronto, Ont.

- **Atlantic Division**: DR. EUGENE C. WOODRUFF
  - 224 W. Fairmount Ave.
  - State College, Pa.

- **Central Division**: CLYDE E. DARR
  - 187 Hill Ave., Highland Park
  - Detroit, Mich.

- **Delta Division**: C. M. JANSKY, JR.
  - Dept. of Elec. Eng., U. of M.
  - Minneapolis, Minn.

- **Hudson Division**: DR. A. L. LAFAYETTE WALSH
  - 240 West 42d St.
  - New York City

- **Midwest Division**: PORTER H. QUINBY
  - 817 Landerman Building
  - St. Louis, Mo.

- **New England Division**: FREDERICK BEST
  - 13 East Crescent St.
  - Augusta, Maine

- **Northeastern Division**: K. W. WEINGARTEN
  - 3219 No. 24th St.
  - Tacoma, Wash.

- **Pacific Division**: ALLEN H. BABCOCK
  - 65 Market St.
  - Southern Pacific Co.,
  - San Francisco

- **Roanoke Division**: W. TREDWAY GRAVELY
  - Box 215
  - Danville, Va.

- **Rocky Mountain Division**: PAUL M. SEGAL
  - Box 1771
  - Denver, Colo.

- **Southern Division**: HARRY F. DOBBS
  - c/o Dobbs & Wey Co.
  - 249 Spring St., N. W.
  - Atlanta, Ga.

- **West Gulf Division**: FRANK M. CORLETT
  - 2515 Catherine St.
  - Dallas, Tex.

**OFFICERS**

- **President**.......................... HIRAM PERCY MAXIM, Hartford, Conn.
- **Vice-President**...................... CHARLES H. STEWART, St. David's, Pa.
- **Secretary**........................... KENNETH B. WARNER, Hartford, Conn.
- **Treasurer**.......................... ARTHUR A. HEBERT, Hartford, Conn.
- **Communications Manager**......... F. EDWARD HANDY, Hartford, Conn.

ADDRESS ALL GENERAL CORRESPONDENCE TO THE EXECUTIVE HEADQUARTERS AT HARTFORD, CONN.
EDITORIALS

THE formal course of the A.R.R.L. Technical Development Program has come now to an end. Once more passing time gives us a perspective as we look back upon a long job; again we have occasion to take stock of our situation and see where we are.

When the League's Board of Directors met in early 1928, amateur radio was confronted with numerous technical difficulties arising from the Washington Convention. In 1929 our bands were going to be reduced and we didn't know how to make our receivers sharp enough, our transmitters stable enough, and our frequency determinations accurate enough to assure ourselves of successful operation. It was one of those emergencies for the very handling of which we amateurs have bonded ourselves into a league. Plainly it was the League's duty to do something about it. So came the Technical Development Program, a year's effort which the League financed from the reserve which it has for just such purposes.

As we look back upon it now, we find it a good A.R.R.L. job. It has produced the answers to those problems of a year ago and now every amateur knows, or should know, how he can operate with success regardless of the Convention difficulties, and that without appreciable increase of effort or expense. The program results have been published in QST. Counting them up we find studies of low and high powered self-excited transmitters, of oscillator-amplifier transmitters, of peaked-audio receivers for code and of superheterodynes for 'phone, of keying for the code men and of 'phone design for the voice men, of frequency-measurement and monitoring for both of them, of the use of a.c. plate supply, and of the possibilities of the 28-Mc. band. A formidable list! These studies have altered the whole course of amateur radio, they have set the new standard for 1929 performance.

We have learned many new lessons. We have come to know that even the simplest transmitter may be made adequately stable by the proper choice of L/C ratio; that in code work the simplest receiver plus our old acquaintance, the 'distortion amplifier,' will provide selectivity for any conceivable interference; that our 'phones may have beautiful quality and greatly extended range by the application of modern engineering principles. We know now that the 'superhet' principle is the ideal one for selectivity in 'phone work; that it is essential to monitor all transmissions, whether key or voice; that with the aid of the monitor and even the crudest frequency-meter, or no frequency-meter at all, we can set our transmitters legally and keep them so. And we know just how to build the apparatus to do these jobs.

This knowledge is worth much. It meant, in fact, salvation technically in 1929. That is why we say that it was a good A.R.R.L. job and one more reason why every amateur ought to be a member of our League.

But, invaluable as this technical knowledge is, it does not mean that we have attained to perfection — far from it. At best the Program skimmed the surface of possible solutions: its need was to find a workable answer for a pressing amateur problem and move on to another equally pressing problem. The conclusion of the program leaves much to be done by amateurs themselves. The program has provided the essentials to existence, it has roughed out the principles. No one is to expect that the brilliant amateur radio of our country will not carry those ideas forward to a greater and yet greater success, building up and polishing, as it were, the original program work.

A.R.R.L. Headquarters therefore can feel content to draw a line now and call the planned work of the organized program completed. It is now up to the membership to carry on the work. To a considerable extent we return to our old basis, a cooperative association of workers whose technical successes are published in our mutually-owned magazine for the common good. During the past year there has been perhaps too much of a "let-George-do-it" spirit. You know who we mean by "George"—we mean O.M. Geo. Program. He's dead now, but his work lives on forever. We shall have more space in QST available for reporting the work of individual members. We want to hear about it. We know that there were other solutions to our technical problems than those presented by the program, and we know that the program answers have been carried to a more polished state by numerous individual amateurs. A cordial invitation is extended to them — to you — to make these results available to the rest of the amateur world through QST's pages. That is the spirit of the A.R.R.L.

Let it not be thought that the editors of QST expect now to rest on their respective posteriors and let the rest of the world go by. That is why we emphasized the formal program. That, yes, is concluded, but there will be more than the usual amount of experimental work continuing at Headquarters. But we need help, fellows, to make our QST everything that it can and ought
to be, and every one of you who has a successful 1929 station has an interesting story to tell—something which will help other amateurs to succeed—which again is the spirit of the A.R.R.L. The postman could still stagger into our place if he carried a few more 1929 articles, and if necessary we'll agree to send a truck down to the post-office after them. Right? Shoot! K. R. W.

Standard Frequency
Transmissions of WWV

The Bureau of Standards announces a new schedule of radio signals of standard frequencies for use by the public in calibrating frequency standards and transmitting and receiving apparatus.

Information on how to receive and utilize the signals is given in the Bureau of Standards Circular No. 171 which may be obtained by applying to the Bureau of Standards, Washington, D. C. The schedule of standard frequency signals is as follows:

<table>
<thead>
<tr>
<th>Time (P.M.)</th>
<th>Eastern Standard</th>
<th>May 20</th>
<th>June 20</th>
<th>July 22</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:20-10:30</td>
<td>135</td>
<td>550</td>
<td>1300</td>
<td></td>
</tr>
<tr>
<td>10:30-10:40</td>
<td>150</td>
<td>600</td>
<td>1700</td>
<td></td>
</tr>
<tr>
<td>10:40-10:50</td>
<td>150</td>
<td>700</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>10:50-11:00</td>
<td>150</td>
<td>800</td>
<td>2400</td>
<td></td>
</tr>
<tr>
<td>11:00-11:10</td>
<td>350</td>
<td>1000</td>
<td>2700</td>
<td></td>
</tr>
<tr>
<td>11:10-11:20</td>
<td>450</td>
<td>1200</td>
<td>3100</td>
<td></td>
</tr>
<tr>
<td>11:20-11:30</td>
<td>550</td>
<td>1400</td>
<td>3500</td>
<td></td>
</tr>
</tbody>
</table>

The figures given above are the transmission frequencies in kilocycles.

The President's Corner

A WORD FROM
HIRAM PERCY MAXIM
PRESIDENT OF THE AMERICAN RADIO RELAY LEAGUE AND
OF THE INTERNATIONAL AMATEUR RADIO UNION

Rocking the Boat

There always have been "boat rockers" and it is reasonable to suppose there always will be. Ever since there has been such a thing as amateur radio there have been those among us who were unable to appreciate what happens when the "rocking" business is carried too far.

Our A.R.R.L. "boat" is a typically American structure. Our members in the U. S. A. correspond to American citizens. Our Divisions correspond to the American States. Our Board of Directors corresponds to the American Congress. Our President and our Vice-President are elected by the Directors and are added to the Board. Our Secretary, Treasurer and Communications Manager are hired by the Directors. They have no vote or voice. Their job is to carry out the orders of the Directors.

Of what use is it to start "rocking the boat" because the Secretary or the Treasurer or the Communications Manager does or does not do something or other? He was told to do it or told not to do it by the Directors. And the Directors were elected in every Division by the members.

There has been "boat rocking" in the past but just before the green water started coming in over the side, common sense has come to the rescue, and the "rockers" have stopped "rocking," and the good old A.R.R.L. ship has been saved. Today there is "rocking" because amateur privileges have been restricted.

The officers, acting under the Directors' orders, resisted this restricting to the danger point. Another ohm of resistance might have brought total extinction of amateur radio. Radio regulation is not what it was once. No longer has our U. S. A. the entire say of what goes on. Radio is world-wide and it is the combined action of all the nations of the earth that determines what is to go on and what shall not go on — not the action of a single nation.

Let's understand this clearly when we start rocking this fine old boat of ours.
In December, 1923, W8ARO went on the air for the first time with a pair of UV-202's supplied from a 750-volt motor-generator. Operation at that time was in the band between 150 and 200 meters and results were never very impressive. Later, a 50 watt replaced the smaller tubes and attention was turned to the higher frequency bands then being opened. Some satisfactory results were obtained but the press of personal affairs caused a suspension of activities for almost two years. The progress of the game was followed carefully, however, and early in 1927 the 50 watt was again put into commission to provide an outlet for enthusiasm generated by reading of the work made possible by the Hertz Antenna on the 40- and 20-meter bands. The results obtained were immediately highly satisfactory and when the 50 watt was later replaced by a UX-852 fed from the old 750-volt generator 17 countries in all continents except Asia were worked. It was realized that the tube, at this low voltage, was decidedly handicapped and in consequence a high-voltage transformer, a mercury-arc and a "brute force" filter were installed.

After reading the articles on "1929 type" equipment in the August, 1928, QST and in the issues that followed, enthusiasm ran high. In the late summer of that year experiment was started on apparatus for 1929 operation. A UX-210 supplied from a power-amplifier "B eliminator" was used for the first experiments, this tube being arranged in a High-C transmitter modeled closely after that described in the August, 1928, QST. From the start and almost without exception the note was reported "d.c. crystal controlled" in marked contrast to the signals of previous transmitters, the reports on which were invariably r.a.e.

Thus encouraged, work with the UX-S52 was started. Considerable difficulties were experienced at first on account of the failure to give any consideration to the fact that the difference between the plate impedances of the UX-210 and the UX-S52 undoubtedly would necessitate the
use of different inductance-capacity ratios in the tank circuit. When the inductances had been increased to a value which permitted efficiencies similar to those obtained with the UX-210 the transmitter really started to perform! Excellent signals were obtained in the monitor and flatter-

![Diagram](image)

**FIG. 1.—THE WIRING OF THE HIGH-C TRANSmitter**

- C1 = 250-mfd, receiving type variable condenser.
- C2 = 250-mfd, doublers-pair transmits type condenser.
- C3 = 5000-mfd, fixed grid condenser, 5000-volt rating.
- C4 = 2000-mfd, fixed by-pass condenser, 2000-volt rating.
- C5 = 5000-mfd, fixed by-pass condenser, 5000-volt rating.
- R1 = 0.003-ohm grid leak.
- H2 = 3000-mw power rheostat.

1. 8 turns of 1/8″ copper tubing, turns 3″ long diameter for 3500 kc, 4 turn B.E.L. coil 4 1/2″ diameter for 7000 kc, 8 turns of 3/4″ copper tubing, turns 3 1/2″ diameter for 14,000 kc.
2. 2 turns of 1/8″ copper tubing, turns 5/2″ diameter for 3500 kc.
3. 7 turns of same tubing and same diameter for 7000 kc.
4. 3 turns of same tubing, turns 1 1/2″ diameter for 14,000 kc. The inside diameter of turns is specified in all cases.

...tank condenser located immediately below the platform. Rapid change of tank coils is made possible by the use of large binding posts bolted to the copper strips. The plate lead from the UX-852 bolts directly to the right hand strip. At the top of the left hand strip is located the grid condenser. Wires from the lead directly to the grid condenser and grid-leak, the latter being of 20,000 ohms resistance. Filament and high-voltage by-pass condensers are located beneath the tube. The antenna coupling coil is at the right end of the glass rods. The antenna condenser, of course, is below the platform. On the upper panel from left to right are the plate milliammeter, the filament voltmeter, and the antenna r.f. ammeter. Other apparatus inside the cabinet comprises the resistor for the plate voltmeter, the shorting switch for the antenna condenser, and the r.f. chokes. The latter are of 160 turns of d.c. No. 30 on a 3/4″ tube. The shorting switch mentioned is simply a s.p.s.t. knife switch mounted on the antenna condenser, and connected to the control knob on the lower panel by means of a formica extension arm.

The circuit, as drawn in Fig. 1, has proven very satisfactory at WSARO. One good feature of it is that the r.f. load on the chokes is very low. Of course the tank inductance is at high voltage, and a number of other parts, but with 2000 volts on the transmitter all parts should be treated with the utmost care anyway. The circuit gives the constants of most of the apparatus. The filament transformer is rated at 150 watts. The filament voltage drops about .2 volt when keying. As stated earlier, attempts at using inductances in the tank circuit (as to number of turns) for a UX-210 proved out of the question when using 2000 volts d.c. due to impossibility of keeping the plate current at normal values. The

![Image](image)

**THE RECEIVER AND MONITOR, ENCLODED IN THE ONE CABINET**

On the left are the tuning control, switch and phone plug of the monitor, grouped on the right are the controls of the fore-end receiver.

...coils used correspond closely to those specified for use with the self-rectified transmitter described on page 26 of the February, 1929, QST. The latter, however, are slightly smaller than those used at WSARO — the difference, as doubt, resulting from consideration of the type of plate supply. Obviously a higher C would be desirable in a transmitter not supplied with pure d.c. All tank coils are wound with 3/8″ copper tubing (the spacing between about 1/4″ except in the case of
the 3500-kc, band coil where the spacing is \( \frac{3}{4} \) " . The adjustment of the filament clip has not been found very critical and the change from one band to another is merely a matter of a few moments.

The two stand-off insulators on the right side of the cabinet are for the leads to the antenna system. Similar insulators are fitted at the back of the transmitter for the high-voltage leads, which are of heavy rubber covered ignition wire. Keying in the center tap lead has proven completely satisfactory though it is quite possible that some other form of keying would be necessary if the transmitting antenna were closer to near-by broadcast listeners' antennas. Power to the transmitter is supplied from a high-voltage transformer. The a.c. after being stepped up from 110 to over 2000 volts is rectified by a mercury arc, and filtered by the filter as shown in Fig. 2. The large galvanized can shown in the photograph of the power supply contains the arc tube in an oil bath and the shaker mechanism. Immediately above is the keep-alive transformer and its choke wound on the same core. On the shelf above are the high-voltage transformer, the filter choke and the filter condensers. The condensers are all rated at 2000 volts d.c. The 1-\( \mu \)fd. condenser is all that is left of one formerly rated at 2-\( \mu \)fd! The filter choke is of 30 hys. inductance, rated at 500 mls. The high-voltage transformer is rated at 1500 volts on each side of the center tap at 500 watts. In the power circuit above it delivers 2550 volts at no load to the transmitter. The load voltage at

75 mls is 2200. Regulation: 6.8\%. Recently, a 2000-volt, 1000-watt transformer was installed. Its load voltage (1500 volt taps) at 72 mls is 2075; no load voltage 2150. Regulation: 3.1\%.

**Fig. 2 — The Connections of the Power Supply Unit**

The power switch 8 and the arc starter switch are at the operating table.

The antenna system first used with the transmitter was a voltage-feed Hertz with a fundamental on the 7000-kc. band. The antenna together with the feeder happened to be of such a length that the whole could be operated as an end feed Hertz for 5500 kc. work. The present system is a large bent Hertz with a fundamental of about 3150 kc. Operation in the 3500-kc. band is made possible in increasing the fundamental frequency with a series condenser. For use on the 7000 band the antenna is loaded to 2330 kc. and operated on the third harmonic. For 14,000-kc. work is loaded to about 2800 kc. and operated on the fifth harmonic. The approximate length of each half of the antenna is 82 feet. The system is quite practical and simple, and permits changing from one band to another without difficulty. The only disadvantage is that the two halves of

**AN INSIDE VIEW OF THE RECEIVER AND MONITOR**

To the left is mounted the UX-223 antenna coupling tube, the tuning condenser with its switching arrangement and the detector tube. At the right of these units can be seen the "peaked" audio amplifier, the Ford coil secondary belonging to it being mounted inside the tube shield. Inside the shield at the extreme right is the apparatus constituting the monitor.
proved if it were possible to extend the two halves of the antenna away from the station in opposite directions.

The wiring of the receiver is shown in Fig. 3. Some idea of its arrangement can be obtained from the front and rear views given.

Looking at the front view the apparatus mounted on the panel are from left to right: The phone and filament lighting jack for the monitor (which is built into the receiver cabinet); the monitor tuning dial; the receiver filament switch for the receiver; the receiver phone jack; the volume control; the regeneration control; detection voltmeter and rheostat knob; the tuning dial and the tuning condenser control switch.

The first three tubes of this receiver were assembled and were being tested as a receiver when the Nov. QST containing the article on amateur receivers arrived. The first UX-222 r.f. tube, the detector and one UX-201-A in a stage of transformer-coupled audio had been found satisfactory but a second UX-222 was then added as a "peaked" audio stage. The receiver is much and stable in operation and more selective than the old two-tube standby. The transformer used is a UV-712, R.C.A. The tuned impedance consists of a Ford coil secondary enclosed in tube shield to left of monitor shunted by a capacity of 0.1 \( \mu \)F. Volume is controlled by a Centralab 200,000-ohm resistor, connected across the transformer secondary. Regeneration control is by means of variable capacity in the detector plate circuit. The detector tube is mounted on sponge rubber. Coils are wound on tube bases fitted with a rim at the top to assist removal. Chokes used are the small Silver-Marshall receiver chokes. The tuning condenser consists of a National 0.0005-\( \mu \)F.

Equitone variable which has been reconstructed. It now consists of two condensers in one, with the stators insulated from each other as suggested by Mr. Westman in September QST. One condenser containing a single stator and rotor is used for the 7000 and 14,000 bands. For the 3500-ke. band this condenser is connected by a switch to the other part consisting of two stators and a rotor making five plates in all. This makes a very flexible and handy arrangement. A choke is shunted across the grid circuit of the first UX-222. The antenna, a single 60-foot wire, is connected to the grid end of the choke, while the other end is connected to the ground. It is hardly necessary to say that the signal strength available is generally much more than can be comfortably used with head phones.

The operation of the tuning condenser control switch can be seen fairly well in the rear view. Two jaws from a knife switch are mounted on the horizontal bar of a \( T \) shaped piece of formica. On the vertical part of the \( T \) is a standard which carries a shaft to which is fastened (by nuts) a lever carrying on one end a counterweight, and on the other two pieces of copper which form a square \( U \) which engages the two jaws, each of which is

(Continued on page 22)
Another "1929" Receiver

By P. S. Hendricks

The following is a description of a simple and practical three-tube receiver for amateur c.w., phone and general high-frequency reception. It has a continuous frequency range from 2800 to 15,150 kc. with a coil for the 28,000-ke. band. The maximum range of the 28,000-ke. band coil is from 25,000 to 30,000 kc., although, when being used for the amateur band, its range is from 27,750 to 30,300 kc., giving a more suitable amount of overlap and coverage. The arrangement providing a double range may be understood from the coil table and a later portion of this text.

The range between 15,150 and 25,000 kc. is not covered because it does not contain much of interest to most amateurs or other high frequency listeners. However, that range could readily be covered with one or two more coils. The windings for them could be judged fairly accurately because they would be between the sizes for the 14,000- and the 28,000-ke. coils. For the territory between 1500 and 2500 kc., coils could readily be made by winding them on the same type form with somewhat smaller wire.

The receiver is assembled on an aluminum panel 12" x 7" x ½" and a wooden baseboard 12" x 8" x 3¼". The top of the baseboard is covered with a sheet of 30 mil. copper on which the various parts are mounted. The r.f. chokes form one of the legs of the detector and a.f. tube socket supports and the a.f. transformer is mounted on top of one of the by-pass condensers.

Such schemes help to make a receiver more compact and simplify the wiring.

CIRCUIT ARRANGEMENTS

The circuit consists of one untuned r.f. coupling stage, isolated from the rest of the circuit by a Silver-Marshall No. 638 copper stage shield: a 201-A detector and one 201-A high quality audio stage.

The antenna is coupled to the grid of the r.f. amplifier tube through a Pilot midget variable condenser, which is placed within the shield with the r.f. stage. Its adjustment may be set for a given antenna and tuning range and does not need further attention while the set is in operation. As may be seen in a photograph, an account of the limited space within the shield, this antenna condenser is fitted with a handle of Bakelite tubing instead of a knob. This tubing is ½" o.d. by ⅛" i.d. and 1½" long. The input to the r.f. tube is coupled across a 50,000-ohm resistor of the gridleak type, which fits into the mounting that may be seen between the antenna coupling condenser and the screen-grid tube. A Silver-Marshall type 277 r.f. choke, shown in one of the photographs, is fitted with the ends of an old gridleak so that it may be used instead of the 50,000-ohm resistor, for the input coupling.
These coupling devices seem to be about equally effective. A satisfactory chip for connecting to the control grid, a type tube, can be made by winding about four turns of springy No. 14 or 16 wire on a diameter such that when slipped on the contact of the tube it will fit snugly enough to make a good connection.

TUNING SYSTEM

The tuning condenser is a National Girder Frame type which originally had 21 plates. The stator of these condensers is assembled on long threaded brass rods with spacing washers. By cutting these rods and adding a few nuts, the stator can be made into two sections; one being supported from each end. In this case the condenser was reassembled with the plates double spaced, one section having three plates, the other, five plates. The three-plate section is just large enough to cover the 3500- and 28,000-ke. bands with a little margin at each end. For the 7000- and 14,000-ke. bands it is too large. Therefore, in order to get a satisfactory dial spread on the latter bands, the extra condenser on the coil form and UV socket is utilized to tap the tuning condenser across only part of the coil, as is indicated in Fig. 1. On the rest of the coils, where the condenser is across all of the turns, a "jumper" is soldered between the contacts "C" and "D" on the coil form and no tap is taken from the coil winding. When it is desired to cover the larger territory between the amateur bands, the five-plate section of the stator is added to the three-plate section by means of one of the small C.R. plugs and jacks. The plug is fitted with an insulated handle and the whole affair mounted conveniently on a small hard rubber strip to the right of the tuning condenser. The eight-plate double-spaced condenser formed by adding the five- and three-plate sections, gives a capacity which covers a fairly large territory without crowding the scale too much.

AUDIO AMPLIFIER

The secondary of the audio transformer is loaded with a resistor to prevent fringe howl. The resistor is made variable and thus also serves as a volume control. In addition, it allows one to cut down the noise in the phones if the receiver gets too much pickup from the transmitter. A fixed condenser across the audio transformer secondary with a switch to cut it in or out, is provided to partially by-pass the circuit.

A FEW PLUG-IN COILS AND A PLUG-IN R.F. CHOKE
higher frequencies thus improving the selectivity and keeping the background level down somewhat. A value of .002 µfd, is a satisfactory compromise between a sharp cut-off and a minimum loss of signal strength. Larger or smaller values may be used to suit individual taste and transformer characteristics. This switch and .002 µfd. condenser may be seen mounted on a small piece of hard rubber, which is attached at the top and extends to the front of the audio transformer.

REGENERATION CONTROL

The regeneration control is a Frost 100,000-ohm resistor, connected as a potentiometer. This arrangement gives very smooth control and allows the adjustment for the point of oscillation to remain in nearly the same position for the entire range of any one coil. It should be noted, though, that the negative "B" must be connected to the negative "A" on the battery side of the filament switch and that the filament switch must open both sides of the "A" battery circuit, otherwise the potentiometer will cause a slight but continuous drain of about ½ w, on the detector section of the "B" battery whether or not the set is in use. It is not necessary to raise the "B" battery voltage on the detector tube when the 25,000-ohm coil is being used.

The movable contacts on the Frost variable resistors are connected to the metal shell of the unit and must therefore be insulated from the metal panel. This has been done by drilling a ½" hole in the panel and using a piece of ½" o.d. x ½" i.d. bakelite tubing, slightly less than ½" long, and cutting washers for the front and back of the panel from 1/16" bakelite sheet.

**REAR VIEW WITH THE TOP OF THE R.F. SHIELD REMOVED, SHOWING BATTERY CABLE WITH PROTECTIVE LAMP**

**GENERAL**

By-pass condensers and r.f. chokes are used wherever there is a possibility of their doing any good and they certainly repay their cost in smoothness of operation of the receiver.

The battery connections are made by means of a seven-wire Yaxley cable and connector plug. All battery wires pass from the connector plug through a hole in the baseboard and are then brought up from below the baseboard through holes near the point where they connect to the apparatus. The circuits are bypassed where they leave the apparatus and go through the baseboard, thus completely isolating the low side of the circuit from the high r.f. side. The battery wires which pass through the baseboard are a light grade of high tension auto or ignition wire, which has rubber insulation covered with a very tough fabric, thus avoiding the possibility of a short circuit where the wires pass through the copper sheet on top of the base-board.

A small flashlight lamp is placed in the "jumper" which connects the minus "B" to the minus "A", outside the receiver. If any part of the plus "B" circuits come into contact with the plus "A" in the receiver the flashlight lamp will blow instead of the tubes.

It may be found that the specified values of the fixed resistors $R_s$ and $R_t$ are a little too high. In order to get just the correct voltage at the tubes it is advisable to connect a voltmeter directly across the tube socket terminals and adjust the resistors by removing a few turns of their winding.

**FIG. 2 — THE CONNECTIONS TO THE UV SOCKET ARE SHOWN ABOVE**

*The arrangement for the secondary coil is of most importance inasmuch as the tuning condenser is not always connected across the entire winding. If the tuning condenser is connected across the entire winding, a "jumper" is connected on the coil form between the pin marked Grid and the one marked $F_2$. When the condenser is across only part of the coil, this "jumper" is omitted and a tap off the coil is connected to $F_1$.**
or short circuiting the excess turns by soldering across them.

The large National dial in the center of the panel operates the tuning condenser \( C_a \). A lamp to illuminate the scale and to serve as a telltale, will fit on to the rear of the dial and is provided for, though it was not in place when the photos were taken. The receiver is calibrated to read in terms of frequency and therefore the dial is set at zero.

**COIL TABLE**

The necessary coils and their ranges are given below.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>214</td>
<td>3</td>
<td>2720</td>
<td>32,500</td>
<td>40,500</td>
<td>49,000</td>
<td>58,000</td>
<td>67,000</td>
<td>76,000</td>
<td>85,000</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>1200</td>
<td>14,400</td>
<td>13,000</td>
<td>11,000</td>
<td>9,000</td>
<td>7,000</td>
<td>5,000</td>
<td>3,000</td>
<td>1,000</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>1200</td>
<td>14,400</td>
<td>13,000</td>
<td>11,000</td>
<td>9,000</td>
<td>7,000</td>
<td>5,000</td>
<td>3,000</td>
<td>1,000</td>
<td>0</td>
</tr>
</tbody>
</table>

---

The recently appointed Junior Radio Inspector at the Office of the Supervisor of Radio for the First District is none other than Irving L. Weston, W1HBB, active amateur and member of the League. Mr. Weston, a graduate of Northeastern University, completed a course at the Massachusetts Radio School prior to taking over his present duties.

---

The Radio Corporation of America has separated its communications business from its other activities, placing the former in a new subsidiary, wholly owned by it, which is known as R. C. A. Communications, Inc. All station licenses, frequency assignments, etc., are now in the name of the latter company.

---

Well-meaning experimenters still manage to get splendid key-click elimination with condensers or resistors across the key when they are using a relay. At least, they still send in their latest circuits and tell of the success they have had with them. Quite possibly an improvement in the click may be noticeable in the receiver alongside the transmitter but any such check usually is quite useless. Apparently it is not obvious to all that such resistors or condensers specified for use across a key when the key is directly controlling the transmitter should be connected across the contacts of the relay when one is used.

---

Fred Schmell (further identification unneeded) has received a year’s leave of absence from the Burgess Battery Co., during which time he will be with the Aero Products Co. of Chicago, well-known manufacturers of amateur gear.
Wired Wireless

By J. E. Smith *

WHEN the transmission of signals from one place to another without the aid of intervening wires was first developed, it was logically referred to as wireless transmission. Later on, the use of the term "radio" became prevalent and carried to most of us the same thought.

However, it is perfectly possible and practical to transmit currents at radio frequencies over metallic circuits as well as through space and there have been great developments in this branch of communication engineering during the past few years. Such transmission is generally referred to as carrier-current or wired-wireless transmission, and it is assuming greater and greater commercial importance as time goes on. Perhaps a few points concerning the general principle underlying this system of communication and some of the reasons for its adoption may not be amiss.

We are all well acquainted with the transmission of speech in the ordinary manner over the telephone. Such speech is transmitted at its own frequencies which in commercial practise varies from about 200 cycles per second to about 2000 cycles. It has been found very practical for reasons which shall be unfolded as we proceed to transmit speech over wires at radio frequencies in much the same manner as today we are transmitting programs through empty space from the broadcasting studios.

This matter of utilizing a carrier wave for the transmission of speech is not new. The beginning of the work dates way back in the nineties, and is due to such men as Pupin, Leblanc, Hutin, Squier, Stone, and others. Then, later on we may include Deforest for his wonderful contribution: G. A. Campbell for his electrical filters, and many more.

Carrier-current systems in use at the present time furnish simultaneously as many as four two-way telephone conversations over each line in addition to the telephone and telegraph facilities normally afforded by the circuit. Other systems are arranged to furnish as many as ten duplex carrier telegraph circuits over each line in addition to the usual telephone and telegraph facilities afforded by the circuit. Think what this means! Without stringing up more wire on poles, or laying them in conduits under the street, it is possible to multiply the number of channels of communica-

![Diagram of radio transmission system](attachment:image.png)

**FIG. 1**

The general principles involved in carrier-current communication are fairly well understood by many of our radio readers. We encounter it every day; in operating our radio receiver, or, if we are amateurs, in operating our transmitters. Suppose we start at the transmitting station. First we have an oscillator which generates the radio-frequency currents. Next we have a micro-

![Diagram of frequency bands](attachment:image2.png)

**FIG. 2**

phone into which the performer sings or speaks. The speech sounds are amplified by the speech amplifier and pass on into the modulator tube. Into this tube the radio-frequency current from the oscillator is passing at the same time, so the modulator is really a "mixing" tube. Next, from the modulator, the mixed currents may pass on through an amplifier and thence to the transmitting antenna and off into space. (See Fig. 1.) One of the most interesting factors to be considered is

---

*President, National Radio Institute, 16th and U Streets, N. W., Washington, D. C.
the many and various frequencies involved. The oscillator may be generating power at a frequency of a million cycles a second. The speech frequencies range from perhaps 30 cycles to 10,000 cycles. After being mixed in the modulator these frequencies are considerably changed, and instead of two frequencies we have many. The most important of these frequencies are known as the "carrier" frequency and the two "side-band" frequencies.

In order to make this clear let us suppose that instead of singing or talking into the microphone we play a single sustained note on a flute and that this note has a frequency of 1000 cycles per second. Also suppose that the "carrier" frequency is 1,000,000 cycles per second. The two side-band frequencies are then 1,001,000 and 999,000 cycles per second. The same rule holds when there are a number of frequencies coming from the microphone and in general we will have a situation somewhat as represented in Fig. 2. We have the carrier at 1,000,000 cycles; the upper side-band, ranging from 1,000,030 to 1,010,000 cycles, and the lower side-band ranging from 999,970 to 999,000 cycles.

And now we can go another step farther: we have a system whereby several telephone conversations and a few telegraph messages can be transmitted over the same circuit simultaneously. Why not transmit power over the same lines at the same time? To tell the truth, this is exactly what is being done today. But it is the other way around: the telephone or telegraph wires are not being used for power transmission, for they are too small, but the power lines are being used for the transmission of speech and code. Quite a lot of work is being done along this line, for in addition to affording a means of communication for the public at large, it is exceedingly important that the different power plants of the same company, or the central power plant and the sub-stations, keep in very close touch with each other.

It is clear how this may be done in the case of alternating current power for this can be transmitted as a certain particular frequency, say 60 cycles, and occupy its own channel (with no side-bands in this simple case) just as each band of speech frequencies or telegraph code occupies its own channel. And going still a step farther it is clear that constant or direct current can be just as easily transmitted along with the communication channels for direct current has a frequency of zero and occupies its own channel of zero frequency.

However, when we come to the matter of transmitting intelligence over power lines operating at high voltages other problems arise, the most important of these being the manner in which the transmitter and receiver of the carrier currents are connected to the power lines. There are two methods of doing this. One of these methods is shown in Fig. 4, where the transmitter or receiver is coupled to the power lines by high-voltage condensers of small capacity, these two being arranged with a protective ground connection. Fig. 5 shows the other method, which merely consists of stringing a pair of wires parallel with the power lines for a distance of a thousand feet or more. These wires not exactly like antennas.

In addition to the difficulties of properly insulating the system in these high voltage power lines there are other difficulties encountered. For instance, where sectionalizing switches in the lines are opened it is necessary to erect what might be termed a "by-pass antenna" in order that the carrier currents may pass over the gap. This incurs losses, to be sure, but at least the gap is bridged, and it is only necessary to increase the power of the transmitter sufficiently to overcome the loss.

Another difficulty encountered occurs when great loads are thrown on the power lines as when large mills are running or at night when the lighting load becomes great. The short-circuiting ef-

(Continued on page 22)
The Glutton

By "Felix"*

If there's one bird in this world whose capacity can't be touched, it's 1, 5LS — beg your pardon, W5LS — himself. For pure unlimited catch-as-catch-can ability to get the bum end of all breaks, I take the original silver-plated gridleak. The only kind of deals I get from life are raw ones, off the bottom of the deck. If the Radiocorp began giving away 204-A's today the chances are 100 to 1 that tomorrow I'd get a job on a farm where the only power available was kerosene.

These cheerful conclusions occur to me as the result of a trip I just returned from as the one and only wireless op on board a little coaster that plugs down through the Canal and up the West Coast. Listen while I tell you why op's go sour.

I suppose the whole business started when, toward the end of a year at school, I got the brilliant idea of taking out a "commercial" and earning a little money on the side while seeing the world through a lead-in insulator.

I got the ticket all right, and soon after that landed an assignment, sight unseen. That was tough break No. 1. The "liner" proved to be a ratty collection of boiler plating held together with paper clips and going under the name of the S. S. Rumor. To top it off our run was not to Hawaii or some place like that, but was up to the Gulf of California. For those who are not familiar with this collection of mud and sand I might say that it was God's official dumpheap during the Creation. In addition, it is used as a storage region for all the heat that is too hot to use in Hades. After it cools off for a few centuries around the Gulf, small consignments are billed to the lower regions and after diluting them with 90% Alaskan glacier they are just about right for the hottest furnaces. From which you might infer that the Gulf is hot — which is right.

The morning we pulled out of the harbor I spent a couple of hours getting acquainted with the radio equipment. This consisted of a 2-kw, cement-mixing spark and associated liabilities, and a three-circuit tuner with a detector and two stages of loose connections and haywire transformers. The serial on the generator was No. 2, and when you fired her up she sounded like a 1913 model fliv with ten college boys in, on, and around her. Whenever she got going good the firemen in the engine room got restless and worked with one eye on the ladder that led to the deck.

Things began happening right away. I went into the shack to give K — a lonesome call, noticing absentmindedly that a Swede deckhand was on the crosstrees painting the forecast, but giving it no particular thought. Half way through the K — call I had to go out on deck to help revive said deckhand, who was lying on deck with a busted leg and temporary paralysis. After that I spent a couple of hours bending on new antenna insulators to replace the ones that had sparked over and wrecked the Swede.

Next thing, the storage batteries began acting up. I had to operate the set off batteries instead of the regular ship juice, because if I'd put a 2-kw load on the ship's generator it would have chewed up the bolts that held it down and walked right out on deck. When I wasn't babying the transmitter I was trying to reason with the storage batteries, which is about as foolish as trying to reason with the M. I., when he catches you operating off-wave a month after your license has expired.

Eventually, things settled down a little and I began to wonder if maybe Fate hadn't finally seen the light as far as I was concerned. I should have known better.

About a week out, the purser came skipping into the shack with a tin ear full of news. But first, let me wise you up to this purser. He was one of those wise birds who knows more than anybody about anything. Once upon a time he'd owned a single-tube single-circuit bootleg receiver, hence he knew more about radio than Mary Texanna Loomis and John L. Reinartz.

The second day out he had come up to advise me that if I'd put a wavemaker in my receiver I'd get 90% better reception and no QRN. I began thinking of the nice impression a 45-volt "B" battery would make on his dome, but he must have been a mind-reader, because he shut up and went below to flunky for the Old Man...

This bright a.m. he had some real news, though.

"Oh, I say, Sparks. The skipper's bought a new ten-tube receiver and wants you to come down to hook up the batteries."

"Me?" queries I. "I thought you once owned a one-tu — "

"Yeah," he hurries on, "I could hook it up all right, but the Old Man's in a rush and I got to string the aerial."

Well, I went down and hooked up the set, wondering meanwhile who had the bad taste to start the institution of purser's.

When I came back on the boat deck the purser had just completed the most superb piece of artistic clothes-line stringing in history. And the dumb decimal-wit had put that antenna parallel
with my leadin and spaced it fully six inches at places!

"Take a look at that," he gurgles, in a patting-himself-on-the-back tone. "You know, when I was with the Louisiana Power and Light Company — "

"— you rolled up guy wire and carried wrenches for the electricians," I added. "Do you realize," I continued, "that antenna is just about as dangerous a combination as nitroglycerine and heebie-jeebies!"

"Why?" he asks.

"Simply because the antenna will absorb enough juice when I'm on the key to electrocute a piece of pyrex."

"Aw, that old set of yours ain't strong enough to electrocute an idea."

"Never mind that," says I. "And as for an idea, you furnish one and I'll be the guy who is shocked to death."

He skips off without answering, leaving me with quite a few thought. True enough, the old rookerusher didn't have much range, but he sure had a powerful kick close to home. As I found out one day when I drew a nice hot spark off a rack in the wall. Thinking of that gave me an idea.

After supper I knew that purser would be up listening in on the skipper's new job, so I skipped up to the shack and fired up the old boiler. I jammed the coupling and hoisted it in another bill of hay, so to speak, and when I hit the key for a dit-dit-dit-da-a-w-w-dit, the ammeter read 18 healthy, able-bodied amps! I gave the key another couple of punches, and then sat back and pretended to read a magazine, waiting for things to happen. They did, immediately!

The purser came up the boat-deck gangway five steps at a time (it only had four).

"Hey, sparks, what's happened to the skipper's set? The blamed thing's smoking hot!

"You ought to know," I returned. "You once owned a single-tu —"

"Oh, can it! C'mon down and do something. The thing is burning up!"

I went down, and sure enough the insulation was burned completely off the primary of the tuner, while the primary itself was merely a couple of blobs of copper in the bottom of the case.

I think I mentioned a while back that I was the King Glutton for punishment. I am, brothers, I am. I was the guy who got the job of rebuilding the front end of that receiver!

W8ARO

(Continued from page 14)

Wired Wireless

(Continued from page 30)

foot produced by the turning on of so many feeder lines causes changes in the characteristics of the lines which makes it necessary to employ more power in the transmitter at such times.

And, finally, before concluding, the carrier current system has been used successfully as a means of communicating from moving trains. In this case the antenna wires were strung along the tops of the cars parallel with the telephone wires along the road.

Concerning the Super-Heterodyne

THE following modifications of the circuit of the Superhet described in the March issue of QST are suggested:

The oscillator should be connected as shown in Fig. 9, page 14 and not as shown in Fig. 7, page 13. The blocking condenser $C_1$ should be located between the $+B$ end of $I_A$ and the grounded rotor of the condenser $C_2$, as otherwise the B battery is short-circuited.

It has also been found advantageous to eliminate the potentiometer $R_I$ as a control of oscillator plate voltage and use it as a volume control on the secondary of the audio frequency transformer. The connections being identical with those for the gain control shown in Fig. 3, page 12, April QST.

Satisfactory adjustment of the oscillator plate voltage is obtained by bringing out a separate "B" battery lead, connected to the end of the oscillator radio frequency choke which goes to $C_9$.

On strong signals blocking of the 201-A second detector tube is not at all unusual. It has been found decidedly worth while to use a 112-A or 210 type tube in the second detector circuit in eliminating this tendency to block. It is quite possible that plate detection could be used to good advantage, particularly if the set is to be used for reception of strong broadcast signals.
Single Control for the High-Beat
Super-Heterodyne

By J. M. Grigg

Single control in a radio receiver means greater convenience and a better usefulness. Even an approximation, adjustable with trimmers, will get more stations in a given time than individual tuning. In addition to these advantages there is a manifold saving of time due to which any successful effort toward eliminating the extra dials should be amply repaid. It must be understood, however, that a good single control is an achievement. It represents not only a piece of mechanism, but also a thoughtful electrical design. It is an intelligent adjustment of inductance and distributed capacity against the mechanical variations in equipment itself.

To make the point, suppose a curve is plotted with frequencies against dial settings. The path of the line illustrates the composite effect of inductance, distributed capacity, and the capacity variation of the condenser itself. In the case of a gang any deviation, say a slightly different plate thickness, a warped plate, or an inaccurately centered rotor, results in a different curve. The difference may amount to 4 or 5 points. Whatever it may be, no readjustment of inductance will properly compensate it; correction must be made in the condenser itself, and trimmers used only to get the equivalent distributed capacity effects.

In the case of the super-heterodyne the task of single control assumes larger proportions due to the fact that a fixed beat difference must be tuned. Moreover, the difficulty increases somewhat in proportion to the magnitude of the beat. Where the difference is small, say 50 to 100 ke., the use of S.L.F. condensers offers a simple and passable solution. Where it amounts to several hundred kilocycles, the angular displacement, or detuning, may amount to 90 degrees, with a corresponding practical rotation of one-quarter turn. Result—the broadcast band cannot be covered. Moreover, if one tries to work one half the dial on the upper beat and the other half on the lower, the oscillator frequency will have a point of coincidence with the amplifier frequency, and interference will occur.

Obviously if S.L.F. condensers are to be used, only upper beat tuning will do, and the large angular displacement must somehow be avoided. That is, the circuits must cover different frequency ranges, and this achievement, in its most obvious solution, requires unequal constants and gear reduction between condensers.

Such an arrangement is difficult and expensive to construct; besides it is bunglesome and it may be subject to the errors of distributed capacity. A better and perhaps the very best of all arrangements is one in which the rotor plates of a gang condenser have been cut to the required design. In this, since the first circuit is taken as it actually

---

\[ r_1 = r_0 \left( 1 - \frac{A e^{-\alpha}}{A} \right)^{\frac{1}{2}} \]

in which \( \alpha \) is the angle separating two radii \( r_1 \) and \( r_2 \), \( A \) is a constant as defined in the expression

\[ C = \frac{1}{2} \int_0^L A \phi \, d\phi \]

and \( \phi \) is the total capacitance corresponding with \( r_1 \) and \( \phi \) being, of course, the distributed capacity.

---

\( ^\circ \) 5051 S. Tripp Ave., Chicago, Ill.

\( ^\oplus \) It is straight between two successive points only if the following relation is satisfied: namely, that

\[ \frac{r_1 - r_2}{r_1} = \frac{A e^{-\alpha}}{A} \]

where \( \alpha \) is the angular deviation of the beat and \( A \) is a constant as defined in the expression

\[ C = \frac{1}{2} \int_0^L A \phi \, d\phi \]
tunes, no special type of condenser is required. Moreover, the expense is little more than the labor, while the job itself is compact and dependable with an expectation of performance in direct proportion to the care and skill of the workmanship.

Referring to Fig. 1, consider two rotor plates, similar or dissimilar, and of any shape whatsoever, but rigidly fixed to rotate together. Designate the full radius by \( r \), the clearance radius of the stator plate by \( r_0 \), and the capacity of a small sector is

\[
dC = \frac{1}{2} (r^2 - r_0^2) d\theta
\]

with a similar expression in subscripts for the other plate. Dividing

\[
\frac{dC}{dC_1} = \frac{1}{\lambda_1} \left( \frac{r^2 - r_0^2}{r_1^2 - r_0^2} \right)
\]

in which the ratio \( \lambda \) will cancel out if both rotors have the same number of plates, same plate thickness, same plate spacing, etc.

The frequency of the circuit will be

\[
f = \frac{K}{\sqrt{L(C+q)}}
\]

in which \( C \) may represent a variable capacity, and \( q \) a capacity which does not vary. Obviously \( q \) is a sum, including the distributed capacity of both the coil and condenser, and it may include whatever fixed capacity is due to that portion of plate area permanently below the original line \( OP \).

Differentiating

\[
f = \frac{K}{\sqrt{L(C+q)}}
\]

\[
dC = \frac{-2K^2}{L^{3/2}} df
\]

which upon substitution in (2) gives

\[
\frac{r^2 - r_0^2}{r_1^2 - r_0^2} = \frac{L}{L} \left( \frac{f+i}{f} \right)^2
\]

In this \( f \) may be taken to represent the antenna frequency, \( f \) the intermediate frequency, and consequently \( f+i \) the oscillator frequency. The symbols with subscripts will in all cases refer to the oscillator circuit. In the foregoing, if arbitrarily chosen initial values of frequency and radius, \( f^* \), \( R^*\), and \( R_l \) substituted, the inductance ratio may be eliminated. Thus substituting and solving for \( r_1 \) (5) becomes

\[
r_1 = \sqrt{\frac{(r^2 - r_0^2)(F^2 - f^2)}{(r_1^2 - r_0^2)(F^2 - f^2)}} \left[ \frac{f + i}{f - i} \right]^{2q} + \frac{r_0^2}{r_1^2}
\]

\[\text{Taking account of the clearance width} \ a, \ \text{Fig. 1, the exact expression is}
\]

\[
\frac{1}{2} \left[ (r - a) \left( \frac{r - a}{r} + \sqrt{\frac{r - a}{r} \frac{r - a}{r} - a^2} \right) \right] d\theta
\]

which reduces to the above when \( a = 0 \).

An expression involving only frequencies and radii.

In the foregoing the origin line may be taken on any radius, values corresponding being parameters connecting frequencies and radii on either side. The equation holds for any radius and frequency, assumed or real, within the proper physical limitations; that is, the calculation must not obtain impossible frequencies, nor run outside the bounds of plate dimensions. The limits of possible frequencies are those of the circuit itself, to which distributed capacity may be added but from which it cannot be taken away. To put it another way, a given coil and condenser will cover a band which may be made narrower but not broader.

At the very best it is difficult to make the antenna circuit cover a band sufficiently wide, while the oscillator band, with its higher frequencies, will be wider than necessary. The general plan therefore consists of taking the antenna circuit just as it tunes and broadening the oscillator to it by reshaping the rotor and adding distributed capacity.

A good gang condenser should be chosen, one with sections similar and rigid on the same shaft. Preferably the construction should be substantial and the plates rugged enough to withstand the cutting process. For the first step one section should be connected with a suitable antenna inductance, taking care, as this inductance is final, to see that the proper band is covered. In general, and in particular with a loop, .0005 mfd. condensers will be needed to cover the present broadcast allocations.

Using a separate condenser on the oscillator, and with the antenna trimmer set for minimum capacity, get an accurate log of the antenna circuit. By accurate it is meant that the readings be those of actual, future working conditions as nearly as possible. Also, if there is any doubt about the upper terminal reading discard it and keep the next highest.

After the logging remove the rotor from the frame, and with a file and tin snips make a template of thin metal, the exact shape of the rotor plate. Lay this template on a sheet of paper, Fig. 2, and scribe around it with a very sharply pointed pencil, and mark in the center of rotation \( O \). The importance of exactness in locating this center cannot be overstressed. Accuracy may be had, however, if the rotor is laid on a plane surface and measurements from this to the shaft center taken; the same results may be had with the use of a combination square. After the center is located, lay a tuning dial over the sketch, mark the dial settings of the log, and draw in the various radii to the center \( O \). Then with a decimal scale, metric or tenths, and a glass if possible, measure the radii, center to periphery, estimating fractional divisions to tenths. These measurements are those of the column headed \( r \).
In calculation, if the origin line is chosen on the radius of highest frequency, errors due to several sources may result; errors of logging and errors of measurement, both due to sparsity of plate area in this region; besides there is likely to be a distributed capacity which is not constant. For these and the additional reason that a small error in determining the beat frequency may have been made it is far better to take the origin line somewhere near the mid point. To do this it will be necessary to assign some arbitrary value less than unity to the ratio

$$\left( \frac{R_1^2 - r_1^2}{l_1^2 - r_1^2} \right)$$

and which in calculation fixes the values of \(r_1\) not in excess of \(r\) on the radius of highest frequency. One or two trials should determine a value that will be satisfactory. Thus in the example shown a ratio of \(0.6\) was taken, and this upon substitution in the equation with other values from the table gives

$$r_1 = \sqrt{0.6 \times 0.060 \times 1.41 - 0.212} = 0.84$$

slightly less than \(r\).

Using the same ratio, namely \(0.6\) and \(F = 870\), the remaining values of \(r_1\) are then calculated by substituting the corresponding figures for \(f\) and \(r\) in (7), the labor of this being materially aided if the progress is tabulated in columns. The new radii are located on the sketch, a smooth curve drawn through the various points, and then a template for use in cutting is made. In going about the latter task first of all scribe on the metal the axes \(XX\) and \(YY\) for use in aligning and comparison. In this connection it might be pointed out that in the entire scheme the requirements for success are these: Proper location of the center point \(O\); the correct beat frequency, and on the template, location marks that will insure accurate comparisons. For the calculations themselves slide rule figures will do.

In the actual cutting the plates may be roughed by grinding if tallow is put on the wheel, but a very coarse file and a sharp knife to trim off the feather edges is just as good. All cutting should be done parallel with the plane of the plates to avoid chattering and bending. Most of the metal may be removed with a hack-saw if the individual plate is caught between two suitable pieces of steel and thus clamped in a vise. In the plate design shown, 75% of the metal was sawed off in 15 minutes. For the finishing a file must be used, the design being scribed on the first plate of the adjacent rotor, and a straight edge extending across being used to check up and locate high spots. And finally, when the rotor is put back, care must be taken to see that the reassembly has not derogated the previous antenna logging.

Better to check a few points, as these readings are needed in the next step.

Thus, the finishing task is the adjustment of oscillator inductance and distributed capacity to the remodelled rotor. That is, the frequency range must be fixed within the proper limits by changing the inductance and distributed capacity, \(q, C\) having been pro-rated in the cutting.

This is done in the simplest fashion by trial. In preparation an auxiliary variable condenser should be paralleled across the oscillator condenser. Also, since the rotor has been cut down, very likely, turns will have to be added to the coil, say 10 or 12 for a trial, as the surplus is removed easily. Then with the gang set at some low reading, say 31 from the log, try to get in the station by tuning the auxiliary variable. If it cannot be done, turns must be removed until it can be done. Then move to a higher frequency and reset the auxiliary to get in the station. Assuming an increased capacity was needed, more turns must be removed from the coil. Repeat, spreading the frequency by removing one turn at a time until the two circuits keep in step all the way through; against the prospect of taking off too much wire it is best to keep the equivalent of one or two turns folded up.

Upon completion the auxiliary condenser may be permanently replaced by a midget, such as a 13-plate Pilot for instance.

If the beat frequency, as needed for the calculations, is not known it may be determined in the following ways. First, if a frequency meter is available it is necessary only to measure it directly, or to measure the frequency of the oscillator and subtract the corresponding antenna frequency. In another method first calibrate the oscillator in terms of the antenna frequency by getting in stations, upper beat, on the low frequency end of the dial. Then tune in some high frequency station, lower beat, and determine by interpolation what antenna frequency this corresponds with, upper beat tuning. Suppose it is 598 kc, and the broadcast frequency is 1300. Then 598 plus 25 = 1300, or
As a closing remark it might be pointed out that only the oscillator rotor is cut; hence the principle may apply to multi-stage amplification ahead of the frequency changer. Redesign for lower beat tuning is advised against since, in the probable case, the antenna rotor would have to be cut, with consequent loss in width of band. As regards the possible accuracy of tuning that may be expected, it might be said that the example used in illustration tunes uniformly sharp without trimming up to 1310 kc, or 93 on the dial, beyond which point the distributed capacity of the condenser practically determines its capacity; this of course with the clearance width \( u \), fig. 1, neglected.

\[
\begin{array}{ccccccc}
1 & 2 & 3 & 4 & 5 & 6 & 7 \\
\hline
6 & 570 & 951 & 0.655 & 2.125 & 1.905 & 7.275 \\
18 & 860 & 1001 & 2.694 & 2.602 & 1.308 & 7.666 \\
31 & 670 & 1051 & 1.768 & 1.851 & 1.638 & 7.553 \\
40.5 & 720 & 1101 & 1.825 & 1.741 & 1.538 & 7.600 \\
49 & 770 & 1151 & 1.885 & 1.705 & 1.493 & 8.061 \\
58 & 820 & 1251 & 1.956 & 1.641 & 1.428 & 8.599 \\
71 & 970 & 1351 & 2.029 & 1.539 & 1.327 & 8.958 \\
74.5 & 1020 & 1401 & 1.126 & 1.501 & 1.285 & 8.751 \\
80 & 1100 & 1481 & 1.217 & 1.471 & 1.253 & 9.141 \\
87 & 1210 & 1591 & 1.307 & 1.355 & 1.143 & 8.991 \\
93 & 1310 & 1691 & 1.356 & 1.254 & 1.042 & 8.871 \\
98 & 1360 & 1771 & 1.414 & 1.141 & 0.903 & 8.380 \\
103 & 1410 & 1871 & 1.468 & 1.047 & 0.800 & 8.046 \\
\hline
\end{array}
\]

\[
\frac{f}{c} = \frac{r_1}{r_2} = 0.6 \text{ at } 870 \text{ kc.}
\]

Hull Returns to Australia

We hope that our readers have remembered that Mr. Ross A. Hull, for the past year our associate technical editor and director of the A.R.R.L. Technical Development Program, is an Australian but a visitor in America. With deep regret we announce that he has now reached the end of his stay in this country and has returned to Australia, leaving behind him a remarkable record of work accomplished, and carrying with him the admiration and best wishes of our staff.

Mr. Hull has made an enduring name for himself in amateur radio, not only in this country but in every country where QST is read — which, incidentally, means every country. When the League's special technical program was undertaken, a Headquarters' council was formed to shape its destiny, consisting of Technical Editor Westman, Mr. Hull, and the League Secretary. Mr. Hull was appointed director of the program. It was his formidable duty to undertake to discover the answers to the numerous problems which came to amateur radio with the advent of the Washington Convention. How well he has succeeded our readers know. His "program" articles have been the high-lights of QST of the past year. The work was often carried out under very trying conditions, with the great desirability of finishing a certain problem in time to report the work in the next issue of the magazine, necessitating the pouring out of an unbelievable number of hours of effort. His labors have answered our difficulties and his articles have set the new 1929 standard in the literature of our hobby.

Mr. Hull joined our staff in December of 1926, primarily to obtain contact with American amateur radio and its methods. When the "program" came along he had his real work cut out for him. He is a most versatile chap, Architect, journalist, amateur sketcher, builder of model airplanes, expert amateur photographer — these are a few of his accomplishments besides radio. One day he dashed off a proposed new design for the QST cover which we liked so much that we have used it ever since. The illustration on our January cover is a bit of his handwriting. In fact he made the portrait of himself which graces this column.

We don't know whether the Aussies will know him or not. We've worked him pretty hard and we've made profound changes in the way he talks and eats and drinks — he's almost an American now. He carries back to Australia two and a half years' experience at A.R.R.L. Headquarters, watching the wheels of amateur radio the world around. From this contact we hope for even closer relations with the Aussies, whose honorary federal secretary Mr. Hull was before coming over. Personally we think he ought to be elected president of the Australian outfit, appointed technical advisor to the amateur empire, and presented with 1000 assorted tubes by the Radio Corporation.

In other words, we shall miss him.

— K. B. W.
The Governors-President Relay

By William M. Smith*

The Governors-President Relay of 1929 is over but it has left with the amateurs of the United States and its possessions fond memories of accomplishment. The 1929 Relay was by far the most successful and most satisfactory that has ever been accomplished in the annals of amateur radio. Those who took part in it may well be proud of their work, not only participating in an outstanding event on Inauguration Day but in again demonstrating the real inherent value of amateur radio as an item of national defense and as a means of emergency communication.

As previously and completely announced in *QST*, the Relay did not start until 5:00 p.m. Eastern Standard Time, March 3rd. It was absolutely prohibited to put any congratulatory messages on the air to President Hoover before that time. At 5:00 p.m., the following day, forty-one messages were safely in the hands of Washington, D. C., amateurs ready for delivery to the President. Included among these were messages from such distant points as Alaska, Philippine Islands, Virgin Islands and Nova Scotia. Several messages from private organizations, such as the Bronx Board of Trade, the Pah Ute Tribe at Yerington, Nevada, and others had been received. However, these private messages were not counted in the Relay as it was considered to be a strictly Governor-President contact.

At the request of Headquarters, the Washington Radio Club undertook to organize a special Committee to handle this Relay, under the Chairmanship of Mr. G. L. Bidwell. Unfortunately, Mr. Bidwell was taken sick and Mr. E. N. Dingley, Jr. (W3HL), Chief Operator of the Washington Radio Club, assumed charge. The result of the work of this Committee in organizing and handling the messages speaks for itself. The following Washington stations took part in the Relay:

<table>
<thead>
<tr>
<th>Station</th>
<th>Owner and Operator</th>
<th>Messages Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>W3BBT</td>
<td>E. W. Darne</td>
<td>12</td>
</tr>
<tr>
<td>W3GT</td>
<td>K. D. Wilson</td>
<td>10</td>
</tr>
<tr>
<td>W3HL</td>
<td>E. N. Dingley, Jr.</td>
<td>6</td>
</tr>
<tr>
<td>W3CDQ</td>
<td>Miss Elizabeth Zandonini</td>
<td>3</td>
</tr>
<tr>
<td>W3BKW</td>
<td>Brewster Marshall</td>
<td>2</td>
</tr>
<tr>
<td>W3KR</td>
<td>E. D. Redington</td>
<td>2</td>
</tr>
<tr>
<td>W3ALF</td>
<td>E. T. Johnson</td>
<td>2</td>
</tr>
<tr>
<td>W3AHP</td>
<td>Roland Fowler</td>
<td>1</td>
</tr>
<tr>
<td>W3AKO</td>
<td>S. M. Grimes</td>
<td>1</td>
</tr>
<tr>
<td>W3AKR</td>
<td>L. W. Holt</td>
<td>1</td>
</tr>
<tr>
<td>W3AU</td>
<td>W. H. Leeth</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>41</strong></td>
</tr>
</tbody>
</table>

The method of operation on the part of the Washington stations was to call CQ-GPR and listen for replies. In response to these calls, some amateurs answered and wanted to know who GPR was, even though the Relay had been mentioned prominently in *QST*. Of course, such stations had no traffic and had to be cut short, as there were plenty of the “initiated” who had looked forward to the Relay and were “on deck” with GPR traffic.

Exceptionally good work was done (as the foregoing list of stations and messages handled will show) by W3BBT, W3GT and W3HL. The Governors-President Relay served only to intensify the activity of these three stations which in ordinary everyday operation are so efficient. It is significant, also, to note that W3BBT and W3HL were ably assisted by their respective wives, Mrs. W3BBT and Mrs. W3HL.

The delivery of the messages to the White House was, of course, the climax to the Relay. At the request of the Special Committee of the Washington Radio Club, the writer had the

*W3GP, President, Washington Radio Club.
extreme honor of delivering the actual messages to President Hoover, in company with most of the amateurs who took part in the Relay in Washington. The President afforded us an exceedingly cordial reception and inquired very closely whether or not all of the messages presented had been received by amateur radio. He was, of course, assured that such was the case and he complimented us profusely on the work that had been done. We all know, of course, that the President, while Secretary of Commerce, evidenced a very clear conception of not only the general radio situation, but was particularly a friend of the amateur. In fact in years past, amateur radio has had a place in his home. One of President Hoover’s sons was not only a prominent amateur but a member of the Washington Radio Club.

Of course we want to mention all of the individual participants throughout the country. To do this adequately it is necessary to take each Governor’s message separately and trace it from the time it left its originating station until it reached Washington. Wherever possible, frequency bands will be noted in the following tabulation, which is made up from the reports that were submitted to A.R.R.L. Headquarters after the conclusion of the Relay. Where there have been several routes and branch-routes, all of them will be traced, the best one coming first — the rest following in chronological order of time of delivery to Washington. After each route will be given the time of arrival, in Eastern Standard Time. The Relay lasted, it will be remembered, just twenty-four hours from 5:00 p.m. of the third until 5:00 p.m. of the fourth. Therefore all p.m. time from 5:00 to 12:00 will be of the third of March; all a.m. time from 0:00 to 12:00 will be of the fourth of March; and all p.m. time from 0:00 to 5:00 will be of the fourth of March. Tabulation of routes by states follows:

ARKANSAS
(1) W5HN — W5BCZ — W3GT (Ar. 7:00 p.m.)

CALIFORNIA
(1) W6APU (7 mce.) — W6CIS (14 mce.) — W8CCW (3500 kc.) — W8OF (7 mce.) — W3AU (Ar. 3:00 p.m.)

COLORADO
(1) W9CAA — W3RKW (7 mce.) (Ar. 3:45 A.M.)
(2) (Too late) W9DKM — W5OM — W9DXZ — W3ZF — W3BWT (Ar. 7:45 p.m., 6 March)

CONNECTICUT
(1) W1MK — W3KR (7 mce.) (Ar. 3:00 p.m.)
(2) W1MK — W3HL (7 mce.) (Ar. 4:30 p.m.)

DELWARE
W3ALQ, after attempting many times to secure a message from the Governor, was informed that the Governor was too busy to attend to the business of writing a congratulatory message.

FLORIDA
(1) W4QR — W4AEF — W4JR — W3BWT (Ar. 7:30 p.m.)
(2) W4ACC — W3GT (Ar. 7:45 p.m.)
(3) W4MS — W4AHM — W3AHZ — W3BWT (Ar. 11:35 a.m.)

GEORGIA
(1) W4RN — W3GT (Ar. 5:20 p.m.)
(2) W4RM — W3CFG — W3BWT (Ar. 9:00 p.m.)
(3) W4RN — W3CR — W1DV — W3KR (Ar. 11:30 p.m.)
(4) W4PM — W8BAS — W3BWT (Ar. 2:30 a.m.)

IDAHO
(1) W7YA — W3CDO (Ar. 1:55 a.m.)
(2) W7ABB — W9DKM — W9CAA — W3BKW (Ar. 3:45 a.m.)

ILLINOIS
(1) W9HNI — W9APY — W9DXZ — W3ZF — W3BWT (Ar. 12:00 p.m.)
INDIANA
(1) W9DSC — W8CNO — W8BAS — W3BWT (Ar. 11:30 p.m.)
(2) W9DXP — W3GT (Ar. 00:50 a.m.)
(3) W9DXP — W8AVS — W8DNUW — ???

IOWA
(1) W9CET — W3BWT (Ar. 1:40 a.m.)
(2) W9CET — W3KR (Ar. 1:05 a.m.)

KANSAS
(1) W9Raz — W3BKW (Ar. 8:25 p.m.)
(2) W9Raz — W3ATU — ???

LOUISIANA
(1) W5YW — W5EB — W3AHF (Ar. 11:30 p.m.)

MAINE
(1) W1BIG — W1ACH — W1MK — W3BWT (Ar. 8:45 p.m.)
(2) W1BIG — W1ACH — W1PE — W3CFG — W3BWT (Ar. 11:00 p.m.)
(3) ??? — W1DV — W3KR (Ar. 11:00 p.m.)

MARTLAND
(1) W3BBW — W3ALF (Ar. 5:01 p.m.)

MASSACHUSETTS
(1) W1ACH — W1LM — W1KY — W1UE — W1RL — W1VAR — W1ACA — W1ARS — W1KH — W3GT (Ar. 8:30 p.m.)

MICHIGAN
(1) WSBGY — W8DED — W8DYH — W1PE — W3ALF (Ar. 11:58 p.m.)

MINNESOTA
Governor went to Washington without leaving message. W9BVH tried the Lieut. Governor but he, likewise, fell down on the job.

MISSISSIPPI
(1) W5AKP — W4RN — W3HL (Ar. 7:25 p.m.)
(2) W5BDE — W5QQ — W4RN — W3HL (Ar. 7:25 p.m.)
(3) W5AZV — W3CDQ (Ar. 3:35 a.m.)

MISSOURI
(1) W9DQN — W3GT (Ar. 3:25 a.m.)

NEBRASKA
(1) W9ANZ — W8BTH — W3BWT (Ar. 4:50 p.m.)

NEVADA
(1) W6UO — W7YA — W3CDQ (Ar. 1:20 a.m.)

NEW HAMPSHIRE
(1) W1AVJ — W1IP — W1TA — W1AEF — W1AYN — W1ATJ — W1BIG — W1ACH — W1PE — W3CFG — W3BWT (Ar. 9:00 p.m.)
(2) W1AVJ — W1IP — W1TA — W1AEF — W1AYN — W1ATJ — W1ART — ??? — W1DV — W3KR (Ar. 11:00 p.m.)

NEW JERSEY
(1) W3CFG — W3BWT (Ar. 5:30 p.m.)
(2) W3CFG — W3ZI — W2AOS — W2PF — W3HL (Ar. 11:15 p.m.)

NEW YORK
(1) W2BGB — W2PF — W3HL (Ar. 11:26 p.m.)

NORTH DAKOTA
W9DYV, SCM of North Dakota, attempted by mail to obtain a message from the Governor, but without success.

OHIO
(1) W8BYN — W8CNO — W8BAS — W3BWT (Ar. 7:00 p.m.)

OKLAHOMA
(1) (Too late) W5APG — ??? — W5OM — W9DZX — W3ZF — W3BWT (Ar. 7:22 p.m., 6 March)

OREGON
(1) W7UN — W6DON — ??? — W9DEX — W3CJ — W3KR (Ar. 7:20 p.m., 3 March)

PENNSYLVANIA
Attempts to obtain a message from the Governor were made by W3ADE and W3ZF without success.

RHODE ISLAND

(Continued on page 31)
Keying the Oscillator-Amplifier

By C. L. Loudon *

Perhaps one of the most effective methods of starting and stopping oscillations in an oscillator is that so long advocated by Hoffman of W9EK. It is shown in Fig. 1.

Let us assume that we have a plate supply of 600 volts. With the key open, the two resistors will be across the supply and there will be a drop of 500 volts across the 50,000-ohm unit and 100 volts across the 10,000-ohm resistor. The filament is connected to the junction of the two resistors and the 100 volts across the smaller unit will be impressed between grid and filament with the negative end at the grid. The 500-volt drop across the larger resistor will be applied between the filament and plate with the positive end at the plate. The tube, therefore, has 500 volts positive on the plate and 100 volts negative on the grid. Under these conditions, the plate current will be zero or very nearly so and oscillations will cease.

When the key is closed, the 10,000-ohm unit is shorted and there can be no voltage drop across it so that the high negative bias is removed from the grid. The total drop is then across the larger unit and we have the full 600 volts applied to the plate, the grid obtaining its normal bias through the condenser-leak arrangement. We have, then, a condition whereby we may shift 100 volts of the plate supply to the grid circuit which does two desirable things: it reduces the plate voltage and increases the negative grid bias. Both of these act towards the stopping of oscillations.

If it is desirable, the grid leak may be replaced by a bias battery without affecting the operation of the circuit. The battery will allow the grid to be blocked with less voltage across the resistor shunted by the key because it is operative regardless of whether grid current is flowing or not.

Such a system has several advantages. The key is at low potential and the current to be broken is small so there are no vicious arcs to be upsetting things and requiring additional filter equipment. Since the key is not in any part of the oscillatory circuit there is no need for a relay even when long keying loads are necessary.

When this system is used to key the amplifier tube in an oscillator-amplifier arrangement, an added advantage is obtained. Suppose we are using a pair of 210's, one as an oscillator and the other as an amplifier and both obtaining plate power from a single source. When the key is open and the amplifier is taking no power from the supply source (assuming a rectifier-filter proposition) the voltage will be dependent upon the load taken by the oscillator. Now, when the key is closed and the amplifier takes power, the supply voltage will drop and the amplifier will draw less current because of the reduced plate voltage. Regardless of what the supply voltage may be, unless the supply is very much larger than is really required, the regulation will be poor enough to make a fluctuation in voltage that will be injurious to the stability of the oscillator.

We found in Fig. 1 that we could start and stop our oscillator by transferring part of the supply voltage from the plate to the grid circuit and back again. The same thing will apply to an amplifier although it may be necessary to increase the amount of voltage on the grid to stop the operation of the tube.

Going a step further, it is possible to subtract the biasing voltage from the plate supply to the oscillator so that when the reduced load on the power supply causes the voltage of it to increase, the amount subtracted will just compensate for this increase and keep the voltage to the oscillator constant even though the load on the power supply may change considerably.

Since the oscillator is drawing current continuously, it is unnecessary to use the voltage divider shown in Fig. 1. A resistor of much smaller value may be inserted in the negative supply lead to the oscillator and the voltage drop across it applied to the grid of the amplifier. This is shown in Fig. 2.

Suppose the plate supply voltage is still 600 and we want somewhat over 100 volts to block the grid of the amplifier tube. If we make R1 of about 4000 ohms and have an oscillator plate current of 30 mils, a voltage drop of 120 will be had across it. Now if we want to run the oscillator on a voltage of 300 or so in order to minimize heating and its attendant troubles, we can insert additional resistance at R2. With 6000 ohms there, the plate voltage will be 300 with a plate

* W2M1W, 3291 Hull Avenue, New York City, N. Y.
current of 30 mils. When the key is closed and the resistor, R1, shorted, the drop that was across the resistor will be applied to the plate of the oscillator to compensate for the drop in supply voltage caused by the increased load on the rectifier-filter system.

If the drop in the power supply unit due to the change in load is lower than the voltage necessary to block the grid of the amplifier tube, the oscillator plate current will increase slightly because its plate voltage will go up. A resistance of a few hundred ohms inserted in either the positive or negative high voltage lead will cause a greater fluctuation in the voltage supplied to the transmitter. Such a resistor can then be adjusted to give exact compensation.

If the oscillator plate current drops when the key is opened it indicates that the voltage change in the plate supply system is greater than that necessary to block the grid of the amplifier. R1 can be increased in value and the lead to the grid of the amplifier may be connected across but a part of the resistor. In this manner the greater voltage drop in the supply unit may be compensated for without putting too much voltage on the grid of the amplifier.

In an extreme case where the value of R1 must be very large to take care of the bad fluctuation in supply voltage it may be necessary to decrease the value of R2 for although the effect of R1 has been to keep the plate voltage of the oscillator constant, it has also reduced the voltage.

If a biasing battery is used for the amplifier it may be substituted for the grid leak and the value of R1 lowered because less additional voltage will be necessary to block the amplifier grid.

A steady oscillator voltage will go a long way towards obtaining a constant frequency transmitter. Here is a method of keeping it constant.

---

**The Governors-President Relay**

*(Continued from page 20)*

**SOUTH DAKOTA**

(1) W9DWN — W9COS — W3CDQ (Ar. 7:03 p.m.)

(2) W9DYX — W8DJV — W3CJ — W3BWT (Ar. 3:30 p.m.)

(3) W9DYX — W9CZF — ???

---

**TEXAS**

W5VV, after repeated attempts to obtain a message from the Governor, had to go home with an empty sack.

**UTAH**

(1) W6BVB — W9BVH — W3GT (Ar. 11:45 p.m.)

(2) W6BVB — W9BVH — W2CUQ — W3AKO (Ar. 10:05 a.m.)

**VERMONT**

(1) W1BEB — W3CFL — W3BWT (Ar. 5:30 p.m.)

**VIRGINIA**

(1) W3BN — W2CUQ — W3GT (Ar. 6:40 p.m.)

**WASHINGTON**

(1) W7GP — W9CWA — W3GT (Ar. 12:30 a.m.)

(2) W7GP — W3GT (To check above)

**WEST VIRGINIA**

(1) W8CAI — W8BYN — W8CNO — W8BAS — W3BWT (Ar. 11:30 p.m.)

**WISCONSIN**

(1) W9EK — W4JR — W3BWT (Ar. 10:00 p.m.)

**WYOMING**

(1) W6BAJ — W9DVR — W9AP — W3AKR (Ar. 10:35 p.m.)

**ALASKA**

(1) K7TO — W7TX — W6CIS — W9I1J — W3BWT (Ar. 3:17 a.m.)

(2) K7TO — W7TX — W6CIS — W3BWT (Ar. 2:04 a.m.)

(3) K7TO — W7TX — W6CIS — W1ANX — W2CUQ — W3AKO (Ar. 11:00 a.m.)

**HAWAII**

(1) K6CFQ — W6TK — ???? — W3C1N — W3ALF (Ar. late at 2:11, 5 March)

**PHILIPPINE ISLANDS**

(1) K1AF — W6AKW — W1MK — W3HL (Ar. 1:12 a.m.)

(2) K1AU — W6BVY — W9BCA — W3CJ — W3BWT (Ar. 7:30 a.m.)

(3) K3AA — W6AMM — W8GNR — ????

**VIRGIN ISLANDS**

(1) K4AA — W4AEF — W4JR — W3BWT (Ar. 10:00 p.m.)

(2) K4AA — W8XE — W3HL (Ar. 6:30 a.m.)

(3) K4AA — W4ACC — W3BWT (Ar. 7:20 a.m.)

(4) K4AA — W2BVH — W3AKO (Ar. 8:30 a.m.)

(5) K4AA — W3ARD — ????

(6) K4AA — W9CRD — ????

(7) K4AA — W2CVJ — ????
THE Official Frequency Station Committee, a part of the Experimenters’ Section of the A.H.R.L. has arranged the services described below for the benefit of the members of the League and others.

1. Standard Frequency Transmissions are sent by Standard Frequency stations (known as O.F.S.-S.F.) on definite schedules with a high degree of accuracy. All the principal amateur bands are covered, several points being given in each so that frequency meters may be accurately calibrated. These transmissions are based on piezo-electric frequency standards that are regularly checked by one or more of the leading scientific laboratories of the country.

2. Official Frequency Transmissions are sent by Official Frequency Stations (known as O.F.S.) at a somewhat lesser degree of accuracy. These stations do not transmit on regular schedules but announce their frequency at the end of at least every other transmission during their regular amateur operation. Such stations will measure the frequency of your emissions upon request.

3. Special services will be announced from time to time as occasion requires.

Practical suggestions are always welcome and should be sent to a proper member of the Committee which is composed of the following: Don C. Wallace, W6AM, Chairman in charge of O.F.S., Room 410, 209 Pine Avenue, Long Beach, Calif.; Prof. C. M. Jansky, Jr., of radio station W9XL and Killian V. R. Laming, in charge of O.F.S.-S.F., Box 731, Hollywood, Calif.

**STANDARD FREQUENCY SCHEDULES**

<table>
<thead>
<tr>
<th>Time</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>PM</td>
</tr>
<tr>
<td>8:00</td>
<td>5700</td>
</tr>
<tr>
<td>8:12</td>
<td>4000</td>
</tr>
<tr>
<td>8:24</td>
<td>3500</td>
</tr>
<tr>
<td>8:36</td>
<td>3000</td>
</tr>
<tr>
<td>8:48</td>
<td>3500</td>
</tr>
<tr>
<td>9:00</td>
<td>3500</td>
</tr>
<tr>
<td>9:12</td>
<td>3500</td>
</tr>
<tr>
<td>9:24</td>
<td>3500</td>
</tr>
</tbody>
</table>

Time is the local standard time at the transmitting station and frequency is in kilocycles.

**DIVISION OF TIME**

4 minutes — QST QST QST de (call letters).
3 minutes — "Characteristic letter" sent very slowly and broken by call letters each half minute.
1 minute — Statement of frequency in kilocycles.
1 minutes — Time allowed to change to next frequency.

**TRANSMITTING STATIONS**

W1XV — Massachusetts Institute of Technology, Communications Experiment Station, Round Hill, Dartmouth, Mass.; H. A. Chinn in charge, Uses Eastern Standard Time and characteristic letter "C".


**ACCURACY**

The transmissions of these Standard Frequency Stations will be within 1 10 of 1 c of the announced frequencies. It is expected that those of W1XV will have a much higher degree of accuracy, the exact figures to be announced during the running of the schedule. Those in a position to utilize an accuracy of better than 1 10 of 1 c may write W1XV for further data. While no responsibility, financial or otherwise, is assumed for the accuracy of these transmissions, every effort will be made to have it exceed the figures given.

**STANDARD FREQUENCY SCHEDULES FOR MAY AND JUNE**

<table>
<thead>
<tr>
<th>Date</th>
<th>Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>W1XV</td>
</tr>
<tr>
<td>3, Friday</td>
<td>A</td>
</tr>
<tr>
<td>3, Sunday</td>
<td>CD</td>
</tr>
<tr>
<td>10, Friday</td>
<td>AB</td>
</tr>
<tr>
<td>17, Friday</td>
<td>B</td>
</tr>
<tr>
<td>19, Sunday</td>
<td>C</td>
</tr>
<tr>
<td>24, Friday</td>
<td>AB</td>
</tr>
<tr>
<td>June</td>
<td>W9XL</td>
</tr>
<tr>
<td>2, Sunday</td>
<td>CD</td>
</tr>
<tr>
<td>7, Friday</td>
<td>A</td>
</tr>
<tr>
<td>14, Sunday</td>
<td>AB</td>
</tr>
<tr>
<td>21, Sunday</td>
<td>C</td>
</tr>
<tr>
<td>25, Friday</td>
<td>AB</td>
</tr>
</tbody>
</table>

**OFFICIAL FREQUENCY STATIONS**

(Required accuracy 3 10 of 1 c)


(Continued on page 88)
Alternating Current Rectification as Applied to Radio

(In two parts—Part II)

By R. J. Kryter*

GAS-CONDUCTION rectifiers are similar in many respects to the above described thermionic rectifiers, differing chiefly in the fact that they are less highly evacuated and as a result much of the current through the tube is carried by gas ions instead of electrons.

The electrons shot off heated bodies normally travel neither rapidly nor far, as they are quickly stopped by the accumulated blanket of negative particles, the "space-charge." If, however, an electric field of proper direction be applied in the vicinity of the hot body, part of the "space-charge" will be neutralized and the electron will acquire a high velocity in "falling" through this field. If the field be sufficiently intense, the electron will be endowed with such energy that if it accidently collides with a gas molecule it will literally tear one of the electrons out of that molecule. The new electron travels on under the influence of the field, leaving behind a gas molecule which has lost an electron and is therefore positively charged. This positively charged particle also moves under the influence of the field but in an opposite direction to that taken by the electron, the particle being called a "gas ion." Thus we see that by virtue of this process of "ionization by collision" it is possible to produce many more charged particles than were originally available, and since the number of charged particles present determines the current which can be carried, this process makes it possible to greatly increase the output of a rectifying tube. If the amount of gas in the tube be vanishingly small (as in the thermionic rectifier) the probability of an electron colliding with a molecule is very remote and therefore ionization does not occur. On the other hand, if the amount of gas is large (near atmospheric pressure, for example) the heavy gas molecules are so closely packed that they stop the electrons before the latter ever reach high enough velocities to cause ionization. Therefore, the phenomena of gas ionization are limited to a certain low range of pressures, usually about 1/10 mm. of mercury, and it is in gases of this degree of rarefaction that gas-conduction rectifiers operate.

| TUNGAR AND RECTIGON TUBES |

The simplest gas-conduction rectifier is the well-known Tungar or Rectigon bulb. This is a simple two-element tube comprising a tungsten filament and a graphite plate, enclosed in an atmosphere of argon at low pressure. The hot filament emits electrons which travel over to the plate when the latter is positive just as in the case of the thermionic tube. In addition, however, the swiftly flying electrons ionize many of the argon atoms and the positive ions thus formed then travel to the filament, reducing the internal resistance of the tube and increasing its current-carrying capacity.

When the plate is negative the electrons are restricted to the vicinity of the filament by the space-charge and cannot reach high enough velocities to ionize any gas. The ions which were produced during the previous half cycle immediately recombine with stray electrons to re-form neutral atoms and as a result the tube becomes non-conducting. The ionization occurring between filament and plate is evidenced by an intense blue glow when the tube is under load.

---

*Research Engineer, Prest-O-Lite Storage Battery Corporation, Indianapolis, Ind.
The Tungar bulb is essentially a heavy current, low-voltage device. It is made in three sizes, the full-load d.c. output ratings being approximately: 1 amperes at 15 volts, 2 amperes at 30 volts and 5 amperes at 90 volts. The efficiency of the tube is low, about 20–25%, the overall efficiency of battery chargers being 15% and 20%. The tube is very rugged, however, and its life is long, 1000 hours being normal. The efficiency of the tube increases with the load voltage. The filaments of the 1-ampere and 2-ampere bulbs take 7 amperes and 14 amperes respectively at 2 volts. The 2-ampere tube has a breakdown voltage of about 60 volts. After the tube has once started, the filament current may be extinguished without interfering with the operation of the tube; in fact, the efficiency will be slightly increased. It is necessary to heat the filament, however, to make the tube self-starting.

MERCURY ARC

The mercury arc rectifier is similar in operation to the Tungar tube except that the gas is mercury vapor at low pressure and the source of electrons is a "hot-spot" on a pool of mercury. This type of rectifier has been applied with great success to many purposes, covering a wide range of currents and voltages. Glass bulb types are available in 3- to 50-ampere sizes and capable of rectifying several thousand volts. The mercury arc rectifier is characterized by its extreme efficiency which runs from 75% to 95% overall for the complete rectifier plant. Its chief drawbacks are its high initial cost and the fact that it is not self-starting. Its overload capacity is limited — a 25% current overload being allowable only for 30 minutes. Current overload will cause the anodes to heat, resulting in short circuiting of the bulb. The breakdown voltage depends upon the degree of vacuum in the bulb and upon the operating temperature, but ranges between 2000 and 15,000 volts. Cooling the bulb by means of a fan greatly raises the breakdown voltage. The life of a mercury arc rectifier is limited only by mechanical breakage or loss of vacuum. The voltage regulation is the best of any known type of rectifier, being only about 10% between no-load and full load. The efficiency of the device is practically constant above one quarter load, but increases with the voltage being rectified. The voltage drop in the tube is practically constant independent of the circuit in which it is placed or the load handled and is 15 to 20 volts.

RAYTHEON

A third type of gas-conduction rectifier is represented by the Raytheon tube. In this tube, which is designed for full-wave rectification, two anodes in the form of short metal rods are mounted side by side within an umbrella-shaped metallic cathode, the whole being enclosed in an atmosphere of helium at low pressure. The exact mechanism of rectification is quite complicated but is due partly to the difference in area of the electrodes and partly to their shape and placement and the nature of the resultant fields. If the rod-shaped anode be connected to the positive side of a d.c. circuit, a voltage of 200 to 300 volts will start a discharge through the tube. If the cup-shaped cathode be made positive, however, a voltage of 750–1000 volts will usually be necessary to cause any considerable current to flow. It is to be noted that at a voltage about the same as that in which the arc strikes in the conducting direction, a small leakage current starts in the insulating direction, although a much higher voltage is necessary to cause the valve to pass current freely. This leakage current is one respect in which the Raytheon tube is inferior to thermionic tubes, although the leakage is small and relatively constant and does not produce the pernicious effects that were observed in electrolytic valves.

It is characteristic of the type of discharge occurring in this tube that the voltage necessary to start the arc is greater than the voltage necessary to maintain it. In a d.c. circuit the minimum voltage at which the discharge can be maintained is usually about 150 volts below the starting voltage. The voltage across the tube has a peculiar wave-form, shown diagrammatically in Fig. 3. This peculiarity of the tube not only causes certain distortion of the output wave, but also generates surges, or "transients" in the high voltage circuit which must be absorbed by buffer condensers placed across the transformer secondary. This peculiarity also makes it necessary
for the tube to feed directly into a capacitive rather than into an inductive or resistive load. The significance of this fact will be appreciated in the latter section on "Filters."

The Raytheon Type "BH" tube has a rated full-load output of 125 ma at 300 volts d.c., and the type "BA," 350 ma at 200 volts d.c. The maximum rated r.m.s. voltage per anode is 350 for both tubes. Actually, picked "BH" tubes may be worked as high as 550 volts per anode, giving outputs of 450-500 volts d.c. The Raytheon tube is more sensitive to voltage overload than to current overload, high voltages causing insulation troubles. Its guaranteed life at full load is 1000 hours, but it will usually operate for 2000 hours or more. Its output is remarkably steady during its entire life, the tube usually failing rather suddenly by open circuiting. The tubes are very uniform, the output voltages of new tubes being within plus or minus 2% limits. The voltage regulation is considerably better than that of filament tubes of equal size, due to the "negative resistance" characteristic of the gaseous arc. The maximum efficiency of the tube itself is about 55%; the overall efficiencies of B-supply devices for receiving sets usually being between 30% and 45%.

**DRY CONTACT RECTIFIERS**

Dry contact rectifiers include a wide assortment of devices which, though similar in structure, operate on various principles. All of them comprise a junction between two dissimilar substances, generally a metal and a crystalline metallic salt which is electrically conductive. The detailed modes of operation of these devices are complex and are not thoroughly understood but in general they involve thin films in which the molecules are so oriented or "polarized" that the transfer of electrons in one direction requires much less work than a similar transfer in the opposite direction. In some cases the conduction is metallic in nature, i.e., no decomposition of the conductor occurs (such as the copper-oxide valve) whereas in other cases electrolytic conduction occurs, i.e., the conductor itself is decomposed by the passage of current and new chemical products appear at the electrodes (such as the copper sulphide valve).

Probably the oldest dry contact rectifier is the humble crystal detector. Although this device can handle only very minute currents and voltages, its efficiency is high and its output wave-form good. Operating in much the same fashion, commercial devices are now available which will handle considerable power. Two main types are popular at present, the aluminum (or magnesium) copper sulphide valve, such as the Elkon and Benwood-Linze devices, and the copper-cuprous oxide valve, such as the Rectox and Kuprox units.

In general, contact rectifiers are simple in construction and have a high efficiency. All contact rectifiers, however, suffer from the fact that their characteristics vary with the condition of the contact surfaces and with the pressure upon these surfaces. In the copper sulphide type of rectifier this fact is most noticeable, inasmuch as the rectifying junction is at the contact between two separate bodies of material. A change in pressure will change the area of contact between these dissimilar bodies and will also affect the nature of any absorbed gas film on the surfaces. In the case of the copper oxide device, the rectifying action takes place in the interior of a disc, at the interface between the mother copper and the cuprous oxide formed chemically thereon. Thus a complete rectifying element is made up of only one physical body and the active junction that is formed during the manufacturing process is not altered subsequently by pressure, abrasion, corrosion or the like. Pressure does affect the copper oxide rectifier, however, insofar as it determines the resistance of the contact made between the external conductor and the crystalline copper oxide sur-

**THE PARTS OF A RECTOX UNIT ARE SHOWN ABOVE**

Along the top row from left to right appear the oxidized face of the rectifying disc, the mother copper face of a similar disc, a lead contact washer and a complete disc with washer. Below these are the bakelite end plate, the terminal disc and the copper strap. A tie-bolt may be seen just above the completed unit at the bottom of the picture.

face. Insufficient pressure will cause a high resistance joint between the rectifying element itself and the connection thereto, thus increasing the resistance in the open valve direction and decreasing output and efficiency. The Kuprox unit is a riveted assembly and no adjustment of pressure can be made, but the other units are bolted construction and their outputs can often be improved by tightening; other units are of bolted construction and their outputs can often be improved by tightening up the bolts and thus increasing the pressure on the elements.

Contact rectifiers resemble electrolytic rectifiers in possessing a definite breakdown voltage and breakdown temperature. If either critical
value be exceeded, the rectifier will pass current freely in both directions. After the unit cools down, or after the high voltage is removed, it will immediately function again much as if it had never been overloaded. Rectox rectifiers have been broken down in this way ten times in succession without showing any permanent ill effects.

Contact rectifiers, furthermore, all show leakage. Like the electrolytic rectifier, this leakage increases rapidly with temperature and to a certain extent with the age of the unit. For this reason it is extremely important that such devices be adequately ventilated; the unit itself should not operate appreciably above 90°-100°F. The leakage current in a Rectox full-wave unit charging a 6-volt storage battery will be 2-6 milliamperes at 70°F., 15-25 milliamperes at 90°F., and 60-100 milliamperes at 140°F. The characteristics of a single element from such a rectifier are shown in Fig. 1. A peculiar leakage phenomenon is demonstrated by some copper sulphide rectifiers which show markedly increasing leakage with age. This is due to the formation by electrolysis of minute threads of metallic copper in the copper sulphide. These copper threads carry current in both directions. If the rectifier output is short-circuited for a time, these threads will burn off, the leakage will be greatly reduced and the output and efficiency will be improved.

Contact rectifiers have one other peculiarity in common with electrolytic valves, namely, that the completeness of rectification is affected prominently by current density or, what is similar, by the voltage applied to a given unit. In the contact rectifier this does not come about as a result of capacity effects but rather because the ratio of "closed" and "open" resistances depends upon the voltage applied. This means that any given design of rectifier requires a certain minimum current to cause the rectifier to function properly. For a copper-oxide valve the minimum density is about 50 ma. per square inch and the normal density 200-500 ma. per square inch. The Rectox rectifier unit has an efficiency of 60%. The breakdown voltage is about 11 volts a.c. per disc and the critical temperature about 160°F. The life is probably the greatest of any commercial low power rectifier and is measured in years. A typical battery charger has been operating 18,350 hours (24 hours per day for 765 days) and has delivered 9,620 amperes hours to date. Its original charging rate was 0.59 amperes and its present rate is 0.43 amperes, the average rate over the entire period being 0.52 amperes. The original overall efficiency, including transformer losses was 34%, and the present efficiency is 28%. 

MEASUREMENTS AND CALCULATIONS IN RECTIFIED CIRCUITS

The peculiar symmetrical wave-forms met in rectified circuits necessitate certain precautions when making measurements or calculations on such circuits. In the first place, the difference between d.c. and a.c. meters must be kept in mind. Strictly d.c. meters are always of the D'Arsonval type (permanent magnet and moving coil) and such meters read only the "electrolytic" value of the current flowing, that is, the net value in the predominant direction only. Such meters are specially adapted to measuring the useful output of rectifiers as they show the value of current or voltage which is useful for charging a battery or producing plate current in a vacuum tube. A d.c. meter reads zero when placed in an ordinary a.c. circuit. A.c. meters may be of the moving iron, dynamometer, hot-wire, or thermocouple types. They read the heating value of any current, regardless of waveform or polarity. Mathematically stated, a.c. meters indicate the square root of the mean square of the current passing through them and their readings are called "effective" or "r.m.s." values. (Note that both positive and negative quantities become positive when squared; thus the a.c. instrument eliminates polarity.) An a.c. meter placed in a pure d.c. circuit will read the same as a d.e. meter, but in any other type of circuit, specifically in rectifier networks, the readings of the two types of instruments will be different. A.c. meters are adapted to reading the input voltage to a rectifier, but their readings when placed elsewhere in the circuit require special interpretation.

Consider the case of an a.e. ammeter and a d.c. ammeter placed in series in the output circuit of a perfect rectifier, assuming a non-reactive load so that the wave-form will be either as "B" or "C" of Fig. 1. The geometrical properties of the sine curve are such that in the half-wave circuit, "B," the d.e. meter will read 63.6% of the a.e.
meter reading; in the full wave circuit, "C," the d.c. meter will read 90.1% of the a.c. meter reading. These ratios are frequently spoken of as "the rectification ratio" and serve as an indication of the completeness of rectification. The above ratios are the highest that are possible to obtain in any circuit of the type described, all ordinary rectifier circuits showing ratios poorer than the above. From these figures it follows that the maximum obtainable d.c. power in a perfect half-wave rectified circuit is only 40.4% of the total power in that circuit, in a perfect full-wave circuit the maximum d.c. power is 81.2% of the total.

Any rectified wave may be considered as a pure direct current plus a super-imposed symmetrical alternating current. If an a.c. and a d.c. ammeter are placed in series (or voltmeters in parallel) the value of the true alternating current (or voltage) is the square root of the difference of the squares of the meter readings.

\[
I_{ac} = \sqrt{(I_{em})^2 - (I_{dc})^2}
\]  

(1)

Although this method is theoretically correct for any condition, it is not useful practically when the d.c. is more than ten times the a.c. and therefore is not applicable to filter circuits. In the case of a rectifier output smoothed by a single choke or condenser, however, the percentage a.c. may be 10% or greater and the above method may be used for measuring the same.

Another property of sine curves must be taken into account in rectifier circuits. In a pure sine wave, such as "A" in Fig. 1, the maximum or "peak" value of the wave is 1.41 times the "effective" value which is indicated by an a.c. meter. Thus, if an a.c. voltmeter reads 100 volts, it means that the voltage on the line varies between limits of zero and 141 volts in each direction. Obviously, when a rectifier is in the "closed" value position, it must withstand this 141 volts peak, and not merely the 100 volts read by the meter. Furthermore, if the rectifier feeds any reservoir of voltage, such as a battery or a condenser, this voltage will also be impressed on the rectifier in the closed valve direction in addition to the above peak voltage. In the case of a rectifier supplied from a 750-volt transformer, and having a condenser connected directly across its output, the d.c. voltage across the condenser being 800 volts, the peak of the input wave to the rectifier will be 1.41 × 750 = 1060 volts, and the maximum voltage across the rectifier will be 1060 + 700 = 1760 volts. The fact that the peak voltage is 41% higher than the "effective" voltage explains why at light loads the d.c. output voltage of a rectifier may be higher than the a.c. input voltage. In the case of the rectified output wave "B" in Fig. 1, the peak voltage is 3.14 times the d.c. voltage, and in wave "C" the peak is 1.57 times the d.c.

The input power to a rectifier must be measured by means of a wattmeter; voltage and current readings are of little value inasmuch as the power factor is usually unknown. In connecting the wattmeter care must be taken to see that it includes the power to the filaments of thermionic or Tunar tubes, or to the "keep-alive" circuits of mercury arcs. A wattmeter in the output circuit of a rectifier reads the true power in the circuit, but not the useful power. The useful power output of a rectifier is the product of the d.c. output volts by the d.c. output amperes. The useful overall efficiency of a rectifier plant is the output d.c. volt-amperes divided by the total input watts.

**SERIES AND PARALLEL OPERATION OF RECTIFIERS**

Certain precautions should be noted regarding the operation of rectifiers in series or in parallel. "Perfect" rectifiers, as described under the heading "The Problem," can be conducted indiscriminately in series or parallel and the behavior of the resultant combination deduced from Ohm's law. Thermionic rectifiers approach this condition. When "leaky" rectifiers are placed in series, however, there is always a tendency to a non-uniform distribution of load which may cause much trouble unless properly provided for. If one of the valves has less leakage than the majority, it will carry more than its share of the load and shorten its life. When this valve fails, the voltages across all the other units will be proportionately increased and their failure hastened. This process will go on until ultimately the entire group of rectifiers fails. For this reason it is important when connecting leaky rectifiers in series, to use an increasing factor of safety as the number of units is increased. This applies especially to electrolytic and contact rectifiers.

On the other hand, rectifiers which have a "negative resistance" characteristic will not divide a load in parallel. Examples of this are found in the gaseous conduction rectifiers. They cannot be paralleled directly to increase current carrying capacity, but must be supplied from separate transformer windings.
CONNECTION OF RECTIFIERS

There are several different methods of connecting rectifiers, the choice of method being governed by the characteristics of the rectifier and the load.

The simplest form of rectifier circuit is the single-phase or half-wave circuit shown in "A" of Fig. 2. In this circuit the rectifier is merely connected in series with the supply transformer and the load. The flow of current through the rectifier unit itself is in the direction indicated by the arrow-head which symbolizes one of the elements; the direction of the direct current through the load is shown by the arrow adjacent to the load resistance in the sketch. When the top of the transformer secondary is positive, current flows through the rectifier and load and back to the bottom of the winding. When the bottom is positive the rectifier closes and no current flows until the polarity of the transformer secondary again reverses. The load current is therefore a series of intermittent pulses. In general the wave shape will be similar to "B" of Fig. 1. In this circuit the rectifier unit must carry the entire load current, and during the closed valve position must withstand the peak voltage of the transformer plus the voltage across the load. The output contains an infinite series of frequencies, but the predominant frequency is sixty cycles (in case that is the frequency supplied to the input transformer).

If it is desired to have a more "smooth" output wave than is produced by the above arrangement, or if better regulation of output voltage with load current is necessary, then two or more rectifiers may be connected so that both halves of the a.c. wave are utilized, one rectifier filling in the gaps in the output of the other. One of the oldest of such full-wave circuits is the "Graetz Bridge" or "4-cell bridge" shown in "B" of Fig. 2. Here, four rectifiers are connected in series in a closed loop. Each half of the loop is made up of two units connected in the same direction, but the two halves of the loop are opposed to one another. The two junctions of unlike elements form the a.c. input terminals, while the two junctions of like element form the d.c. output terminals. In the sketch, when the top of the transformer secondary is positive, the current flows through the upper left unit, through the load, and thence through the lower right unit to the bottom of the secondary. Current is prevented from flowing in the opposite direction by the upper right-hand valve. When the polarity reverses and the bottom of the secondary becomes positive, the current flows through the lower left unit, through the load, and thence through the upper right unit back to the transformer. The output of such a rectifier will resemble the output of two of the half-wave rectifiers described in the preceding paragraph, one being shifted a half cycle relative to the other. In general this will yield the wave-form shown in "C" of Fig. 1. In this circuit any given unit carried only one-half of the total load current, although this current must pass through two units in series. In the closed valve position, one unit must withstand the peak transformer voltage plus half the load voltage. The output wave again contains an infinite series of frequencies, but is predominantly one hundred and twenty cycles.

Another full-wave connection in the bi-phase or "split-secondary" circuit is shown in "C" of Fig. 2. In this common hookup, the transformer is wound for twice the desired voltage and a rectifier is placed in each leg of the transformer output, the two rectifiers facing in the same direction. The load is connected between the center-tap of the transformer secondary and the common connection of the two rectifiers. In the sketch, when the top of the secondary is positive, no current can flow because the upper valve is closed. However, the center of the secondary is also positive with respect to the bottom of the secondary, so current flows through the load, through the lower valve and back to the bottom of the transformer, only the lower half of the winding being active. Similarly, when the bottom of the secondary becomes positive it is rendered inactive by the lower valve, while the upper half becomes active, current flowing through the load and upper valve. Thus this connection achieves with two valves the same output wave that was obtained by the circuit of "B" from four valves, though with different con-

FIG. 3.—THE GENERAL ARRANGEMENT OF A SMALL "ELKON" RECTIFIER USED IN AN "A" SUBSTITUTE IS SHOWN ABOVE

The rectifier discs are connected in a bridge-connected circuit as shown at B. In actual practice the discs are mounted on a backing which holds them under proper pressure and connections are made as at A.
VOLTAGE DOUBLING

A radically different connection is the "inverted valve" or "voltage doubling" circuit shown in "D" of Fig. 2. This circuit is used where no transformer capable of supplying a sufficient voltage is available or where transformer insulation presents difficulties. In this scheme the opposite elements of two rectifiers are connected to one side of the transformer secondary and the remaining elements are connected through condensers back to the other side of the transformer. The points of connection between the rectifiers and condensers form the load terminals. In the sketch, when the top of the transformer secondary is positive, a surge of current flows through the left-hand valve, through the load, through the right-hand condenser and back to the bottom of the transformer. At the same time additional current flows through the valve to charge the left-hand condenser. When the polarity reverses, a surge flows through the left-hand condenser, the load and the right-hand valve, while the right-hand condenser charges. Thus the entire d.c. load is carried in the form of a.c. surges through the condensers. These surges are in such a direction that the voltage of the condenser is added to the voltage of the transformer. The result is full-wave rectification with two valves producing a voltage across the load of twice that produced by circuit "B" or four times that of circuit "C," assuming the transformer secondaries to be wound for the same voltages in each case. The current through each valve is equal to the current through the load, because the valve must supply half the load current and charge the condenser besides. In the closed position, each valve must withstand the peak of the transformer voltage plus the peak of the condenser voltage plus half the load voltage. This amounts to about four times the load voltage, just as in the bi-phase circuit, "C." The output wave is similar to that from circuits "B" and "C," the predominant frequency being one hundred and twenty cycles. The feature of this peculiar circuit is the ability to obtain a high output voltage from a given transformer winding.
I T seems that we went off half-cocked in our last issue in hailing the appointment to the Federal Radio Commission of Prof. C. M. Jansky, Jr., A.R.R.L. Dakota Division Director, and Supervisor Arthur Batcheller. We’re so used to seeing the commissioners named by recess appointments of the President that we forgot that Congress was in session at the time and that therefore the appointees could not take office until they were confirmed.

They were President Coolidge’s appointees, made during the closing days of the old Congress. Just before it signed off, that Congress finally decided to extend the life of the commission as the licensing authority until the end of this year, but it did not act upon these appointments and Messrs. Jansky and Batcheller therefore have not taken office. It is now up to President Hoover. He can nominate these candidates or he can choose others. Until he acts the Commission has but three members: Chairman Robinson, Judge Sykes, and Mr. Lauton.

In the act extending the commission, Congress authorized an expansion of its legal department. We are happy to announce that Mr. Paul M. Segal of Denver, W9EEA, Rocky Mountain A.R.R.L. director, has been named assistant general counsel to the Commission. For the past several years he has acted as general counsel of the League, a position he necessarily resigns upon taking office at Washington. Although the League loses his legal services, amateur radio benefits by having on the Commission’s legal staff a man who knows his amateur radio backwards and forwards.

— K. B. W.
Experimenters' Section

During the past few months there has been an intensive experimental program in progress at League Headquarters, the findings of which have been chronicled in various issues of QST beginning with the August, 1928, number. This program has covered many of the problems appearing in the list of problems before the members of the "Experimenters' Section."

As a consequence of the rapid developments reported most every month by the Program, the individual experimenter has felt that by the time he was able to get started on a problem an article concerning the work of the Technical Development Program on that problem would appear in print and little benefit would accrue from his efforts. This effected a slackening in the pace of the individual experimenter during this period in which it seemed more practical to await the results of the efforts of the Technical Development Program.

This program has now come to a close and many important questions concerning amateur operation have been answered. However, the members of the Section should not feel that all the "1929" problems have been solved for there are many, both major and minor, that deserve all the consideration they can be given. Now is the time to dust off the lab table and get after those problems that have not been covered by the T.D.P.

All the problems that confront the Section are not electrical in nature and probably one of the most important is that concerning its general maintenance. The present arrangement calls for the Technical Editor and the individual in charge of the Technical Information Service to keep the wheels going around.

Theoretically, the man on the Information Service desk is supposed to devote half of his time to the answering of letters requesting information and the remainder to matters pertaining to the Experimenters' Section. Practically, this is not the case because the answering of the hundreds of letters received each month requesting information of various sorts necessitates that all of a man's time be given to the task of digging out the proper answers. The Section has, therefore, muddled along with what attention it has been possible to give it at odd moments.

These conditions were not unsuspected when the Section was originally organized and precautions were taken to keep the routing paper work covering enrollments, etc., to a minimum in order that the time spent in this work produce the greatest amount of good.

The general method of enrolling in the Section ran somewhat as follows: In answer to a request for enrollment in the Section, a set of blanks in duplicate were forwarded with the idea that they were to be filled out and one set returned to Headquarters for further handling. The other set was for the experimenter's file. Upon receipt of the returned set of blanks, a mailing stencil was cut for each of the problems in which the experimenter was enrolling and he was sent a list of other men who were working on that problem. This list was supplied so that it would be possible for the experimenter to get in touch with his co-workers on a given problem and aid in the general cooperation which is usually so helpful and which in many cases is absolutely essential.

There are, however, a number of men who make no use of these lists and as they represent a considerable amount of work, their general issuance will be suspended in the future. These lists may be obtained upon request and will be made up only when needed. This will probably entail some delay but that cannot be readily avoided.

In addition to the list of men working on the problem, the experimenter also received an outline which covered the major considerations of the problem. In general, the outline gave some of the past work that had been accomplished and indicated methods that might be pursued in the further attack of the problem. A brief bibliography listing the more important references was included.

These outlines consumed a large amount of the available time in their preparation and constitute one of the major problems confronting those of us who are responsible for the continued operation of the Section. They also result in a large number of enrollments by applicants who apparently have
no fixed intention of doing any constructive work on a problem but who enroll merely to see what information they can obtain with no particular amount of effort on their own part. While it is, of course, impossible for us to read the minds of these applicants and prove such to be the case, the rapidity with which they lose interest in the problem after receiving the outline indicates either the above thought or an exceedingly poorly prepared and unsalesmanlike piece of writing on the part of the authors of the outline. Even if we do say it ourselves, the outlines are not quite that badly made up, so we have come to the conclusion that a large part of our membership is composed of men with more curiosity than ambition. Needless to say, this is an extremely unhealthy condition and needs some attention to prevent the dead wood from completely choking off all life that is existent. Every such enrollment represents a certain amount of wasted time in handling as well as in the carrying along of the names of such “experimenters.”

Perhaps the simplest and quickest method of attacking this condition would be to do away with all outlines and let every experimenter dig up his own past history as he sees fit. This, however, would be very inefficient and is likely to be exceedingly wasteful of the time of a large number of men, which means that less time than should be will be available for the actual carrying on of constructive experimentation. It has been decided that the most satisfactory answer will be to continue to supply outlines but to materially change their form and scope.

In the future, all outlines will be much briefer than they have been. They will all follow a definite form which devotes a few short paragraphs to a simple and concise explanation of what constitutes the problem. This will be followed by a bibliography covering articles published in past issues of QST. In addition to these, references to the Proceedings of the Institute of Radio Engineers will also be included. Other pertinent references may or may not be appended as the case may warrant.

It is not believed that this type of outline will work any hardship upon an experimenter who is really interested in a problem. He would in the course of his investigation consult all material having a bearing upon the problems and such a bibliography will be of great aid to him. On the other hand there will be little of immediate interest to the man who is more curious about the outline than he is concerning the problems.

For the benefit of those who may be but mildly interested in such bibliographies, it is our intention to present them from time to time in these columns. This will save such members the trouble of enrolling in order to get the list and at the same time save us some work in the handling of the enrollments.

**OUTLINE ON PROBLEM A-10**

**ANTENNA AND FEEDER SYSTEMS**

This problem will concern itself with the design of antenna systems for use in general amateur transmitting work. Special designs to give a particular characteristic that may be desirable under normal or abnormal working conditions will also be included. Some of the major factors to be considered are given below:

1. **Radiation.** The main reason for an antenna is to dissipate a large percentage of the energy supplied to it in the form of useful radiation that may be made to actuate receiving equipment at a distance. Unless an antenna has this characteristic it is of no use in transmitting work. This, therefore, is the chief consideration.

2. **Flexibility.** The antenna should be capable of being operated at more than one frequency and preferably in any part of the present-day amateur bands. This is an extremely important consideration and deserves much attention.

3. **Space required.** All antennas require some space in which to be erected although the amount varies greatly. A design that does not allow the erection of an antenna within the limits of the...
average back yard is unusable by most amateurs. One should also consider the problem of a suitable system for use in apartment houses and under other cramped conditions.

4. Cost. Mighty few amateurs are millionaires!

5. Miscellaneous. Under this heading one should consider such matters as the complexity of the original adjustment, rapidity with which the system can be shifted for operation on different frequencies, amount of accessory equipment required for its operation, its practicability and directional properties. Other considerations will undoubtedly present themselves to the experimenter and should be given that attention they deserve.

QST
Antenna Fundamentals, Feb., 1925 (53).
A Simple Way to Find the Fundamental, Jan., 1925.
A Special Short-Wave Antenna (Zeppelin Type), June, 1925.
Canadian 2CG's Capacity Coupled Antenna, May, 1925 (57).
Counterpoise or Ground? ("X" Sec.), Aug., 1925.
Direct Current Resistance of Antennas, Feb., 1925 (30).
Harmonic Transmission, Sept., 1925 (51).
Our Friend the Node, Jan., 1925 (34).
Practical Leecher Wires, Sept., 1925 (11).
Some Thanks re Underground Antennas, May, 1925 (62).
Steadying Our Notes, June, 1925 (38), including antenna suggestion.
The Hertz Antenna on 20 and 40 Meters, July, 1925 (24).
Top Loading Antennas and Loops, May, 1925.
Transmitting Hints, Sept., 1925 (65).
Underground Antennas, May, 1925 (62).
Antenna-Counterpoise Fundamentals, May, 1926 (46).
Feeding the Antenna, July, 1926 (8).
Horizontal Reception, Feb., 1926 (9).
Picking a Good Antenna for the Short-Wave Station, May, 1926 (27).
Straightening Out the Antenna, Aug., 1926 (30).
Super DX with the Indoor Antenna, Sept., 1926 (58).
The Length of the Hertz Antenna, Oct., 1926 (16).
Adjusting the Current Feed Hertz Antenna, Dec., 1927 (46).
A Portable Antenna Tester, May, 1927 (38).
Concerning Antennas for Several Bands, "X" Sec., Feb., 1927 (43).
Pipe Antennas, Feb., 1927 (48).
Receiving Antenna Tuning Systems, Nov., 1927 (43).
Reducing Static at Short Waves, Aug., 1927 (52).
Matching the Transmission Line to the Antenna, Jan., 1928 (43).
Directional Properties of Transmitting and Receiving Antennas, March, 1928 (17).
Some Investigations of Short Waves At Nijni-Novgorod, April, 1928 (9).
A Combination Fieldmeter-Wavemeter-Voltmeter, May, 1928 (30).
Some Notes on a Visit to the Naval Research Laboratory (contains antenna data), July, 1928 (9).
Tests on a Method of Voltage-Feeding the Antenna, July, 1928 (57).
Reducing the Cuss-Quotient (data on adjusting feeder), July, 1928 (44).
An Effective Antenna Tuning System, Aug., 1928 (36).
The Zepp., Sept., 1928 (33).
High Angle Radiation, Oct., 1928 (31).
What Length Antenna, Oct., 1928 (49).
The 7,000-ke. Zepp. for 3,500-ke. operation ("X" Sec.), Jan., 1929 (31).
Distributed Coupling ("X" Sec.), Jan., 1929 (33).
Antenna Systems — A Rehash, Jan., 1929 (31).
Before the Guy-Wire Breaks, Jan., 1929 (40).
Increasing Transmitting Antenna Efficiency, Jan., 1929 (43).

I. R. E. PROCEEDINGS

The Polarization of Radio Waves, April, 1926 (205).
The Insulation of a Guyed Mast, March, 1927 (225).
Some Aspects of Short-Wave Operation at High Power, June, 1927 (301).
Radio Communication, Jan., 1928 (40).
Beam Transmission of Ultra Short Waves, June, 1928 (715).
Characteristics of Certain Broadcasting Antennas at the South Schenectady Development Station, July, 1928 (872).

Aircraft Radio Installation, July, 1928 (921).
Effect of the Antenna in Tuning Radio Receivers and Methods of Compensating for It, Aug., 1928 (1077).


Page numbers are in parentheses. Back issues of QST may be obtained from the Circulation Department at 25 cents each. All issues mentioned above are not available, though. Issues of the Proceedings of the Institute of Radio Engineers may be obtained from the Institute of Radio Engineers, 33 West 39th St., New York City, N. Y., at $1.00 per copy.

MISCELLANEOUS

Distribution of Current in a Transmitting Antenna by R. M. Willmoite, B.A. Proceedings of Wireless Section, Institute of Electrical Engineers (British), June, 1928.


BOOKS


All of the outlines are not yet available. As they are prepared and suitable for distribution they will be sent to those enrolled. Please do not write in requesting outlines that have not as yet been prepared as they will be made up in the order of their importance as indicated by the number of men enrolled in the problem.

VERNIER SCALES FOR DIALS

In this day when tuning adjustments must be so much more accurate than they have been in the past, there is a distinct need for dials which allow greater accuracy in the reading of their position. While dials with vernier scales that may be read to a tenth of a division are now on the market, they are quite expensive and one can afford but one or two at the most. It is, however, nice to have such dials on the receiver and monitor as well as on the frequency meter and it is possible to fit your present dial with a "tenth" scale without a great deal of trouble or expense.

The first operation is to cut a strip of metal to the shape of the piece D of Fig. 1. The hole at the lower end is just large enough to slip over the condenser shaft and it should be cut so the right side face of the piece, if continued, would run accurately through the center of the shaft.

Next a second piece of metal similar in shape to E in Fig. 2 should be provided. The upper end of this piece will constitute the "vernier scale" when you are finished. The slot F cut in the lower end should be a sliding fit over the condenser shaft. This piece is slipped between the panel and the dial with the slot straddling the shaft as deeply as possible. It should then be tightly clamped in place by means of C clamps or similar instruments.

The strip D is next slipped over the shaft and bent as shown in Fig. 3. This will work only on dials where the knob may be detached, exposing the shaft. In other cases where this is not possible, the arrangement shown in Fig. 4 is resorted to. Because D does not pass directly over the scale of the dial under these conditions, more care will be required to obtain accurate results.

When the pieces are all in place, ten adjacent lines of the dial should be extended onto the piece E using D as a straight edge. This is shown in Fig. 1.

Piece E is then raised until its first and tenth marks coincide with the first and ninth marks on the dial and again clamped in position. Using D
once more, the lines on E are extended to the edge of the dial and a line is drawn on E at the edge of the dial. Trim along this line with a pair of nips and finish with a file or sandpaper.

Piece E may then be fastened just above the dial so that the two scales are opposite each other. When reading the dial position, first note which line on the dial is just below the first line on the vernier scale. This reading indicates the number of full divisions. If the dial is set at exactly a whole number of divisions, the line on the dial will exactly coincide with the first line on the scale. If its position is not a whole number of divisions, these two lines will not coincide. However, there will be some line of the vernier scale that does exactly coincide with a dial marking and if we count its position from the first line on the scale, it will indicate the number of tenths of a division to be added to the number of whole divisions. — C. F. Jobs, W3BVH, 1322 James St., St. Paul, Minn.

SUPER-REGENERATION

In the course of developing a satisfactory high-frequency laboratory oscillator that would not have a second harmonic the following experimental set was made. Its use is limited by certain of its features. The set is relatively broad in tuning and does not oscillate so it cannot be used as an autodyne receiver. However, it seems to have a field of use in the reception of modulated c.w. at high frequencies where little or no antenna may be used and seems to be particularly valuable for plane reception of high frequency telephony. The circuit is shown in Fig. 5.

The idea of a push-pull oscillator is certainly not new, but here it is used in a super-regenerative circuit in an attempt to cut down the characteristic super roar and to increase sensitivity. Success was not complete but reduction of this roar was marked and when any c.w. wave was tuned in the remaining noise disappeared. C.w. stations without modulation may be read as dots and dashes of silence. In telephony, however, the result was eminently satisfactory due to the continuous presence of a carrier wave.

The important points in construction are few. The first is the arrangement of the coil stand and its associated leads and condensers so that the same physical characteristics may be had for the leads to each tube of the push-pull arrangement. This is indicated in Fig. 6. The second is the use of a tuning condenser with a dead shaft such as the Remler. The coils I use are wound 1 1/2 inches in diameter with No. 13 d.c. copper wire and are of the usual self-supporting type. The mid-tap and each end connection are soldered to G.R. plugs which fit into suitable jacks on the coil stand. It is important that the leads to each side of the tuning condenser from this coil be of equal length. There is little or no hand capacity even though each side of the tuning condenser is connected to a grid.

Antenna couplings of various types were tried but the most satisfactory seemed to be direct coupling to one grid by means of a small variable condenser in the usual manner.

There is no oscillation control as the set will not oscillate when properly constructed. Volume is controlled by means of a Clarostat in the common "B" lead to the push-pull circuit. This variable resistor is by-passed by a 1-mfd. paper condenser. Separate Samson No. 85 r.f. chokes are used in the plate lead of each tube of the push-pull circuit to provide the proper feed back and to help keep the r.f. out of the common circuits.

The variation frequency may be any type of oscillator at 15,000 to 17,000 cycles. I used a G.R. air core 30-ke. filter from an old super tuned with a 350-mfd. condenser. This frequency is lead to each grid in the push-pull circuit through a 0.1 meeghm resistor. It would seem that for best results these resistors must match within 1%. A one-step audio amplifier may be added if the operator so desires. — L. Dave Insktip, M.D., Second floor, Medford Bldg., Medford, Oregon.

— H. P. W.

Hudson Division Convention

May 24th-25th at New York City

The Director and the committees are working hard to make this year's convention one of the best ever held in this division. Well known men will be present to give lectures of importance to our amateur radio enthusiasts; and the entertainment features will not be forgotten.

The Hotel Pennsylvania is the place chosen for all events. From all reports the banquet will leave nothing more to be desired.

Follows of the Hudson Division, you are all cordially invited to attend. Don't forget to put down on your calendar Friday and Saturday, May 21st and 25th, and drop a note to Director A. L. Walsh, 220 West 42nd St., New York City, and tell him that you will be present.
How to Learn the Code

By Karl O. Bornen

In March QST, page 84, the Communications Department invited contributions on any phase of amateur communication activity, offering prizes for the best article selected from those submitted during each month of 1929. A wide variety of subjects on which articles should be welcomed were suggested in the original announcement. In addition to these articles which received a good position in QST, the authors whose articles appear to have the greatest value of those sent in for consideration each month have a choice of (1) a copy of the Radio Amateur's Handbook bound in leather, (2) six sets of A.R.R.L. message blanks, or (3) 300 A.R.R.L. letter cards.

This month two articles of the five submitted for consideration in connection with our contest have been selected as prize winning contributions. The article by Mr. Bornen contains suggestions calculated to assist beginners in learning code most easily and correctly; these suggestions being derived from several years' experience in teaching code in Army circles. The fact that correct reading, which is not necessarily speedy reading, is essential to securing the greatest effectiveness in all communication work is brought out in this article.

—Farren.

Much has been written about "bad lists"—yet little has been said about how these "bad lists" develop or how they may be cured. It is my intention to explain in this paper that there is a cure which, peculiarly, lies in prevention rather than correction. By this it will be understood that any treatment is not for the operator confirmed in poor practices as much as it is for the beginner who is learning the use of the key.

The first step for a student in Continental (International Morse) Code work is to acquire in his mind a "mental echo" of the characters of the alphabet. In thinking of the letter A, for example, he should not visualize it as...nor should he think of it as "dot dash" but rather he should think of it in sound as "dit dash." In this connection it is helpful to use a key and buzzer, or to listen in on slow signals sent by another operator. When this method is followed the pupil automatically grasps the idea of both the sound and the time element involved. The letter B will not seem to him as "dash and three dots," but will be "dah dit dit dit." The letter C will not be "dash dot dash dot," but will be "dah dit dah dit." Those two little sounds, "dit," and "dah" are used in place of "dot" and "dash" because they are of the correct phonetical dimensions. "Dot" is short, and actually sounds similar to a dot as it comes through the phonos. "Dah" is long, and likewise represents the actual dash as the student will hear it when he begins to copy signals. The length of the space between the parts of a letter is equal to one dot, the space between letters is equal to two dots, and the space between words is equal to one dash. In Army classes the code is thus taught by the "dit dah" method; the men are not allowed to see the code written down at all, but are required to learn by sound alone.

It is surprising to note the success by which the student will start to use a key after learning the characters by this method. He has the sound and time element tucked away in the back of his head, and his fingers will automatically reach to what he is thinking. The element of accuracy is acquired at the very beginning.

When all of the letters of the alphabet and all of the numerals have thus been memorized, actual practice with key and buzzer should begin. In Army classes the student is required to transmit to each student. This is a very efficient method, for it teaches transmission and reception at the same time; but obviously it can not be used where there is only one student in the class, and he the instructor as well as the student. In such a case, the student can listen to slowly transmitted code from an omnigraph, teleplex or he can build himself a receiving set and listen in on slow signals from the low frequency stations or from some of the Volunteer Code Practice Transmitting Stations in the 1750-ke. band. At the same time he should make constant use of his own buzzer, transmitting to himself at slowly increasing speed. Never should he try for speed in transmitting until he is able to copy nine-tenths of the signals he hears on the air. Speed in transmitting will come without any conscious effort on the part of the student. His chief concern must be accuracy in forming the characters.

The business of receiving deserves a good bit of study on the part of the student. Before listening he should make up his mind that he will not stop for missed letters. When he misses failures to recognize (temporarily) a letter, he will forget it as quickly as possible and go on to the next one he hears. When a student stops and tries to remember what was missed, he acquires a hesitancy, a faltering, in his reception, whereas if he forgets about his error and goes after the next letter, he will gain confidence, and before long will not miss any.

The business of transmitting also deserves a good bit of study on the part of the student. He must learn at the very first to grasp of the key of the knob correctly. He must learn to sit upright in a chair of the proper height at a table of the proper height—viz., thirty inches. He must hold the key about eighteen inches from the edge of the table, and the knob must be adjusted so that the spring is "heavy" and so that there is a vibrational motion of the lever of about one-sixth of an inch at the knob. He must not hold the key tightly. His index finger and second finger should touch the back edge of the knob, and his thumb should touch lightly on the side of the knob. His third and fourth fingers should be free from the key—they will take care of themselves. His thumb and finger tips should be the only points of contact to the table and key. His wrist should move up and down.

†See announcements in C. D. sections of past issues of QST.
should be in tune, but they all should be under control. His finger tips should not leave the key knobs as he forms the characters.

Gradually he will gain speed without consciously trying to gain speed. When he has reached a speed of ten words a minute he can go on the air with a transmitter of his own. This is always the most momentous occasion in initiation of a beginner, and many a man has been "scared to death" at the time he first hears someone answering his call. But if he has practiced faithfully and followed all of the rules he will well through the ordeal, albeit "scared to death." Of course, he will at first be a slow operator. He must realize this and look on the business of going on the air as his final step in learning the code. Just as actors must overcome "stage fright," so he must overcome timidity on the air. This is usually a small thing, though quite exciting while it happens, and the man who has spent his apprenticeship with key and buzzer and slow-signal-copying will soon be laughing at himself for his temerity on his "first QSO."

As a further bit of good advice to operators a word or two regarding speed vs. effectiveness in operating is in order. If a man keeps up a good, steady, well-timed, twenty-word-per-minute speed, he will move twice as much traffic and be able to say twice as much in a given time as most of the "speed artists" heard on the air. Just listen closely to some of the rapid operation you run across some night and note the number of repeats due to mistakes of QRM. You will find that the rate of transmission will average about fifteen words or thereabouts unless exceptional operators happen to be working under unusually good conditions. Every operator should remember that transmissions sent transmit taken too fast and hurriedly are often poorly spaced. They are ineffective also when directed at operators of limited code speed. It is a good working rule never to pound out your signals any faster than you can take them in return, too. Above all, if someone goes faster than you can copy, don't hesitate to have him put on the brakes. If he is a real ham and an intelligent operator he will come down to the speed that you are sending just as soon as you make a necessary request of this sort.

### Phone Versus C.W.

*By Lewis B. Coo*

"Phone vs. C.W.", by Mr. Coo is in reality an application for tolerance and broad-mindedness on the part of the owners of these different classes of amateur radio stations. Mr. Coo won second prize this month.

---

**Editor:**

The future of our column seems to exist a feeling of slight hostility between the operators of phone stations and the operators of c.w. stations. A certain number of the phone station owners think that their system of operation should rule the air. The phones get proved if some brasspounder interferes with their ragchewing. The brasspounder gives vent to warm exclamations when a phone messes up his traffic or DX. The law does not prohibit c.w. stations from operating in the phone band, but it certainly does prohibit the phone from going into the c.w. band. The phone men say this is unjust. However this may be, if both phones and c.w. stations lived up to the standard of quality set by QST, interference as we now have it would be a thing of the past.

Some of the phones think they are entitled to exclusive ownership of the 1750-kc. band and regard the c.w. station working there as an intruder. There is certainly no reason why all the valuable kilocycles in that band should be reserved for an occasional Saturday night special amateur phone station. The 1750-kc. band offers excellent possibilities for the traffic man who has local schedules. It gives the amateur the best chance he has to duplicate the snappy sounding signals found in the lower wave commercial bands. Let us hope that some of the traffic men will recognize these possibilities and act on them.

As let us consider the respective functions of phone and c.w. in amateur work. The primary value of the phone is its use for good old fashioned chats among men bound together by mutual interests. It also offers more technical difficulties in construction and adjustment than c.w. This gives the experimenter something to shoot at. And, of course, there is the thrill that we all feel of conveying with a distant ham, with the ease of land line conversation. The two most important functions of c.w. are traffic and DX. It is also a good ragchewing medium but it is not so well adapted for this purpose as phone. Of course, traffic and DX can be handled on phone but the advantages of c.w. are more apparent to anyone.

Thus the amateur has two types of communication at his disposal, each ideally adapted for different purposes. Every station should use phone as well as c.w., employing each type of transmission all the time. To "note what your list is necessary. Unfortunately, the cost of a really excellent phone station is rather great and of course, the builder will wish to install only the very best in equipment regardless of type. However, if the plan of balanced operation can be followed, the operators will derive the greatest pleasure from all his work, and have the satisfaction of knowing that he is making full use of the opportunities given him. Besides this, the prejudice that now has a tendency to exist will then cease to have any foundation.

### High Grade Stations - 1929 Signals

Each month Section Managers and Route Managers report the outstanding stations which they consider the "best" ones operating in each band. Really good signals with the requisite sharpness, steadiness, and clarity of tone which constitute our present-day standards of perfection are not too numerous if we may judge from all reports. To "note what your list is necessary. Unfortunately, the cost of a really excellent phone station is rather great and of course, the builder will wish to install only the very best in equipment regardless of type. However, if the plan of balanced operation can be followed, the operators will derive the greatest pleasure from all his work, and have the satisfaction of knowing that he is making full use of the opportunities given him. Besides this, the prejudice that now has a tendency to exist will then cease to have any foundation.

Operators of stations listed in our reports consistently month after month should be well satisfied with their performance and for good reason. Our column will grow too, especially if you help your SCM and RM in deciding on their recommendations to QST by submitting small lists of the outstandingly good signals and reliable consistent operators that you hear. Other stations not in our present list will not doubt be able to qualify shortly. Separate reports from each Section in the U. S. and Canada will have more emphasis on good station PERFORMANCE. . . . the emphasis on a small DX record accomplished perhaps with brute power and wailingly signals. Since our reports came from all over the country they are equally fair to all station owners. This month our list is too long to permit publication of reports from each of the twenty-four Sections contributing to the success of this column. From all the reports received we have compiled an alphabetical summary which credits the stations reported more than once by separate mention. The future of our column depends both on your cooperation in submitting accurate reports and on our new space requirements for this portion of QST. Comments on how you would prefer to see the reports modified to do the greatest good would be appreciated. Separate lists should be turned
Phone QRM—Terrell Asks Cooperation

The Washington Radio Club held its annual banquet on Saturday, March 8th, 1929, at the Capitol House, 

Cooperation

Washington, D. C., March 8th, 1929.

Mr. William Smith, President, Washington Radio Amateur Club.

Washington, D. C.

May 1st, 1929.

To whom it may concern,

I wish to thank you for your kind invitation to be present at the Amateur's annual banquet on Saturday evening, the 23rd instant, but as I have indicated to you by phone, it will not be possible for me to be present much of the time, as I have always enjoyed being with and talking to Amateurs.

There is one thing that I would like to bring to your attention, and that is, that the banquets and meetings of the Washington Radio Club do not exceed 130 members, although they have been held with an attendance of 200 or more. The reason for this is that the Board of Directors of the Washington Radio Club has decided to limit the number of members to 130, in order to maintain the highest degree of organization and efficiency. I wish to express my appreciation of the efforts of the Washington Radio Club in maintaining a high level of organization and efficiency.

Sincerely yours,

W. D. Terrell,

Chief, Radio Division.
The Scandinavian Contest

The Scandinavian-American Short-Wave Tests were held during the week of 23 to 30 October, 1928. Several American amateurs who participated were rewarded with some very nice prizes in recognition of their selfless in contacting with a very few Scandinavian stations who likewise received prizes. The one regrettable feature in this contest was the scarcity of signals from the vicinity of "the land of the midnight sun". The Norwegian, Swedish, and Danish stations were on the air in full force we might now be able to chronicle a contest filled with zest. As things turned out there were not enough stations on the other side of the Atlantic to make contact with all of the American stations that operated during the contest.

Some of our men did very well, however, and we are pleased to announce the following stations and the respective prizes they won:

- WIAKS 1 Operadio Tone Chamber
- No. 21308 Burgess "B" Battery
- W1JC 1 Operadio Tone Chamber
- No. 507-2 Ward Leonard Grid Leak
- W1SI 1 Operadio Tone Chamber
- No. 21308 Burgess "B" Battery
- W2C1Q 1 Operadio Tone Chamber
- No. 507-2 Ward Leonard Grid Leak
- W2VC 1 Operadio Tone Chamber
- Set of Aero Products Receiving Cols
- W3AFU 1 Operadio Tone Chamber
- $25.00 Credit Letter from the Sprague Specialties Co.
- WSADG 1 Operadio Tone Chamber
- Allen D. Cardwell Transmitting Condenser

The Scandinavian prize-winning stations are SMUX, the Royal Technical University, Vähallavassen, Stockholm, Sweden, and OZZZ. H. T. Peterson, "Fibro," Ostertor, Norresundby, Denmark. As reported to us by Radiolutter, the sponsor of the contest, prizes were distributed as follows:

- SMUX 1 Orfus Loud Speaker (A. V. Holm, Stockholm)
- OZZZ 1 150 watt. Foto Transmitting Valve (P. Elmegaard, Copenhagen)

Of the two Scandinavian prize winners, SMUX did by far the greater amount of work and has covered all of the winning American stations during the contest.

There were two American stations, W2UK and WIRY, who participated in the contest, according to data given to us by Radiolutter. The former is reported to have worked SMUX, and the latter to have worked OZZZ (as that time cEZG). No reports were turned in to the A. R. R. L., however, and we were totally unaware of the work of W2UK and WIRY at the time the distribution of American prizes was made.

This is very unfortunate: the A. R. R. L. would like to give everyone a square deal, but can not do so when there is no information at hand. The moral seems to be that contestants should read QST very closely; in our September, 1928, issue it was stated very clearly that all American reports should be sent to the A. R. R. L.; and in these cases no reports were sent either to the A. R. R. L. or to Radiolutter.

Credit is due Radiolutter of Copenhagen for the arranging of the contest, and the A. R. R. L. for the tabulating of fog data and distribution of prizes to the American stations.

-- L. R. H.

ELECTION RESULTS

In the Oklahoma Section of the West Gulf Division, Mr. Wm. J. Gentry, W5GF, 610 Pettenger St., Shawnee, Okla., Mr. LeRoy Moffet, Jr., W5ZAV, 132 Page St., Norman, Okla., and Mr. Lyman M. Edwards, W5FJ, 515 S. Lincoln St., Enid, Okla., were nominated. Election results: Mr. Gentry, 10; Mr. Moffet, 15; Mr. Edwards, 11. Mr. Gentry, therefore, has been declared elected, his term of office beginning March 30, 1929.
WIMK

A.R.R.L. Headquarters' Station WIMK operates on frequencies of 3575 kc. and 7150 kc. Robert B. Parmenter, "1W", is the chief operator; his list is familiar to most of the amateur fraternity, and reasonably, other members of the Headquarters' staff operate at WIMK. Their personal signs may be found in the QRA Section of QST.

Throughout this notice time will be given as Eastern Standard Time, which is also known as "75th meridian" or "Zone Plus 5" time.

OFFICIAL AND SPECIAL BROADCASTS are sent simultaneously on 3575 kc. and 7150 kc. at the following times:

8:00 p.m. Sun., Mon., Tues., Thurs., and Fri.
9:00 p.m. Mon. and Fri.
1:00 p.m. (midnight) Sun., Tues., and Thurs.

GENERAL OPERATION periods have been arranged to allow everyone a chance to communicate with A.R.R.L. Headquarters. These periods have been so arranged that they usually follow an official broadcast. They are listed under the two headings of 3500 kc. and 7000 kc. to indicate whether the watch is devoted to listening on the 30-meter band or to the 40-meter band.

3500 kc.: 8:10 p.m. to 9:00 p.m. on Sun., Mon., Tues., Thurs., and Fri.
8:10 p.m. to 9:00 p.m. on Sun. and Thurs. (No OSC before these periods.)
12:00 p.m. to 1:00 p.m. (or later) on Sunday night (Monday morning)
7000 kc.: 10:10 p.m. to 11:00 p.m. on Sun., Mon., and Fri.
12:00 p.m. to 1:00 p.m. on the following night (initially on the morning of the day following) Mon., Tues., Thurs., and Fri. (Only on Tues. and Thurs., does the OSC precede these periods.)

SCHEDULES are kept with the following listed stations, through any of which traffic will travel expeditiously to A.R.R.L. Headquarters. The frequencies included within parentheses indicates the band in which each individual station keeps the schedule with WIMK.

W1BIG, Augusta, Maine (3500): Mon. and Thurs.
W1BDQ, Newport, R. I. (5000): Mon. and Fri.
WIVB, Newton, Conn. (3500): Tues. and Fri.
N3PA, Port Antonio, Jamaica (7000): Sun., Mon., and Fri.
W3ZS, St. Davids, Pa. (3500): Mon. and Thurs.
W4HM, Atlanta, Ga. (3500): Mon. and Thurs.
W4AQY, College Station, Texas (7000): Fri.
W5IC, San Antonio, Texas (7000): Thurs.
W8ARK, Oneonta, N. Y. (3500): Mon., Tues., Thurs., and Fri.
W8AYB, Buffalo, N. Y. (3500): Tues.
W8BLY, Columbus, Ohio (3500): Mon., Tues., and Fri.
W9APY, Berwyn, Ill. (3500): Tues.
W9OWS, Kansas City, Ia. (7000): Wed. and Fri.
W9XI, Minneapolis, Minn. (7000): Mon. and Fri.
W9HAL, Toronto, Ont. (5000): Tues. and Fri.
W9BS, Yacht Carnegie (9000): Sun., Mon., and Fri.

BRASS POUNDERS' LEAGUE

<table>
<thead>
<tr>
<th>Call</th>
<th>Orig.</th>
<th>Del.</th>
<th>Rel.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W8CHC</td>
<td>150</td>
<td>300</td>
<td>452</td>
<td>802</td>
</tr>
<tr>
<td>W8LX</td>
<td>100</td>
<td>32</td>
<td>400</td>
<td>561</td>
</tr>
<tr>
<td>K1HR</td>
<td>152</td>
<td>99</td>
<td>337</td>
<td></td>
</tr>
<tr>
<td>W6EEO</td>
<td>37</td>
<td>152</td>
<td>317</td>
<td>599</td>
</tr>
<tr>
<td>W6EOP</td>
<td>84</td>
<td>96</td>
<td>267</td>
<td>447</td>
</tr>
<tr>
<td>W5KE</td>
<td>157</td>
<td>50</td>
<td>207</td>
<td>310</td>
</tr>
<tr>
<td>W6AKW</td>
<td>13</td>
<td>7</td>
<td>366</td>
<td>388</td>
</tr>
<tr>
<td>W1MK</td>
<td>42</td>
<td>84</td>
<td>233</td>
<td>363</td>
</tr>
<tr>
<td>W5AQY</td>
<td>135</td>
<td>20</td>
<td>155</td>
<td>340</td>
</tr>
<tr>
<td>W0DLD</td>
<td>13</td>
<td>11</td>
<td>238</td>
<td>262</td>
</tr>
<tr>
<td>W0AD</td>
<td>20</td>
<td>122</td>
<td>117</td>
<td>259</td>
</tr>
<tr>
<td>W1AUR</td>
<td>72</td>
<td>104</td>
<td>72</td>
<td>248</td>
</tr>
<tr>
<td>W1ANH</td>
<td>51</td>
<td>135</td>
<td>54</td>
<td>240</td>
</tr>
<tr>
<td>W9EGU</td>
<td>9</td>
<td>6</td>
<td>224</td>
<td>239</td>
</tr>
<tr>
<td>W9EQQ</td>
<td>30</td>
<td>26</td>
<td>172</td>
<td>228</td>
</tr>
<tr>
<td>W2BFQ</td>
<td>49</td>
<td>120</td>
<td>50</td>
<td>219</td>
</tr>
<tr>
<td>W6DKY</td>
<td>15</td>
<td>10</td>
<td>192</td>
<td>217</td>
</tr>
<tr>
<td>W9DXZ</td>
<td>15</td>
<td>40</td>
<td>161</td>
<td>216</td>
</tr>
<tr>
<td>W8DEP</td>
<td>42</td>
<td>11</td>
<td>158</td>
<td>211</td>
</tr>
<tr>
<td>W8CRI</td>
<td>63</td>
<td>34</td>
<td>114</td>
<td>211</td>
</tr>
<tr>
<td>W9KEW</td>
<td>64</td>
<td>51</td>
<td>92</td>
<td>207</td>
</tr>
<tr>
<td>WIAJC</td>
<td>48</td>
<td>46</td>
<td>111</td>
<td>205</td>
</tr>
<tr>
<td>W8DHY</td>
<td>43</td>
<td>40</td>
<td>112</td>
<td>201</td>
</tr>
<tr>
<td>W3BBW</td>
<td>17</td>
<td>37</td>
<td>146</td>
<td>200</td>
</tr>
<tr>
<td>W8CNX</td>
<td>54</td>
<td>118</td>
<td>28</td>
<td>200</td>
</tr>
<tr>
<td>W1BIG</td>
<td>40</td>
<td>79</td>
<td>66</td>
<td>176</td>
</tr>
<tr>
<td>W6ALX</td>
<td>17</td>
<td>56</td>
<td>84</td>
<td>157</td>
</tr>
<tr>
<td>W8BEU</td>
<td>50</td>
<td>70</td>
<td>114</td>
<td>178</td>
</tr>
<tr>
<td>W9COS</td>
<td>51</td>
<td>57</td>
<td>26</td>
<td>134</td>
</tr>
<tr>
<td>W3BBT</td>
<td>19</td>
<td>53</td>
<td>59</td>
<td>131</td>
</tr>
<tr>
<td>W72IP</td>
<td>40</td>
<td>53</td>
<td>18</td>
<td>118</td>
</tr>
<tr>
<td>W9ALEF</td>
<td>6</td>
<td>74</td>
<td>30</td>
<td>110</td>
</tr>
<tr>
<td>W8GU</td>
<td>41</td>
<td>54</td>
<td>10</td>
<td>105</td>
</tr>
<tr>
<td>W9HT</td>
<td>43</td>
<td>56</td>
<td>19</td>
<td>108</td>
</tr>
<tr>
<td>W9ASM</td>
<td>27</td>
<td>53</td>
<td>18</td>
<td>99</td>
</tr>
<tr>
<td>W4JY</td>
<td>74</td>
<td></td>
<td></td>
<td>74</td>
</tr>
</tbody>
</table>

This month the requirements for the B.P.L. were a bit stiffer due to the unusually short reporting month — February 20th to March 15th inclusive. We are glad to see so many of the covalent stations still on the honor roll in spite of the temporarily increased requirements.

The several amateur stations responsible for the best traffic work — the ones that are "setting the pace" in worthwhile traffic handling — are listed right up near the top of our B.P.L., the figures giving the exact standing of each station accurately.

All these stations appearing in the Brass Pounders' League are noted for their commendable schedule-keeping and dependable message-handling work in amateur radio. Special credit should be given to the following stations (in the order listed) responsible for over one hundred deliveries in the ten-day period:

W8CHC, W6EEO, W1ANH, W6AD, W2BFQ, W3BBW, W8CNX, W1AUR.

Deliveries counter: A total of 200 or more bona fide messages handled and counted in accordance with A.R.R.L. practice, or just 50 or more deliveries which will put you in line for a place in the B.P.L. Why not make more schedules with the reliable stations you hear and take steps to handle the traffic that will qualify you for B.P.L. membership also?

Beginners

The following new schedules have been received from volunteer transmitting stations:

W3AY, Audubon, N. J., transmits on CW and C., from 7:30 to 8:30 p.m. E.S.T., on Tuesdays and Thursdays.
W3AVQ, Collingswood, N. J., transmits on C. and W, from 7:30 to 8:30 p.m. E.S.T., on Tuesdays and Thursdays.
W8PYV, Moneta, Mo., will transmit from 4:30 to 6:00 p.m. C.S.T. on CW with buzzer practice. These transmissions will take place regularly each Sunday, although later more periods of practice may be added — if enough enthusiasm is shown by listeners-in.
Order Your Parts
By Col. Xavier McKenzie

Away back in the grand old year of 1908 the call signals XZ and MH were perhaps the best known of all in the Mississippi Valley. Old timers of that day will recall how each building Marconi invisibly would ask: 'round or later, 'How do XZ and MH make their notes sound so nearly alike?' Theremon, it became declared that XZ and MH originated from the same transmitter, Capt. Xavier McKenzie and Dr. Mitchell Hastings, neighbors and boon companions, had pooled their 'wireless' interests and had built one transmitter for both operators. It was located in an operator-less shack between their respective homes, and was controlled remotely from their two homes. Separate receivers, of course, were used.

In those days, it will be remembered, etherial signals were few and far between, and it was much more blessed to give than to receive. So, when XZ and MH combined could raise no one, XZ proceeded to work MH, and thus the mystery arose.

Since 'the good old days' before licenses were required, Captain McKenzie and Dr. Hastings have been separated, the former serving for fifteen years in China, and the latter spending most of this time as surgeon for a large rubber plantation in South America. But late in 1927 both returned home, the Captain a Colonel and retired from service, and the Doctor searching for a cooler climate. The two old friends have again pooled their interests, this time in a beautiful country home, 'Roller Heights,' overlooking the Mississippi River. Amateur radio again becomes their common hobby, and has resulted in the building of a '1029 type' station atop the bluff on which rests their home.

Unfortunately for amateur radio, their station will not be on the air a great deal, as each of them has his separate interests to look after. The Doctor has a private sanitarium not far off, and the Colonel has a troop of Boy Scouts, the local Red Cross, the American Legion, the Spanish War Veterans, a gun club, and in addition is protagonist for the erection of a Carnegie Library.

A hobby is a hobby for 'the Kernel' and 'Doc,' however, and they boast that, although their time will be limited, they will engage in every phase of amateur radio: Traffic work; experimenting; DX; roach-chewing ham-festivals; in brief, all the activities that make up the good old 'ham' game. This article is the first of a series of observations on amateur radio that Colonel McKenzie will write for us. — EDITOR.

When an old bullet-dodger like me comes out of the bushes to settle down and pass the remaining days of his life in peace and quiet, he needs some engaging and interesting amusement to keep him from wandering back to the barracks. He needs some blast to hold his bulwarks down and keep the enemy from firing through and upsetting the cook's wagon in the rear. He needs to be put on a sort of permanent detail that will keep his troops busy.

I was speculating on amateur radio for this purpose a bit before I settled down, and I had just about decided that the game nowadays is too difficult, that there is too much for an old man to learn. When Doc marched into camp, surrounded the guns, and forced me to a hand-to-hand battle, I saved him off to the last trench, retreating by a series of forced marches, and almost won the fight, in face of heavy odds, when he sent a contingent of artillery around by my left flank and caught me unaware with heavy emplaced fire.

Of course, I had to give in. The terms originally were 'unconditional surrender,' but after the armistice, Doc told me that all I needed was a new command, which he gave me in the form of License to Radio Operator, Amateur Class.

Then he detailed me on construction. I tell you, I was surprised at the way I fell in on all the new orders of the day. With several years of QST on hand, and four Handbooks (nothing like having your reserves in good order), it was only a matter of a few weeks before I knew all about kilocycles and QSA5, and even had a little time to spare in reading the newspaper articles about Einstein's new theory.

By and by, I got the mail order catalogs down from the shelf and picked out what I thought ought to make a good station. Condensers, tubes, and all gadgets that I was unable to make were bought outright, whereas most of the coils and other parts that could be made at home were manufactured in the workshop. Before long I was assembling things. The receiver took shape first. Then came the antennas, the transmitter, and the monitor. Finally I had them all finished and ready for installation in their permanent (more or less) locations in the shack.

Here I found a problem. What kind of an arrangement should I have? Would the transmitter be better off on the same table with the receiver, or should it be placed at the opposite end of the room, nearer the leads-in? I decided that it would undoubtedly be much better to put it in the latter location, where it would cause less QRM to the receiver. I decided to keep on the operating table only the necessary controls that must be handled in order to operate.

Directly in the center and rear, I put the shielded receiver. To the left I put the message rack, which contains eight divisions, the first three of which are labeled for traffic that has been handled—originated, delivered, and relayed messages. The next four divisions are for message on the hook. Their labels designate the directions in which the messages
are going — north, south, east, and west. The last division is special, in which will be kept a copy of schedules, a copy of dial settings for various stations, and other useful information. Immediately to the right of the receiver is located the key, which is set just eighteen inches back from the front edge of the table. To the right of the key are the toggle switches that control the transmitter. On the extreme right is the monitor box, on which sits a small and inexpensive loudspeaker. During all transmissions the monitor is in operation, and the operator can check the signal's frequency by the dial working. A pair of copy paper lies directly in front of the operator, and an "Eversharp" type pencil, fully loaded, lies in place on the table. To the left is the call book, and to the right, the log.

Yes sir, everything on that little table went just where it was meant to go. I found that most parts had to be ordered twice: once by mail, and the next time when I came to put them in their places. It is just as important to order them correctly the second time as the first.

----

**TRAFFIC BRIEFS**

The Cleveland Amateur Radio Association is conducting a "fly power" contest. The rules stipulate that competing transmitters must use a tube of the 210 type or smaller. Maximum plate voltage is 90. To date W3CMR holds the lead with contacts as far off as N6R5. W3DLY is second, having worked a Canadian 4, and W3APB is third, having worked several 6's. Go to it, boys!

KVTA on 8950 kc. is the S. S. Lake Ormoe of the Ford Motor Company, now up the Amazon River in Brazil on a six month's trip which includes a visit to the Ford rubber plantation near Santa Ream, Brazil. W8BCA keeps regular schedules with KVTA, handling worth while traffic that helps him to hold that nice position in the B. P. L. This is a good channel for routing South American traffic — through W8BCA.

VZ seems to be the Spanish Honduran S. S. Lepern, W2RIK reports working him on about 8720 kc. (84 4 meters) recently.

W6AKW and W6HFM have had a number of consistent QSOs with W2TEFF, the S. S. Dicko, in the Indian Ocean. In mid-January the Dicko was near Port Singapore in the Orient, bound for Batavia. The Dicko was near Port Said February 9. In spite of the call signal, W2TEFF, we understand that the operator is not a former American amateur. W2TEFF has been using W2TEFF a frequency of approximately 7275 kc., dropping to 7200 kc. for subsequent contacts. Early evening work (6 p.m. to 8 p.m. PST) is now being attempted.

In addition to keeping daily schedules with K1AF and K1OM, W6AKW has followed the Dicko consistently from port to port. W6AKW recently hooked up with W2TEFF as late as 8 a.m. PST through local interference. A schedule was made for 8 a.m. when the two stations were QSO again. W2TEFF, QSA, W6AKW, QSA through very bad QRM. The QSO was still going fine at 9:20 a.m. PST at which time one operator had to close down. Not so bad for 1929 QRM-band work we think!

W1XV, station of the Massachusetts Institute of Technology, keeps a daily schedule that runs clear around to the Philippines and China. The route is as follows: W1XV—W9F9G—W6EDO—K1HR—XT1. We understand that W1XV also is a branch of this relay chain. Messages to the Orient can be handled well through any of the above stations.

The QRA of BX is Puerto Cabelas, Nicaragua, with QSL address of "Radio Operator Albert Krog, c/o Bragmans Hynf Lumber Company, Box 830, New Orleans, La." BX's frequency is at the top of the 7000 kc. band, Top: Yes, that means near 7300 kc.

W6HS is now the official west coast QRA station for W9FO's Radio Amateur Call Book. This brings us to mention that there are three official QRA stations for the United States: W9FO, W6HS, and W2NGT. Any one of these stations will be glad to furnish QRA's that are not to be found in the Radio Amateur Call Book. Also, it must be mentioned, W9FO, W6HS, and W2AGU will be overjoyed to receive news of changed addresses, new QRA's, and other information of the sort that is useful in preparing an up-to-date amateur call book.

----

**AN INGENIOUS WRINKLE**

An often-asked question is: "Is there any use for used 'B' batteries?"

They are always handy when your neighbor wants to borrow one.

From the oscillator of the Amateur Radio Research Club in California, we learn that W6W8U took 50 messages from K1HR inside of four consecutive hours, while working the key at W6AMM. As all of these messages were mailed in that time, too, W6W8JG claims that he holds the record for making the BPL in four hours. Who can tie that one?

Changes in Japanese call letters have reached us through Col. Clair Foster, W6HSM, of Carmel, California: J0KX is now J0DC; J2AX is now J5CB; J3XK is now J1B4A; and J0CZ is now J1C2.

C. M. Shockman, formerly of Dayton, Ohio, and SDKZ, writes in that he is now on U.S.S. West Virginia and would be pleased to hear from some of the gang around Dayton.

W4CL (Wilson Trolan, 256 Connecticut Ave., New London, Conn.) was elected President of the newly formed New London Radio Club. He would be pleased to hear from active amateurs in or near New London. Visitors are welcomed at the club meetings at all times.

"A" in radio shorthand means abandoning ship.

The Podunk Daily Gruel.

Since seeing this new definition I can recall quite a few cases of improper use of the old "dit dit dit dah dah." The ops ought to be more careful. Yeh, we agree, OM, but we thought that "A" was the abbreviation for "Virginia." Guess we'll have to learn our shorthand all over again. Now, as to "SK," which also is "dit dit dah dah dah," we rise to suggest that this one might mean "sure kumming" — meaning that the ship was not going to be abandoned after all. What do you say, Alexander?

K1HR at Fort Wm. McKinley, Philippine Islands, has a kind of QRM that most of us are unacquainted with. It is caused by a species of lizard that hide in the walls of the shack, unnoticed in the daytime, but vociferous with "shouts" at night.

The Tri-State Amateur Radio Club (Iowa, Nebraska, and South Dakota) of Sioux City, Iowa, keeps schedules with other organizations, and would like to hear from any clubs throughout the country that may be interested in regular two-way work.

A wife of one of the Marine officers in Nicaragua received as a Christmas gift an invitation to join a group of friends on a European trip. Wishing the counsel of her husband before accepting the offer, she called upon W6AKZ to serve as a link in communication. The message was relayed and received an immediate reply, which was sent to the wife, residing in Washington, D. C., after which the trip was made. Communication by mail ordinarily requires about four weeks.

S. C. M. Keer of Iowa suggests that American Legion posts are apt to have some nice traffic that they would be glad to turn over to amateurs in their respective cities. Inter-post correspondence could be handled nicely in this manner, and after it was established there could very well be post activities that could be reported from one city.
to the next by amateur radio. The Army-Amateur system could be worked into such a schedule, with benefit both to Amateur Radio and the American Legion. How about it, fellows?

W1XY recently made contact with W1W, a ship in the Red Sea that operates on 14 mc. Schedules were arranged, but the ship has only been heard spasmodically in recent times.

——

**WUXTRY!**

Herewith we attempt to initiate a longing that has been expressed from all corners of the United States. Route Managers especially will be pleased to find below the long expected picture of Miss W1XY. From left to right we find the receiver, then Gladys, then the transmitter, and — lastly — Griff, the station’s monitor box!!

W1XY is the Route Manager for the Eastern Massachusetts Section of the New England Division. Regular schedules are kept with several brasspounders and, in addition to keeping the traffic moving through her part of Massachusetts, Miss Hannah holds the important position of Chief Waffle Cooker and Official Ice Cream Passer for the monthly Route Managers’ parties over the air.

——

**AN INVESTIGATION OF PHONE INTERFERENCE WITH B.C.L.S.**

As soon as the new crystal controlled 3350-kc. phone transmitter at W2BRB was working in a satisfactory manner (approximately 50% modulation of 60 watts max output at the time of the test) the address and telephone number were given regularly and reports of interference were invited so that they might be taken care of properly. Two neighbors reported the signals but did not complain of interference. Two other threatening phone calls were received. A letter was written at once to the local Supervisor of Radio anticipating the two complaints and presenting details of the situation. A thorough survey of the conditions in the immediate neighborhood of the station was planned at once and Mr. Glaser of W2BDR assisted by Mr. Talley of W2FF set out to do the necessary investigation and missionary work.

The antenna-counterpoise system of the transmitting station was noted to be parallel to 220-110 volt lines, telephone and telegraph lines, and 11,000 volt 25-cycle high tension feeders, all 20 to 50 feet away. The Long Island Railroad runs 60 feet away. In examining the receiving installations it was found difficult to compare or judge the selectivity of the different sets. The owners seldom knew anything about the length of their antennas or anything concerning antenna characteristics either. The interference did not appear to conform to the circle pattern. At one location over 800 feet distant and not in line with the maximum radiation from the inverted J type radiator the interference was so bad as to compete with the strongest local broadcast stations. This set was a homemade affair with a single tuned r.f. stage with about 100 feet of antenna, and electrified. A neighbor across the street from W2BRB with a regenerative tuner and 80-foot antenna did not hear the phone at all. Also the phone was not audible in a 1927-type medium frequency broadcast receiver located but five feet from the transmitter using a short indoor antenna. The signals were audible in a electrified tuned-r.f. receiver on the first floor, but not much above 25 degrees on the dial, this representing a different type of interference than was experienced in the local huts. The transmitter plate supply is from a motor-generator and filament transformers all have grounded center taps so that interference via internal 110-volt lines is probably nil in this case. In one case a receiver over a half mile away was practically paralyzed when the phone started up.

The results (in brief):

1. Interference, where present, always appeared in the same form, all over the dial with the same intensity, no noticeable peaks. Straight e.w. is not heard at all, there being no clicks in keying. The QRN appeared to be of the impulse excitation type, independent of frequency.

2. The amount of interference was not proportional to the proximity of the transmitter, given similar receiving installations.

3. Series condensers in the antenna-feed of receivers had no noticeable effect on the signal-QRM ratio.

4. Some nearby installations received not the slightest interference.

5. In every case a wave trap tuned to the frequency of the transmitter, inserted directly in the antenna-feed, resulted in eliminating the interference altogether or cutting it to a low value so as not to be bothersome. Motto: All receivers should be supplied with wave traps.

**Divisional Reports**

**ATLANTIC DIVISION**

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, H. H. Layton, WSALS — Maryland: W3BBW made the BPL last month and kept a 16-hour watch during the GPR with the assistance of W3A1H and W3A1L. W3BA and W3HL are both in Baltimore. W6DON, W9ELX, W9AIM, W9BRW, W3ALF and W2BGO in the “Round the World Route” provide 24-hour service to Hawaii, New Zealand and
We welcome W3RXH as a newcomer but an old-timer. Delaware: W3A1Q had hard luck with the Delaware GPR message. Letter of Columbia: W3HL and Mrs. W3HI were on full blast during the GPR. W3HL is also very active in the USDA Net. W3BWT, with the assistance of Mrs. W3BWT, handled 18 states during the Relay. Some are maintained with W3ZF and W3ZAS. Also made the IPI. W3GP has a third relay contact set with W4QC and W8AD. We clear each other at some transceivers, but we require nicely handling each tone. W3A1F had hard exam QRM, but did good work even so.

Traffic: W3BWW 200, W3MH 17, W3BHX 10, W3BWT 13, W3WCM 110, W4MLM 46, W3BWX 46

SOUTHERN NEW JERSEY - SCM, M. J. Loyth, W3C3G - Traffic seems pretty plentiful and all are quite active. W3C3G had a score of 9 in the GPR, and ARC includes to be our most consistent station, W3BWX had a fine tone. Could get reports from non-ORS W3RK whenever he is on the air. W3ATJ will also be on the air more as his rather recuperates W3KJ and W3ATP are building. Traffic: W3CGF 102, W3ARC 88, W3BWW 55, W3CT 25, W3TX 14, W3TQ 1, W3FQ 1, W3KQ 1, W3FX 1, W3MR 1

EASTERN PENNSYLVANIA - SCM, J. B. Morgan, 2nd, W3QP - Rather good turn out this month, fellows, in spite of its being much shorter than usual. We regret the loss of two good ORS, reducing the number to nine, but have several feeling better. None of us are quite able to qualify for the Bip, although W3ZJ came within a short throw with 37 deliveries. Too bad, Don and Pat. W3WJ and W3ADE report having a lot of worries - going to sign off for present. We hope it won’t be long, OMs. W3VJ, W3XQ, W3JX, W3RQ, W3WJ, W3WJ, and W3ZJ put the Three Musketeers from Scranton, report all sorts of different colored trouble with YLS to skeptical neighbors. Things are looking brighter down W3AKS’s way. W3CDS has been on the net the last 2 weeks. W3NF was QSO KDB 5 recently. W3HJC has moved a new QTH, on W3HJC. W3IPQ is gradually making an impression on the ether. W3BQJ is making a nice start. W3RZ-XS reports some traffic handled by Bob Creighton of W3MCV.


WESTERN PENNSYLVANIA - SCM, A. W. Meads, W3C7O - W3HC again tops the list and says that the ORS is meeting surely. Most of the work was on 7000 kc. W3NE handled 265 deliveries, and W3WJ handled 150 deliveries when they learned of the new reporting date. They will take on some OH work soon. W3CFR is starting to build a new transmitter. W3CNZ is troubled with some QRM from BC. W3JX and W3S in CT put a lot of new transmitter with improved results all around. W3CNZ, W3CNZ, W3JX and W3TW are handling traffic. W3TW, operating directory, is on the air regularly. Look for him on the 3500-kc band any Sunday p.m. up to his neck in QSO’s with A. T. A. members. None of W3BNR is having difficulty with license renewal. W3C6I is handling a bunch of traffic and is very active. Storage B battery is required for that DC note.

W3CRA, W3B0G and W3AVY are looking for traffic. W3CQ1N is attending school in Boston. W3G1H is working on state and local amateur Transmitters Association will hold another banquet this time in honor of Field Marshall Herbert and Director Woodruff. There is a noticeable tendency toward better notes and general station adjustment. The old idea of sending "double" has about disappeared and better operating is being practiced by a greater number.


WESTERN NEW YORK - SCM, C. S. Taylor, W3P5 - W3A1HC reports WFA QSO now. W3BPP, W3DQP and W3ATP complete of poor signs. W3BSM has schedules with W3CWZ and W3AS. W3IPI handled a few. W3PGC has quite a total for a beginner. W3CMW and W3C6G are still after traffic. W3CNZ made the Bip twice over this month. FBY W3CPC is working hard on his transmitter. W3DHI finds 50-meter band best for traffic. W3DHI states traffic poor now. W3PL is moving his station to W3BHK.

Traffic: W3AHG 18, W3BIP 9, W3BMM 64, W3P6 16, W3BGG 62, W3CMW 18, W3CNX 200, W3FCC 21, W3CYG 16, W3DDL 32, W3DHI 18, W3QIP 17, W3FC 10

CENTRAL DIVISION

ILLINOIS - SCM, F. J. Hinds, W3APY - W3A1K has a M.O.P.A. going, FB, W3RA has joined the USNR. W3R0D has rebuilt entirely. W3BNT originated the Illinois GPR message. W3G1D is the operator in the State of Illinois. W3FOQ has a pair of R-33's. W3FOQ is building his rebuilt. W3EJO dropped a plate of pins on the 825. W3RDU says the QRM is so bad he cannot handle work by schedules. W3K8B is rebuilding parts of his set. W3BPRX is charging over 7000 kc. FB has a brand-new monitor. W3DRZ has his forty out. W3CTA and W3FAPB say DX is very good. W3FGK is rebuilding. W3CKZ has rebuilt. W3W0Z has some nice results. W3G1M is working around power peak QRM.


INDIANA - SCM, J. A. August, W3CYQ - The Indianapolis Radio Club has appointed a committee to put on a fund raiser. Who all has borrowed state with 561 even though the month was short. W3FOK is building a new shack. W3FBl shut down by female QRM. W3D1B reports that he will soon be going on crystal. Looks about as though that will shut W3D1B down. W3D1B reports that he is on again as he has borrowed state with 561A at 3500 kc. W3ABF is putting a new Zepp antenna. W3DGB and W3CMJ are going to college at Earlham. W3EPI has a new ham at Richmond. W3EPI has some words and won’t work him unless you have had it. W3D1H and W3EAIK are charging over 7000 kc. It’s the summer heat. W3EAIK is in the ICU set repairing business with W3CMI. W3FCQ is the new R.L. and district superintendent of District No. 4, which takes in central Indiana. Indianapolis, Marion, Bloomington, and Terre Haute and the territory between. If you are not an ORS, send your reports and requests for schedules to W3DSC. W3FIV has a new antenna. W3AUP, W3CTD and W3CQ1Y visited ham at Dayton and Richmond. March 9th and 10thententative Ours, the operation of which is about to be turned over to the convention. W3BSU is using regular weekend. Chicago dates. W3EVA is back on again. W3GMA moved to Marsee, Ohio. W3QBE has a new M.O.P.A. going. W3FKE and W3B11 and W3A1K have bone. W3CQ1N cracked him. W3CQ1N has a 540-meter band. W3BEJ reports his Radio Traffic Association of Fort Wayne reports made on meetings as well as they are having regular speakers. W3EVTB is using 180 watts of battery.


KENTUCKY - SCM, J. B. Wathen, H. W3BZ - W3ABU has about given up television. W3ETD has a fine W3F3V is putting in screen-grid. W3ELL works Ausie’s any old time. W3BAN has hard time finding reliable QSP points. W3IMX has his new screen grid working. W3JW is waiting for his PX-3600, but has a few per doc’s orders. W3GAL says QRM had on 7000 kc. W3IF is still knocking ‘em dead. W3CFO installed a new filter and gets out better. W3BQG was QSO a French X station twice last week. W3BQG, assured by W3PLM, talked to a friend in L. A. directly. Due to the shortened month, no one came within the prize zone. W3IOX is still high with one month to his credit. Where is all the big competition that was talked of?

Traffic: W3I 79, W3BAQ 41, W3FQN 39, W3A1Z 16, W3WQ 12, W3C1E 11, W3D1K 9, W3BBG 6, W3TEO 1, W3A1R 1, W3MM 4
MICHIGAN — SCM, Dallas Wise, W8CEP — W8BLA has been offered a contract with the Firestone Tire & Rubber Co. to up at their experimental short wave station in Liberia, West Africa. W8DJK-WOOD is using a vertical Hertz Family of the breakeven type on 109 ft. high, W9CE and W9AXE reported on time this month, W8KD is a newcomer just starting up at Lapeer. Steve of W9BTQ is spending his time making hams out of the 3CLs. W8USB is busy lining things up for the coming breaks in Grand Rapids April 20th. All Michigan hams are invited. A good feed and lots of entertainment are on the program. Drop W8AUB if a hamsy if you intend to come. W8ZFS has a shortage of operators, W8CU and W8ASO are having shtter troubles, W8CAT has a new transformer ordered. W8HNY, High School transmitter is about finished. W8DSF says the bad weather and work bromed his schedules out for the time being. W8DSF of St. Joseph reports a mistake in his traffic total for February which should read 75. Hurry about the mistake, OM, and hope to do better. W8ACB is still off the air due to dotted package book, W8CKZ wants report cards. Babcock of W8BGY has gone to Philadelphia. W8BGY started the Government-President message on its way, FB. W8AUF is using a low power TPTG set with 250 watts. W8BV has visions of a 75-watt rig and W8DEG says he is after the BPL any more due to business, but he has told me that so often only to come back to the same, W8DH is the new EM for the eastern section of Michigan and any traffic problems, dope on schedules, etc., can be submitted to him. His is W8DH and 75-W will find him on 3000 kc. any night. W8DMS received several responses to the call for "Ops" for the National Guard Encampment, but says he has room for several more, so don't be bashful, fellows, if you would care to spend a couple with W8DMS. Get in touch with W8DMS direct or thru the SCM.


OHIO — SCM, H. C. Storek, W8BYN — The personnel in Ohio is very good now and new appointments will be out long before the next report. Harry H. Porter, W8CHI of Athens, Ohio has been appointed Route Manager General of Ohio. Ed Nau, W8CM1B, Cleveland is RM for Northern Ohio, Ed Anspach, Cincinnati, W8BBR is RM for Southern Ohio, under W8CHI. Congratulations to all three of you, and best of luck. In spite of the short period, W8CHI made the SCM with W8CMQ. W8CMQ has in touch thru 40 and one of her reptools, W8BBR is busy. W8CMB turns in a nice total and reports that there will be a northeastern hamfest April 20th. It is with regret that we announce that W8LA plans to leave this section for work in the east. W8FBCH prove that traffic can be gotten on most judged without schedules, if it is looked for and the operator is in earnest to do his best. W8GZ got most of his total with Army-Amateur messages. W8BUXM did good work in the GPR, W8APB has been saving his skids to go to the next one. W8CHI is GM, W8JY is GRL school. W8DSF sends in his first report as ORS, W8DZG spanned his operating wrist, cranking a "linxie." W8CWX is working on a net for public utility emergency work. W8AYO and W8BRQ are busy with BCL trouble-shooting. W8ADH has built a new monitor, W8DSG is going to have a good FPL when W8UE needs some tubes. W8AQ is busy. W8AM1 blew his lunch. W8CNU reports it was a rotten month for traffic. W8EJL is constructing a new vertical antenna. W8DDK is now associated with W8BYN in business and says his ambition to pound home at the SCM's has been realized.


WISCONSIN — SCM, C., N. Cripe, W9VY — W9DLQ again got into the BPL by the aid of his sixteen schedules although the Aurora tried hard to blanket his signals. W9ARE sends his final report before again reporting for duty on the Lakes with the Reiss Steamship Company. W9DNB will be going to school. W9DLQ got in almost too late with a nice total. W9DNJ is building a 100-watt xtal layout. W9BWZ says deliveries were terrible this month because they had to be made in a boat. W9WEGX is on 3581, 7162 and 11624 kHz and W8KKZ says the local paper published live station photos and wire groups of ham stations. W8CNL is on the air consistently. W8BFZ seems to be about the only reliable contact at Madison. W8FHZ says traffic is slow at Mosinee. W8JDC's xtal outfit coming along fine. W8FWA is testing a new screen grid receiver. W8LY, W9FZK, and W9JDC were on for a few. W9DTS has improved his filler.


DAKOTA DIVISION

NORTHERN MINNESOTA — SCM, Carl L. Jobs, W9BVH — W9FXU has discontinued the WFBT schedule, but still has eight left. So his traffic looks as good as ever. He also has a portable call, W9GZ, to use at his shorebond says he plans to make a dump at W8EGU-WGZ this summer. W9FER is second in line. W8CTW is moving. W8CF reports some 1929 signals. W8EGE is operator at W9CDE. Calumet, Mich. W9CWA and W9BVH handled GPR messages. W8EHF ground his crystal unit last month. W8ER has arrived. W8DSIR plans to use 3500 kc. W8DFZ is rebuilding. W8EH1 and W8DSR are both busy. W8GGO and W8AMK are new hams for our section — welcome, OM's!!


SOUTHERN MINNESOTA — SCM, J. C. Pehosehek, W9EFP — W9COS handles half the Section's traffic each month. He is the RC so drop him a line more often, fellows, telling him what skeds you have and what you want. W9XI is having exams and QSK. W9AIR has a new Skutter-bolt Six. W9ERT also busy with exams. W9EOH has now a 75-watt bottle. W9DOP is building xtal control. W9HZS is on again consistently. W9BXK has the new MG working. W9ELE says 3500 kc. has lots of traffic. W8EFK had a 50-watt given to him. W9FCF finds his operating time restricted. W9DM1A is house cleaning. W9DHP got back on 14 mc. W9DBT has a crystal. W9WGA handled quite a few Xerox jobs and is having a session with apt. BCL's who cut into his time. W8COS 134, W9XJ 29, W9AIR 20, W9ERT 17, W9E0H 14, W9DOP 11, W9H2Z 10, W9BXC 8, W9ELE 7, W9EFK 7, W9EDH 6, W9GGA 9, W9LYL 2.

NORTH DAKOTA — SCM, B. S. Warner, W9DYV— W8BFV turns in a very nice message total for a short reporting month. W9DYA is a new Army state net control station. W9FCA handled a few. W9CNO has been on the 1750-band, high a couple of schedules.


SOUTH DAKOTA — SCM, D. M. Pasek, W9DGR — W9AZR comes through with the best traffic report. He has several skeds on 3500 kc. W9DBR has given up over 28 mc. and comes through strong on 3455 kc. W9FNL handled the Governor's-President message OK. W9DFZ sent in the best report last month, but it was too late for QST. He hears W9A, W8BT and W8FAR regularly. W9DNS and W9DGR are trying to organize their Army-Amateur nets, but are having a hard time to hear the state Net Control Station — W8CKF. The Sioux Falls station are requested that ex9DES is returning to the state (so am 1 — SCM).

When W9EUG gets his new shipment of B batteries he should have a real rig. He (or his pocketbook) bemoans the fact that he hasn't got a good amplifier. A. C. W9CWA may be heard at 3500 late in the evenings. W9DSB and W9DPE in the Jerau Lake has been using fun on 1750 kc. for the last few months, but is dropping to 3500 for AA schedules.

ARKANSAS — SCM, H. E. Velte, W5AB1 — W5CX is a new reporter with a nice total W5EP handled in the largest total and reports that he has rebuilt his station completely as of 1929. His best DX was CAMCO. W5SSS is selling out and will not be on the air until next fall. WSAQQ is still busy at KILA. W5ARA has been very busy notifying offshore 7000-kc. stations to get where they belong. This is FB, OM, and we are hoping that you will keep up the good work. W5RJD is having business QRK. W5AB1 has been getting out FB on 14 mc. W5BDD has replaced his 50-watter with an 862 tube and has been getting out FB. W5BDC worked Africa on his 852. It is impossible for the SCM to know what is going on over the state if the game doesn't drop him a line. Come on, fellows, let's see who will be in the line-up next month.


LOx WSANA — SCM, A. M. Hill, W5EB — W5WF, high man for last month, has a commercial ticker and has gone to Post Arthur for a trip to sea. W5AW1 is second up and says he will keep the bottles warm. W5BDX has replaced his 210 with 5-watter and gets out as well as ever. WMFJY has a transmitter all fixed, but has trouble with his MG. W5ADG has been having business QRK. W5LW has business QRK. W5AXS has had his shack painted. W5AFE handles traffic with nnNIC and Y64DN. W5ANCA is a new ORS. W5AY7 had the pleasure of starting our government's message as W5W2U. W5CNK is not in proper working order at the time scheduled to start. W5EB is building another transmitter for the 14,000-kc. band.


NOSSippi — SCM, J. W. Gullatt, W5QOQ — W5QQ has schedules with W5AYD, W5WF, W5ANQ, W5AQY and W5AAD. W5QQ has been appointed bypass condenser blower in this section. W5ILY is now trying out 14 mc. W5BEX is now on 7000 kc, using five 201A tubes, with an output of 23 watts. W5BED is working W5GOF with a small amount of noise on 7000 kc. W5BDE is busy playing in an orchestra. W5BBX has his transmitter going. W5AKP forgot and put his hand on the power switch of his transmitter and 1100 volts stroked him, but he got up and kept on working DX as if nothing had happened. The radio inspector visited Meridian yesterday and gave examinations for both amateur and commercial licenses. It is with sincere regret that we report the passing of W5AVX from this world to the next, as he was killed in an airplane accident near Oklahoma city. He had a license to fly and was killed on a licensed aviator and was liked by all who knew him.

Traffic: W5QQ 83, W5FQ 7, W5AKP 75.

Hudson Division

EASTERN NEW YORK — SCM, F. M. Holbrook, W2CN8 — W2QO makes the BPL with lots of traffic daily with nnNIC and lets PLY1AW use key to reach his home in Brazil. W2GBG procured GFP message. W2LC makes good first report. W2ANV is busy with air mail reports. W2AXK is working on 3955 kc. and finds plenty of traffic. W2AQJL is working South Africa regularly and reports Yonkers Radio Club now flourishing with meetings first Tuesday each month and all hands welcome. W2AN has that old weather bug. W2BCN is quitting the air temporarily and will return shortly. W2BHV handles the 15-kc. W2AN has handed over his share. W2BF5 entertained five White Plains hams at his shack. W2BKN is active. W2BJJ saw W2ALU QSO Byrd Expedition.


NEW YORK CITY AND LONG ISLAND — Acting SCM, V. T. Kemeyer, W2GQO — Manhattan: W2BGG leads his borough with 171. W2BNL reports a few.

Bronx: W2BFQ leads the Bronx, and keeps his Army sked regularly. W2SF is keeping his skeds as they should be kept. W2CIX and W2AFT are doing some good work.

Brooklyn: W5BFQ is the cinderlender this month and makes the BPL two ways. W2F has a summer camp in the recent storm but be managed to get up again well enough to keep the Second Corps Area AARS Net working. W5BRRB is putting together a new "de luxe plus" xmitter tall wave. quick change, CC1 and will be heard again on 28 mc. very soon. A general house cleaning is going to take place and all new phones. WORS are going. W6AB is en route with reports in order that they may retain their appointments.


NORTHERN NEW JERSEY — SCM, A. G. Wester Jr., W2WR — W2WR is now on 7000 kc, and will be glad to work his various ORS. W2AOS is handling lots of traffic in the Army network. W2DX has been doing Naval Communications each Friday with NDB. W2AMG connected with the west coast early this month. W2OD is working all stations with his new MOPA on 3500. W2IS has two xmitters in operation. W2GO has xmitter perking fine but cannot dig up traffic.


MiddleWest Division

IOWA — SCM, H. W. Kerr, W9DZW — A short month and a pretty good traffic total, thanks to the faithful. W9F1, W9JED and his boys are doing a pretty good job. W9BCA's DX in West Africa on 14,000 kc. and W9BSB at Tahiti. W9JEW reports W9PFL spliced with the YL, congress from the gang. W9BDL desires popularity, if only a small traffic report. Wait till he gets the 25-cycle merc he bought of W9OCC going. W9PC is active at 14.000 kc. and W9RTU is working the west coast and getting his report in plenty of time. 30 cycle to try the ESCO MG. W9KYU was QSO ms3N3IC and sends traffic report. W9FGQ shot his old 8 tubes but nice traffic. W9EZC has a new station license and is going again. W9DNP puts the GOR for Iowa with a lot of kick to it and is making permanent improvements. W9HRW totals 23 and the two fifties went west. 210's now. W9FDE has his MOPA perking and gets a start on traffic. W9BSP reports, has skeds for SW, wants traffic. W9DL is playing W9BTM and W9W9V is a new sked to him. The station is closed. W9BLT is in radio school. W9TY, the Iowa State College, Ames station, reports the Campus Club will have their call and be going soon. W9BCA handled the GOR most from Manilla. W9CVO got a three-column write-up and picture in the Sunday edition. W9FLX is trying the 7000-kc. band. W9BKV says 75 to the old gang. Plans for the Midwest Division Convention at Ames are materializing and the SCM would like the address of every chap that is desirous of a program — there will be lots doing and you will get to do something. W9KHD will give us the life history of "Our A.R.R.L." Assistant to the CMI, Huber, will take on "Communications Activities," and Mr. Turner, Acting U. S. Radio Supervisor, will speak on Rules and Amateur's Problems. Others are planning slides. Go thou and do likewise for Ames. May 10th and 11th, W9FDFD and W9DXP reported almost too late for fair totals.


KANSAS — SCM, J. H. Amis, W9CET — Due to a short month, no one made the BPL. W9UN leads the gang with a nice total and still works his daily sked with the Aussies. W9CFCN says schools closed and no activity. W9HRC says he will make the BPL next month. W9FLQ has been appointed Army Amateur control for Kansas and is keeping 10 skeds. W9FGU is going strong on 14,000 kc. and is building a 8-section receiver. W9FQK is the newly appointed A.A.R.L. net control for the first district. His tone was reported in Alaska. W9BHRS is on 3500 kc. and has to call on W9FQK when he needs an op. He is also trying to convince the SCM that push pull is better than xtal. Hi, W9KCU says business is good so the radio must suffer. W9FQK is combating QRM, and says he wants a sked west and can't get it. Will someone please arrange this for him? W9FTY thought his 210 went west, but made a new RF choke, and now it perkas FB. Hi, W9FYP changed from ultradet to Hartley and now gets pure IM. W9CTY has installed a pair of 866's as rectifiers on the last stage of his xtal rig, and says they are
FR W9BFZ is going strong with his M.O.P.A. rig on 7000 kc. W9GFI is on 3500 kc.fone and CW. W9BIH lost his licence and has been very QRV work, but will be on regularly now. W9ECF is on 3500 kc.fone and says he is going down on 7000 kc. soon. A number of ORS are not reporting and can expect to hear from others. W9BMI, the RML reports ORS night progressing nicely with a lot of interest from the gang. Listen for him on Wednesday nights at 8 p.m. 3500 kc. The SCM would like to hear from every one in Kansas who is doing anything of interest.


MISSOURI — SCM, L.B. Laine, W9RL — St. Louis: W9RL has a new antenna. W9GU broke his new antenna and are all had to QSY chem rect. again. Sked with W9FLG going fine, W9BIF tried to make a better antenna, W9DZN reports low power exp. at his station, QSO W2BNY with 47 watts on the QRM band. W9MU joined A-A net among other activities. W9BDI of Pierce City just got linemen again and another new ORS of Battery A. 203rd C.A. (Anti-aircraft sections) and plans on being in the A-A net. W9DKG has a new skid, C9ISBY five days a week. W9BAS is a new station in Columbia. W9DAE was a visitor in K. C. lastly. W9FYJ received his A-A appointment and another new ORS coming up out of Fayette. Ex-W9CIG is now in Toledo. W9DMT is still a traffic handler when possible. W9ECS turned in an excellent total. W9ERM writes that W9AJW is now at Michigan U working W9BEK. W9RCU is rebuilding. W9CJS reports being in a patchy fashion and the news on W9GJF is no news. W9DMT is working over in K. C. Kansas. QRSA McAle-Reynolds Co.)


NEBRASKA — SCM, C. C. Diehl, W9BYG — W9ANZ breaks in on the President-Governors Relay. FB, W9QY experimenting with crystal, from grinding on up. W9LBW has been in field working for W9EL with W9ECF again sends in a fine report, also says that he is busy sending code lessons on 165 minutes Saturday, Sunday, and Monday. That is sure fine.

Traffic: W9ANZ 1, W9BY 4, W9DWH 6, W9DVR 2, W9AMJ 4, W9DNC 5, W9BOQ 1, W9BLW 5, W9DNQ 3, W9BQR 1, W9BSB 5, W9DHC 8, W9DBS 2.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, C. A. Weidenhammer, W1ZL. — Unfortunate circumstances forbade completion of traffic and reports on QST. We trust that we shall not be forced to do that again. W1BQD is doing splendid low power traffic work. W1AJC worked ten countries on his U250. W10S has new auto parts in place of radio junk. W1VB is still batting out his second report. W1AFB's totals continue to be very fine. W1BLQ is another of our ORS candidates. W1AOX gets crystal reports. W1NE is on 7000 and 3500 kc. W1BWM has a new tube rectifier unit. W1AWD is doing good traffic work. W1BJK cleaned up his set. W1BDI continues to handle much Philippine traffic. W1IBM has schedules with W1CT, W1AOI and W1AOF. W1DTD got the surprise of his life when W6AWD answered his call on 3500 kc. W1BHQ has a battery set in operation. W1CPW is back on the air. W1IBB has a 250-watt and several other transmitters. W1BMS, the SCM is making a mighty 50-watt. W1AMG handled an important Army message from KDV5. W1BF has a new TP-2 push-pull circuit. The same old Nicaraguan schedule is kept by W1LM. W1PWF is getting a new power transformer. W1BGC is on 7000 kc. W1CDA — SCM, K. K. Wilson, W1B and W9ECG, the SCM, reports ORS night progressing nicely with a lot of interest from the gang. Listen for him on Wednesday nights at 8 p.m. 3500 kc. The SCM would like to hear from every one in Kansas who is doing anything of interest.

Traffic: W1CTT 38 (20), W1BGC 11, W1PWF 11, W1LM 30, W1BOI 15, W1AMG 47 (65), W1AT 2 (51), W1BNS 4 (12), W1HJ 18, W1CPW 16, W1BHQ (1), W1TD 14 (18), W1BH 12 (22), W1BDI 110 (164), W1BK 9 (20), W1DWA 9 (85), W1BW 49, W1NE 13, W1AOX 17 (17), W1BLO 12 (15), W1AEB 66 (80). W1V 18, W1AMC 6, W1RP 62, W1BDI 5 (71).

RHOODE ISLAND — SCM, C. L. Jenks, W1BF — W1AW is still plying his trade and W1BQD are on 3500 kc. ORS W1ACR and W1FKW are on 7000 and 3500 kc. W1BQD would like to make schedules for traffic. W1CPW and W1AEV are two more new ORS. FB, W1LM0 has been re-built, working out of the Woodlawn building. W1LM0, W1CDA and the others have already sent in their reports. That is sure fine. W1BM0 joined in on the HC, and W1ARZ and W1CIW, W1WU is interested in ORS. W1YK is now a USDA station. Gladyes asks that active ORS, take her recent letter with a grain of salt. It was written to further activity and no offense meant!! W1AB has taken a VL unto himself. Good luck. O.M., W1CQO is QSO with W1AOI in Texas which was 1000 ft. up. FB, W1AOI has a new F.C. circuit and worked 5EYFZ. W1BLO got report of Q5A5 from England on 28 mc. and worked NJ2PA on 14 mc. DX has been just as good as ever at W1BLO and W1ATD. W1BBD has been both on and offай the signals. ORS not mentioned in this report — please make every effort report next month.


NEW HAMPSHIRE — SCM, V. W. Hodges, W1AQ — W1AY is going slowly with his new 50-watt MO-Pa. College work is keeping W1MFT busy as usual. W1EAF is carrying on with a 201A. W1UM and W1IBB are handling a bunch of traffic. W1AEU handled a few. O.M., W1CQOW has a new 3 cycle going well with his usual outfit. W1AEF is putting out a PDC sig now. W1AIW has a new screen grid receiver. W1BFS reports the arrival of a brand-new V.L. Courant, O.M. The SCM has been having trouble with the start of W1AT.

Traffic: W1AIW 156, W1P 83, W1AEU 18, W1AEF 15, W1AIV 18, W1BSS 13, W1CWO 10, W1IX 9, W1BSS 3.

MAINE — SCM, Fred Best, W1BQG — W1AHH has been experimenting with a 14 mc. Zepp antenna. A push pull operating time for February is in the future. W1BQG joining in on the February meet of the PL. Things are looking up in real good. Good work, Harry. W1DXX turned in a good enough total to land him sixth position. W1BBB turned a mighty fine total in Fine work. Ernest, Mrs. W1AFC joined the BPL this month. She says that the fifty new lorries to be posted are going to be very fine. W1BLO is putting out the signals. ORS not mentioned in this report — please make every effort report next month.

Traffic: W1AIW 156, W1P 83, W1AEU 18, W1AEF 15, W1AIV 18, W1BSS 13, W1CWO 10, W1IX 9, W1BSS 3.
that the OW was busy making the BPL. Hi, W1AQD handled the California GPR message. W1AQL turned in a mighty fine Official Observer report. W1KQ has been rebuilding. W1TIAO sent an urgent message from EF8CT to California on 14,000 kc.
The SCM has been away for fifteen days on active duty with the Naval Reserve, and reports a fine time with plenty to do, and lots of hands visited. Due to a late return, as well as sickness in the family after his return, the report for last month could not be gotten up in time to reach HQ in time for printing. W1BHQ is rebuilding his transmitter, and plans on trying pure DC for a change.


WESTERN MASSACHUSETTS—SCM, J. A. Tesser, W1UM—The activity in the section is increasing, FRI W1FX is looking for some good active stations to arrange schedules. W1BKG is active in Pittsfield. W1WQ has rebuilt TPTG, W1PY is on 5 to 6 p.m. week days. W1AJK and W1ANJ are busy with Naval Reserve drills. W1AIO is an active worker in the Worcester Radio Club. W1BYR is out of QG4A, W1QH has his station all painted. W1ASU has been reelected president of the Worcester Radio Association, 274 Main St., Room 301, where meetings are held each Thursday evening. All hams are welcome to visit. W1AWW will be on regularly.

Traffic: W1BYR 2, W1LY 4, W1ADJ 17, W1RX 10, W1BKG 15, W1WQ 3, W1PY 8, W1ASU 8, W1UM 1.

VERMONT—SCM, C. A. Paullette, W1HT—Several OQRS announcements have been made on account of inactivity. I wish to report here that I will honorably cancel any station with the privilege of reinstatement any time upon request if things are so that you can't possibly be active. We have four reporting stations this month, and they are WICGK, W1FYH, W1HAY, and W1HBY. Why you should not be active, W1RQ is busy with a ship job. W7UN, W1QG, W1FYK, W1QG, W1HAY, W1HBY are all reliable traffic stations and are on consistently.

Traffic: W1TUN 34, W1QRB 18, W1WTR 15, W1AMQ 14, W1PG 6, W1ALM 6, W1AIK 3, W1AIG 2, W1AVM 2, W1PE.

MONTANA—SCM, O. W. Viers, W3AT—W3BP takes traffic honors again this month and W3HTI ranked a close second. These two stations hold down heavy daily traffic skeds and handled seven death messages in twenty days. W3AT worked KFR5 in the Casual Zone and was reported on QSA4. Why not have a report from all the gang once next month?


WASHINGTON—SCM, Otto Johnson, W7FD—Unfortunately, word of the changed reporting dates did not reach the SCM until too late last month, so this is a combination of February and March reports. Activity is on the increase throughout the state, with many of the gang getting ready for the annual exodus to Alaskan stations. DX is still to be had in spite of the narrowed bands. W7GP in Olympia handled the Governor-President Relay in fine shape. El, Red, OBI W7PH of Everett staged a nice piece of work during the Washington Basketball Tournament at the U. of W. pavilion, erecting a portable station there (W7KZ) and keeping his home school informed of the progress of the tournament.

Interest in the coming Seventh District A.R.R.L. Convention, to be held in Portland, is evident throughout the state, and a record attendance can be expected. We understand this convention will be held about the first of September as usual. Don't forget to bring the OW or YL to the banquet. Hi, AND, do not forget the new reporting date is that day!!

Traffic: W7ACY 88, W7YK 65, W7GV 84, W7TE 58, W7PH 62, W7AAE 47, W7TX 46, W7RT 41, W7GR 37, W7AB 33, W7DP 27, W7BR 22, W7AC 18, W7KZ 15, W7WQ 14, W7WJ 12, W7EA 12, W7BB 9, W7AC 7, W7AF 6, W7FD 6.

IDAHO—SCM, James L. Young, W7ACN—W7CG and W7FN are two newcomers. W7ACP is going to rebuild. W7H and W7HE are both on the job. W7GU is on 8500 with tone and 7000 with CW. The KIDO gang is putting on a second KIDO ball. W7A handled the Idaho and three other Governer-President Relay messages right to Miss WCDQ in Washington, D. C. Good work, Austin. They report three new ops coming on right away from W7YA. W7HR and W7ACD are right on the job. W7JE needs a receiver. W7ACN handled quite a new MOPI to perk. W7BF is on 7000 quite a bit.

Traffic: W7YA 34, W7ACD 9, W7HR 9, W7JF (Feb.) 126.

PACIFIC DIVISION

LOS ANGELES—SCM, D. C. Wallace, W6AM—Two stations made the BPL this month, W6AKW and W6DKV. Forty-six stations reported to this office, with thirty-seven W7BDF and W6AVY considered top. W6AVY is still in fine reports. W6A31 is QSO 7 count on March 20th on 7200 kc. 1929 is sure fine for DX on the 7000-kc. band. W6HI1 talked to VZ when he was 2700 miles of Cape Hatteras. W6CZ0 and W6CHA reported. W6UI and W6M1 are still in fine reports. W6CR is a second KIDO. W6KJ handled the Idaho and three other traffic reports right to Miss WCDQ in Washington, D. C. Good work, Austin. They report three new ops coming on right away from W7YA. W7HR and W7ACD are right on the job. W7JE needs a receiver. W7ACN handled quite a new MOPI to perk. W7BF is on 7000 quite a bit.

Traffic: W6HI1 34, W7ACD 9, W7HR 9, W7JF (Feb.) 126.
Sigfons will be found at 2530 kc. with ten minutes very slow
sending, about three words per minute. The second ten
minutes is a bit faster, and the third ten minutes is about
eight words per minute.

EAST BAY — SCM, J. Walter Frets, W6CRZ — The Board of Directors of the Oakland Radio Club have practically completed arrangements for the next tri-section hamfest. To be held in San Francisco, the meeting will be held at the Civic Auditorium on Sunday afternoon, April 19th. They agreed to sponsor the affair as a project of the section.


ARIZONA — SCM, D. Lamb, W6BAN — W6BN, working on the 7000-ke. band, held the section this month. Fiddler, second op., held the convention at Riverside, Calif., with the Army, W6BYF on 3500 kc., mostly with lots of traffic. W6EAA is back on the air with push-pull again. W6CDU has a new Ford. W6ANO is planning on rebuilding. W6CAP is using our 852 for DX fair, and W6EF is on 14 and 7000 kc. W6GQ is planning on getting a commercial ticket soon. W6SW was over visiting the gang in Phoenix. W6CRA has exam QRMs. W6CQJ is building a new shack. W6WBS hooked Z22B, who is ex-FOA. W6CQY expects to have crystal soon. W6DTU hears a lot of DX.


SANTA CLARA — SCM, F. J. Quensted, W6KNX — handled the most traffic for the month. He kept skeds with W6FT on the 7000 and 14,000-ke. bands. K6EN is a new station on the 7000-ke. band with a 210 tube. K6DQQ is rebuilding his transmitter. K6AFF is a new ORS, K6DTG is still on 17,533 kc., with the DX skeds. W6HCC is on 3500 and code sets on 14 mc. and 7000 kc. K6ALM has a new mercury arc rectifier. K6CIJ has a rebuilt W6EX on 204a tube on 14 mc. and 7000 kc. K6ACW is a new ham on the air with a 210. Wish all the fellows that are on the air and not reporting a good band, We need the dope, fellows. How about a record year for 1929?

Traffic: K6AVL 135, K6ENF 24, K6DQQ 22, K6AFF 17, K6DTG 12, K6EKG 9, K6ALM 6, K6CIJ 4.

SAN DIEGO — SCM, G. A. Serra, W6WQ — W6AJM reports QSO's several times recently. At 5000-ke. band recently. W6FYO installed a new antenna so can QSY all bands now. W6DNS reports important traffic handled this month and five skeds. FB. W6ACJ has three regular skeds. W6HAX is going to try 28 mc. soon. W6ZQZ has one regular sked now. W6ZQZ is back with his 2010 activities and W6WQ reports on 3500 and code sets. W6WQ reports official intermediates for Chile as CE and Peru as OA. W6CNK is arranging sked with W7WN.


PHILIPPINES — SCM, M. I. Felisardo, K1AU — W6EFO again handled the report by radio — FB! KIHR at Fort McKinley keeps the following regular schedules: K9PB, Zanboanga, P. L., 5:15 p.m. daily; WVN, Tientsin, China, 6:00 p.m. daily; K9TB, Sumay, Guam, 7:30 p.m. daily; K9KE, Radio School at Catic, P. I., 7:00 p.m. daily; K6RJ, Geraldton, Australia, 8:30 p.m. daily; W6-EQ, William, California, 9:30 p.m. daily. Frequency regularly used is 7010 kc. (42.8 meters).

Traffic: KIHR 557.

SACRAMENTO VALLEY — SCM, C. F. Mason, W6WQ — W6WQ reports with a whoop and a laugh — just look at his total!! Attaboey, OM. Daily schedules are kept with W6EUG. KIHR and W6AJM, and more are planned for the future. W6DON comes across with a good number and is setting up his new Usada Net. W6AEF was one of the official starters for the GPR. W6BID and W6EKL both worked a bit. A meeting of the Superior California Amateur Radio Club was held at Stockton recently with a large attendance. The Sacramento Valley Section is after the Convention for 1930.

NEVADA — SCM, C. B. Newmanbe, W6UO — W6CDZ claims that Reno is going to be known as "the center of ham activities in Nevada." from now on. Let's watch him keep his claim. The Reno Radio Club is still well organized, now contains the following members: W6ZO, W6EAD, W6BBD, W6IPW, W6CHG. KFPI, W6CDZ-W6DKE, Herb Pennington, W6AJP, W6GA, Walter Mulechay, W6XAI-KZA-KZB-W6CNW, and W6EUF. FB, fellows — now let you see how ready some traffic.

ROANOKE DIVISION

WEST VIRGINIA — SCM, F. D. Reynolds, W5VIZ — W8ACE and W6CLQ take the honors this month with W5DPO coming in a close third, and handling a fair amount of reliable DX, the best being NR2WD, X9R, XBZ and 5E1KKF. The latter being Chief Station Radio of Fort Flathers, Sahara, North Africa, this contact being made on 14.000 ke. W8OJK keeps two A-A sked on 3000 ke. and is a proud papa now. W8SP is working on his screen grid receiver. W7SDKM has a fifty on 7000 ke. W8AMX was heard on fone. W6BFU, W6CSR, W8APN and W8ACZ attended the Roanoike Division Convention in Charlotte, N. C., and had a grand time there with the SCM. W8OI's new 5-KW xtal job at WBT, WSZY is busy with BC work.


VIRGINIA — SCM, J. E. Wohlford, WCA — W2AJ handled an emergency message to Nebaucks when wives were down. WSHY has baseball QR. W3KR handled eight GPR messages. W3BDZ is still rebuilding. W3CKL is using a 1920 self-recalled circuit and says it's the berries. W3BDZ attended the convention at Charlotte and reports a big time. Dr. E. H. Cunningham attended the Charlotte Convention and, on the way back to Hartford, stopped over at Richmond and had a round with the gang there.

Traffic: W3HY 2, W3KR 14, W3CA 34.

NORTH CAROLINA — WATS leads the section this month and surely deserves a place in the 2000 club. W4AMU and W8ACZ get into fine shape. W6QI's work is back as an ORS. W6FWX is doing some fine DX work on low power. W9EUR at Pueblo has been on 2500-ke. fone. The Denver Radio Club is making another trip down to Pueblo for another joint meeting with the Pueblo Club. This joint meeting seems to do a great deal in the way of keeping the interest up in the state.

Traffic: W6CA 14, W9DKM 5, W9CDN 12, W9FXW 3.

UTAH-WYO-MING — SCM, Farley N. James, W6AJ — W8ACZ has had a couple of his skeds in the air now. W6EKF is still kicking out with the 201A, and reports two new hams in Ogden. W6CNX was up at Salt Lake on the 16th and applied for ORS. W6DXM is still waiting for the parts he ordered for his new transmitter.


SOUTHEAST DIVISION

ALABAMA — SCM, S. J. Bayne, W4AAQ — W4JY reports business QR and several Fuked schedules. W4AAH has a 1920 signal. W4AHZ helped a rudderless airplane by making arrangements for its safe landing at Maxwell Field. W4AX is on again with a 50-watt, W4AJY has a YL and several fine schedules. W4AJY has built a screen grid receiver. W4M5 has a new bottle, and promises to keep it hot. W4HA handled some flood relief traffic. W4UV has a schedule with New Zealand on 14,350 ke. W4AQ works the Byrd Expedition. W4AIM has made his application for ORS. W4T1 handles all of Selma's traffic. W4JY is working on a 250-watt High G outfit. W4AEF is experimenting in Charlotte, N. C., with W5N1R. W4JY is now Army Amateur Control Station. W4AJR is hoping quite a time with his xmitter. W4AKB is getting out better than ever. W4AQG got in on some flood work. This is an opportune time to express the need of more active stations in Southern Alabama. Can you help us?


FLORIDA — SCM, Harvey Cohn, W4AI — I want to thank the guys for the get to know you while Mr. E. M. Winter, W4HY, was acting SCM. I will appreciate all suggestions and cooperation from all the gang. W4ACC turns in a FB report this month. W4SD complains of no messages from his QSO's. W4SR-exUEA will have an 852 and MIG going at Melbourne soon. W4AEF has just accomplished WAC on both 14 and 7 mc. W4IEE keeps a schedule with mnLNIC and with KEFJ. the same. "Ripple!" en route from California to Bradenton. W4U11 keeps schedules with N3P2A and two ships. API and 2XQ0J. W4AGI says the Miami Radio Club is still looking for DX and W8APE has the Silver Anniversaries. W4AC is still looking for DX and W4KCI has his 852 xmitter about ready. W4NP has just rebuilt his receiver. W4AEF has rebuilt W4IYV is new hams in Tampa and are ready to QSO all of the gang. W4RO has left the state and will be gone about a year. W4AFD is looking for DX work with the Silver Anniversaries. W4AGD is working and will be back in Miami in a month or so. W4CT has handled some messages. W4ACK is now building all of the 1929 type receivers and will be ready in about a month. The following ORS appointments will be canceled if I do not hear from them by next report: W4MS, W4BN, W4PB, W4ID, W4AAO, W4CH, W400, W4QY, W4RK, W4IY, W4AL. Fellows, please send your reports in by the 16th, to no at 8002 South Ave., Tampa, Fla.


WEST GULF DIVISION

OKLAHOMA — Acting SCM, L. M. Edwards, W5FJ — Your Acting SCM takes the reins of office, and asks you to help your section by reporting to him. W5AMA in Tulsa is doing quite. W6AIAV is on with xtal now and surely sounds FB. W5A2G is constructing a MOPA set for better results. W5AYF is the lone reporter for Tulsa this month. W5ih has a sad case of YLitis. W5P6A had a sore foot until he attended a dance with W5FJ, and W5E6A and W68WQ are on all waves. W5LAND and W6CSR get out in fine shape. W5QDD is back as an ORS. W6FXW is doing some fine DX work on low power. W9EUH at Pueblo has been on 2500-ke. fone. The Denver Radio Club is making another trip down to Pueblo for another joint meeting with the Pueblo Club. This joint meeting seems to do a great deal in the way of keeping the interest up in the state.

Traffic: W5CA 14, W9DKM 5, W9CDN 12, W9FXW 3.

UFAH-WTO-MING — SCM, Farley N. James, W6AJ — W8ACZ has had a couple of his skeds on the air now. W6EKF is still kicking out with the 201A, and reports two new hams in Ogden. W6CNX was up at Salt Lake on the 16th and applied for ORS. W6DXM is still waiting for the parts he ordered for his new transmitter.


SOUTHEAST DIVISION

ALABAMA — SCM, S. J. Bayne, W4AAQ — W4JY reports business QR and several Fuked schedules. W4AAH has a 1920 signal. W4AHZ helped a rudderless airplane by making arrangements for its safe landing at Maxwell Field. W4AX is on again with a 50-watt, W4AJY has a YL and several fine schedules. W4AJY has built a screen grid receiver. W4M5 has a new bottle, and
and says a wonderful time was had by everybody. He also says the Doe does mean barbecue-pit. Hi.


NORTHERN TEXAS — SCM. J. H. Robinson, W5AKN — W5HY heads the list for this month. W5SW is fixed up with a MIG set now. W5HAD has QRN from school and baseball. W5BAI is on regularly Saturday nights and Sunday p.m.s. W5ATZ says that W5DO sent him a new 5-watt. W5AKN is glad to see any and all you fellows when in Dallas. W5HPB is moving again. W5AYD has a schedule with W5LY. W5ANK is leaving for Los Angeles, Calif. He will be on with a six call soon. W5ABP and W5DFP handled a few.


MARITIME DIVISION

PRINCE EDWARD ISLAND — SCM. E. W. Hyndman, VE1BZ — VE1AP has been on the air and has done some fine DX, working ZL2GO and receiving a report from Bombay, India. VE1CO is rebuilding. Traffic: VE1AP 16.

NOVA SCOTIA — SCM. A. M. Crowell, VE1QD — All the N. S. gang are urgently requested to get on our new Canadian allotment in the 3500-ke. band for Canadian work. Do your part to help the showing of activity here by having your station on the air this month. The SCM is now out of town and this report is possible by the cooperation of VE1CT, who reports much DX on 14,000 ke. and softening of his 210. VE1QD got a fine report on his home from Salem, Ore., saying "fine modulation." VE1QV is giving tone work a heavy switl. VE1AL is heard often and still away. VE1AS is doing fine work with his new man from Halifax. The gang are all sorry to hear that VE1BN is leaving us and hope to hear his call on the air again soon from another QRA if possible. Traffic: VE1BS 4, VE1AK 4, VE1A 1.

QUEBEC DIVISION

QUEBEC — SCM. Alex. Reid, VE2BE — The big event of the season will be the banquet at the Quebec Hotel, Montreal, April 13th. Mr. Menholz of the New York Times, and a technical man from headquarters will be with us, and the committee in charge expect a record breaking gathering of Second Division members and their friends. VE2BB is giving valuable aid to the Montreal and Albany air mail route by giving daily weather reports to Albany, N.Y. VE2AC has been QSO the west coast and England several times on 28 mc. Alphy is busy establishing a cross-Canada relay and VE2CG is on the air at a new location and says conditions are ideal. VE2AP is now turning his attention to VE2AR of Quebec City, who is on the go. VY2BN improves. VE2AR is our most consistent traffic station and is looking for traffic.

Traffic: VE2AC 31, VE2AP 4, VE2BB 14, VE2AI 14, VE2AM 7.

VANALTA DIVISION

ALBERTA — SCM. E. J. Taylor, VE1HA — Calgary Radio Club goes on the air soon with a pack of 250's. VE410 is the new president. This station is one of the oldest and most consistent in Alberta. VE4AF is the DX station for this report, having worked a couple of VK's and ZL's, VE4CC is the traffic star again this month. VE4GD says power leak out his set. VE4GM is going strong. VE4AG is busy designing QRO cards. VE4GX is a very consistent station. VE4GD and VE4GE have an xmitter in their place of business for visiting hams. VE4HM has his eye on the short wave bands and VE4FT is on 1218 ke. with VY3X and VE4CT on 1218 ke. with VY3X and puts out a line signal. VE2BE has arranged his summer sked with Paddy of New Zealand.

Traffic: VE2AG 31, VE2AP 8, VE2BB 16, VE2BE 10, VE2AI 14, VE2AM 7.

PRAIRIE DIVISION

MANITOBA — SCM. D. B. Sinclair, VE4FY — VE4DJ has at last satisfied his great ambition by working pyلا on the 14-mc. band. VE4GQ is missing VE4FY's laurels in the DX line. He received reports from VK, ZL and G lately, VE4DFP is using a 210 again. VE4AR is using an Ultradon circuit. VE4HC has been 7QO England. VE4ER has been experimenting with MOPA. VE4DB has plenty of leisure to pound brass. Hi. VE4FN is still our most consistent traffic station and is now using a MOPA on 7 mc. VE4DI is working on a TPTG circuit for 3.5-mc. phone. VE4HJ gets a nice steady signal from his MOPA. We are gratified to observe that VE4GQ, VE4DU and now VE4FY are threatening to come back on the air again. VE4DI is now married. He is a real old-timer, and will be a welcome addition to the gang. VE4AR and VE4BJ are on 14 mc.

Traffic: VE4FN 22, VE4GQ 10, VE4DJ 5, VE4FY 1, VE4HJ 5.

SASKATCHEWAN — SCM. W. J. Pickering, VE4FC — The traffic for the period has increased a great deal owing to more stations reporting promptly and to VE4CM who tops the list. He says he is going to try for 100 next time. VE4JR reports a new ham, VE4HW in Swift Current, who uses phone on 3000 ke. VE4HL is getting lined up to work the 28-mc. band. VE4CB is always to be heard Sunday afternoon. VE4DD says that he will be on 4000 ke. for QSO's with Canadians.


ONTARIO — SCM. E. C. Thompson, VE3FC — Central Dist.: VE3AL and VE3BC tie for traffic honors this month, both having regular schedules, the former using 3550 ke. and the latter, 7000 ke. VE3DA is using both bands. VE3BJ is on 3900 ke. VE3AY heard W5ATF. VE3BP is looking for traffic. VE3BO writes a wonderful report as usual. VE3CI is experimenting on 7000 ke. VE3AR is rebuilding again. VE3BI has the 600 watt going full blast. Southern Dist.: VE3CS has been appointed ASCM to succeed VE31A in this district. VE3DG uses 7000 ke. and 3500 ke. with good results. VE3AO is operating on 3900 ke. VE3AQ is using 14,000 and 3500 ke. VE3CB uses all three frequency bands. VE3CS is planning DX schedules on 14,000 ke.

Traffic: VE3BC 23, VE3AL 35, VE3BC 10, VE3BP 12, VE3BY 7, VE3JI 4, VE3DA 4, VE3AR 2, VE3BO 2, VE3CI 2, VE3CF 4, VE3BL 4.

LATE AND ADDITIONAL REPORTS

W4ABR almost forgot to report on account of the new reporting date. W58PS handled quite a few this month keep up the good work. OAI, K4AAN sends in his report this month via W1RP, Good work, OAI.

Conducted by A. L. Budlong

By the time this account gets into the hands of QST's readers, there will have been held at Prague, Czechoslovakia, a European radio conference very similar in its aspects to the recent North American Radio Conference held recently on this continent.

As we write this, however, the European conference is nearly a month in the future, being scheduled for April 4th to 13th. The conference, which is a sort of sequel to the Washington Conference, is intended to iron out difficulties now being experienced with radio allocations on the Continent, and to bring about a state of harmony and unified standards among the various countries represented.

Much interest is expected in short-wave allocations. I.A.R.U. Headquarters is particularly interested to note that one of the subjects on the agenda is "Amateur Radio" and is still more interested to discover that the country which is apparently championing the cause of the amateur at the Prague conference is Holland. When it is remembered that Holland for years was a country where amateur radio was strictly forbidden under any circumstances, we must admit that the authorities have made great strides and that Dutch amateurs can be justly proud of what they have accomplished through their society, the N.V.V.R., in gaining recognition for amateur transmission and reception. Well done, OM's!

Union Headquarters has obtained copies of the Dutch proposals regarding amateurs, and has given them much study. The two American representatives at the Prague conference have also conferred with us, and are thoroughly familiar with both the American and foreign amateur situations. We hope that they are able to be of assistance in obtaining for European amateurs the very best privileges possible, and that our next issue of QST will be able to announce as satisfactory an outcome for amateurs at the Prague conference as we were able to announce for our own North American conference.

Good luck, OM's.

INTERNATIONAL PREFIXES

Additions to the international prefixes are coming in steadily, and we would like to take this opportunity to thank those amateurs who see to it that we are kept continually advised of new prefixes. Information is still needed on many countries, however. Particularly we would like to hear from our section in South Africa, where they seem to have not only two prefixes, but an entirely new system of call signs. We haven't information of a definite nature on either of these, OM's. Please advise us promptly. The complete list to date is as follows:

- Argentina: US
- Austria: OT
- Australia: VK
- Belgium: ON
- Brazil: PY
- Canada: VE
- Chile: CE
- Cuba: CM
- Czechoslovakia: OK
- Dutch East Indies: UI
- Ecuador: HC
- Egypt: SH
- England: G
- Finland: OH
- France: F
- Germany: D
- Holland: PA
- Indochina: HU
- Irish Free State: EI
- Italy: I
- Japan: J
- Luxembourg: UL
- Mexico: X
- Newfoundland: VO
- New Zealand: ZL
- Northern Ireland: GI
- Norway: LA
- Panama: RX
- Peru: OA
- Poland: SP
- Portugal: CT
- Romania: CV
- Salvador: VS
- South Africa: ZS (also ZT?)
- Spain: FA
- Sweden: SM
- United States (Terr.): W
- Uruguay: CW
- U.S.S.R.: RQ

AMATEUR REGULATIONS

I.A.R.U. Headquarters wishes to request that all foreign amateurs advise us immediately their countries are issued definite amateur regulations. Many times it is of great importance and help for (Continued on page 76)
Above 11,000 kilocycles

11,000-kc band

Inductance 11,000 kc band

Below 11,000 kilocycles

Inductance below 11,000 kc band

Continued on page 82
1929

Box 643, Louann, Ark.

Editor, QST:

I want to thank you fellows for the great amount of painstaking effort you must have spent in the development of the 1929 equipment described in recent issues of QST.

There is no doubt in my mind that the unorganized efforts of amateurs, not guided by an organization as is working in Hartford, eventually would have written "Finis" to amateur radio, I know positively in my own case that the end of my activities would have arrived on January 1st, or immediately thereafter.

As it is, I have built the low-power m.o.p.a. transmitter as described in QST. With comparatively few difficulties (all of which could have been avoided had I paid closer attention to your instruction), it operated beautifully, and in at least 80% of the reports gets "crystal control."

I am using the three-tube 1929 receiver with the 222 peaked audio amplifier and can’t see how anyone can operate without some such arrangement. The only change from the QST specifications was to shield it completely in an aluminum cabinet and use the four-tube tuning arrangement, interchangeable coils and condensers. The coils, however, are still wound on tube bases for the sake of economy and I can’t believe that any efficiency has been sacrificed. Thanks again to QST. We threw away burnt out tubes for years before we know they had any value.

If phone signals are to be received it is necessary to have a separate audio amplifier from the 222 peaked arrangement. That is not news. Such an amplifier here plugs in behind the detector tube and works above criticism. Anyone doubting the efficiency of the peaked amplifier has but to make such an arrangement and listen to the same signals on each amplifier!

The climax of the whole works appears in the "monitor box." This extremely cheap and simple and amazingly useful little device will save many a ham a lot of futile explanations and vain regrets, not to mention hard work, before 1929 is over.

Made in any old way it is useful. Made with the same care you would spend on a 10-meter receiver or a well-built wavemeter, it is indispensable. It is easily calibrated and checked by use of the standard frequency transmissions of W9XL or some similar station and will perform in a way that no wavemeter will, regardless of price.

If you want to check the frequency of your transmitter, go to your monitor. It will not vary the transmitter frequency by 1 cycle because of its proximity to the transmitter or the body capacity effect of having to hold it all over the works to get some sort of an indication of resonance. Take it in the next room or next door if you like. At the same time listen to the quality of the emitted note of your transmitter. If you are still not satisfied, tune your receiver to beat with the monitor and see where you are in regard to the rest of the gang. Show me a wavemeter that will do that and I’ll shut up. If the other fellow wants his frequency, go on listening to him and tune the monitor to beat with his signal just as he signs. You lose not a word of his conversation and can give him the dope he asks for. If you are winding coils to cover a specified frequency band, why wait for WEM, WIZ or NAA. They might not be on the air. Wind your coil, plug it in the receiver and let the faithful little monitor tell you just how far up and down the coil will go.

Reverting to the transmitter: Recently, to try out the QST m.o.p.a. transmitter as a really low-powered set. I used two old brass base UV-201-A tubes. The oscillator was run at 150 volts and drew 1.5 watts. The amplifier was run at 200 volts and drew slightly over 4 watts. On the 7000-ke. band, a "9" in Missouri reported "QSA 5 xtal," a "3" in Penna. reported "R9 xtal." This was between 8 and 9 p.m. while the band was very crowded. Why should we fear 1929, or any other year, when we have "1929 type" apparatus developed for us that serves our needs so magnificently?

-D. L. Edmondson, W5ARA, W5BCR

In Appreciation

S.S., Pres., Harding

My dear Mr. Maxim:

On leaving this great country, I beg to thank you, Mr. President, and all other members of A.R.R.L.’s Headquarters, from the bottom of my heart for all your most gracious and hospitable attitude shown me in Hartford.

I enjoyed my stay in this great country immensely, which was not to the least extent due to the most cordial relations established with many Ws; amongst them I am particularly in-
Transcontinental
THE MOST EFFICIENT SHORT WAVE COIL EVER MADE!

Locked joints. Strong mechanically. Can't warp or lose its shape or loosen.

Heavy posts and vertical pillars will not shift or bend when abused.

Wire wound in slots. Small coil with large capacity. Can't slip.

Leads outside, where hold is weak, reducing losses.

Positive contact between solid prongs and side wiring bronze grommet cannot loosen.

Here is the coil you have been wishing for — low-loss, mechanically strong, small in size, and inexpensive. Skeleton construction, built up without any metal fastenings, gives 96% air dielectric with lower losses from eddy currents and hysteresis. It is solid — you can stand on it without smashing it — so it will not change when plugged in and out of the socket. The same frequency will always be at the same place on the dial. It is only 1 1/2 inches in diameter — the field is small and can be shielded. And careful construction gives every coil the same ideal shape factor, making every coil equally efficient. There are so many new and wonderful features we can't describe them all here, so mail the coupon below.

Send Today!

Transcontinental Coil, Inc.
GOTHAM ENGINEERING & SALES CO.
NATIONAL SALES REPRESENTATIVES
50 Church Street New York City

Say You Saw It in QST — It Identifies You and Helps QST
debted to William L. Rust, WSAZ of Lebanon, N. Y., and to Marshall P. Wilder, W1AWK of Cambridge, Mass., for their exceedingly kind hospitality, which enabled me to keep in close touch with my friends at home as well as to establish many pleasant QSTs with American amateurs.

Believe me, I shall not forget the wonderful time I had in this country.

Thanking you very much once more. I remain with all best wishes,

- Carl Lumma [QST]

Subdividing the Bands

Editor, QST:

From time to time, in late issues of QST, there have been various discussions as to the advisability of dividing the present forty-meter band into two sections, placing all W stations in one section and all foreign stations in another. To the best of my knowledge, this has not been seriously considered.

Why not make a division such as this? Reserve the section from 7300 kc. to 7175 kc., or a band slightly narrower, for foreign stations. Then, set the section from 7175 kc. to 7000 kc. aside for W, VE and K stations. Taking into consideration the skip distance, as it affects this particular band of frequencies, I do not believe that the interference will be as bad as it would appear after the first glance at this suggestion.

My understanding is, that the 7000-ke. band is primarily a “DX” band. Therefore, I believe most stations using it will appreciate the idea of this outline. For those who prefer traffic and rag chewing, it would seem that under these new conditions, their place is on the lower frequencies, mainly the 3500-ke. band.

Here is another fact that may forestall some argument on the above suggestion. Over a period of twelve days, between 00 and 755c. of the U.S. stations heard were operating below 7195 kc.

I hope that amateur operators will get to work and clear up a situation that is hindering both the DX man and the traffic man.

— F. R. Stevens, W7BB

Schedules Wanted

Washington, D. C.

Editor, QST:

Many of the eastern college amateur radio clubs are arranging schedules and getting together for the purpose of handling the enormous potential traffic of colleges.

National cooperation, and perhaps national organization under the auspices of the A.R.R.L., would do inestimable good to the cause of college amateur radio. We need reliable schedules with other colleges; we want to be able to handle traffic caused by inter-college matches, reliably
Convert Service Liabilities Into Profits!

OWNERS of Jewell 199 Set Analyzers are converting service liabilities into business-building assets. Since troubles are so easily located by using this remarkable instrument, radio dealers are actually promoting sales through service calls.

A courteous service man who is competent is an effective builder of sales and good will. The quick and accurate analysis of set troubles, made possible by Jewell 199 Set Analyzers, Analysis Charts, and data furnished in the "Instructions for Servicing Radio Receivers," makes it easy for any service man to get the best possible reception with any receiver with minimum effort.

You, too, can convert your service men into builders of good will and profit by equipping each of them with a Jewell 199 Set Analyzer.

It will pay you to investigate the Jewell Method of Radio Set Analysis which eliminates guesswork and quickly and accurately locates set troubles.

Mail the Coupon for this valuable Booklet!

In the Jewell Method of Set Analysis, tests are made on each stage by inserting the convenient plug in the tube socket and inserting the tube in the Jewell 199 Set Analyzer. When each stage has been tested the entire result of the test is compared with the data covering the set furnished in the Jewell booklet entitled "Instructions for Servicing Radio Receivers." Radio dealers everywhere are using this effective method of set analysis to build a bigger and more profitable business. You will find a Jewell 199 Set Analyzer for each of your service men a profitable investment.
The first practical book on radio vacuum tubes — —

Here is thorough and practical information on the most essential part of all radio apparatus—the vacuum tube. All the underlying fundamentals, every use and every function of the radio tube are discussed in this new book. It gives you full information and accurate directions for the most effective use of the vacuum tube in all types of radio receiving apparatus.

Just Out!

RADIO RECEIVING TUBES

By James A. Moyer, Director of University Extension, Massachusetts Department of Education and John F. Wostrel, Instructor in Radio Engineering and Supervisor in Charge of Industrial Subjects, Division of University Extension, Massachusetts Department of Education. 296 pages, 5½ x 8, 181 illustrations.

The major portion of the book describes two and three element vacuum tubes as used in radio reception and transmission. Additional applications include the remote control of airplanes and scavenging vessels by the use of instruments which employ vacuum tubes in essential capacities, as well as methods of applying vacuum tubes to the remote control of humidity and similar uses. Every standard type of tube is included. The book discusses the tube as used for 1. detection, 2. radio-frequency amplification, 3. audio-frequency amplification. 4. power output, 5. oscillation.

If you wish a simply written, understandable explanation of all important vacuum tube in all its phases, see this new book FREE.

Chapter Headings


See it for 10 days FREE—Order NOW

$2.50

McGraw-Hill Free Examination Coupon

McGraw-Hill Book Co., Inc.
438 Seventh Avenue
New York, N. Y.

You may send me Moyer and Wostrel's RADIO RECEIVING TUBES $2.50 postpaid. I will either return the book, paying prepaid, in 10 days, or return it at that time.

Name__________________________________________

St. & No.________________________________________

City_____________________________________________

State____________________________________________

Name of Employer_______________________________

Official Position_______________________________

(Books sent on approval in the U. S. and Canada only)

Q.S.T. 8-29

and directly with the other college: and to do this, we must know what other colleges have radio stations.

Please then, student amateurs, let's hear from you here in Washington.

— Albert W. Small, W3JS-W3AYV.

Chief Operator, George Washington Univ.

Radio Club.

Phone

232 Lamar St., Selma, Ala.

Editor, QST:

Maybe the readers, the editors, and even the printers get tired of reading about all our troubles, but we have so many that we have to unload somewhere—hence the letter.

I am one of the hundred or more fellows who are trying to do a little phone work within the fifty kilocycles given us. We have plenty of squawks and squeals, even without the help of any rough r.f.e. c.w. sigs up in the phone band. I do some c.w. work also but I do drop down below the phone band when I am operating ye olde key.

Now, fellows, I know that the 85-meter phone band is also open to c.w., but why not give the phone stations that little fifty kilocycles unmolesed?

What do you c.w. fellows say?

— L. E. Lee, Jr., W4LA ex-W4API, 5LU

Service Rendered

215 West Wayne Ave., Wayne, Penna.

Editor, QST:

Last month I received a radiogram from station W9SH at Rantoul, Ill., apprising me of the safety of my nephew, Arnold H. Clark of Greenfield, Mass., who is with the Byrd Antarctic Expedition. The last letter I had from Clark was dated October 7th, so you can easily see how welcome this news from station W9SH was to me. I feel that the amateur who gives his own time and money to these experiments should be encouraged and backed by the governments as they have, and are still doing a wonderful work. I certainly wish to express my gratitude to the American Radio Relay League.

— Mrs. H. W. Bryan

More About Phone

Spencer, Iowa

Editor, QST:

I have never been really interested in amateur work until the last month. Although I have taken QST for several years, I recently got a short-wave set, and have listened quite a little to the amateur phone stations on the 100-meter band. What I hear rather discourages me from attempting to start up a transmitter. With only two or three exceptions, all the phone stations I have heard have sounded wretched, to say the least. Their modulation is terrible. And if
Your Amateur Receiver!

Does it produce the new requirements?

Does it meet the maximum signal strength?

Does it hold wide spread consistency, calibration?

Does it operate tuning over each band?

A GOOD amateur band receiver must have these qualifications. Does yours? If not you are probably trying to get by with your old 1928 set. It can't be done. You must modernize and keep in step with progress.

The simplest way to meet these specifications is to use the correctly designed coil and condenser combination. The Radio Engineering Laboratories, exclusive short wave designers and manufacturers for the past five years are offering their Cat. No. 182 amateur band plug-in coil kit and their Cat. No. 187-E combined tank and vernier tuning condenser as a solution to every amateur's receiver problem.

An old 1928 set, it can't be done. You must modernize and keep step with progress. If you don't want to build a new receiver, take your old set and revamp it with the REL coil and condenser combination. The results speak for themselves. Ask the OR that uses them.

This is especially good news to the amateurs regularly engaged in traffic handling because they above all require selectivity.

Here's the REL Cat. No. 187-E combined tank and vernier tuning condenser. There is no other condenser which affords to the amateur the features combined in this REL unit. Heavy end supports - insulated stand-off bushings — single bearing control rotor shaft — new patented noiseless rotor contact — heavy brass condenser plates — panel mounting space 4 1/8 x 4 1/4 — 3/16" condenser shaft fits any standard knob or dial.

Cat. No. 187-E combined tank and vernier condenser is specially designed to tune modern high frequency receiver circuits. The large semi-variable tank condenser is controlled by means of the rear bakelite disc. This disc may be notched at desired points. The notches will then coincide with the spring ratchet locking device, in this manner it is easy to always return this tank condenser to the same setting. The small vernier single plate condenser is used to obtain full spread tuning over any desired band. Full information on how to calibrate the tank condenser is supplied with each unit.

The Cat. No. 187-E condenser has the following electrical specifications. Maximum capacity of tank condenser 115 mmd, — maximum capacity of single plate vernier condenser when single plate is spaced 1-1/4" 30 mmd. Price $6.25.

If your dealer does not stock these REL items, order direct.

This shows one coil and the coil base which are part of the regular REL Cat. No. 182 amateur band plug-in coil kit combination. These new REL plug-in coils are radically different from other short wave inductors. The coil itself is a one piece bakelite mould with 6 threaded flats. The heavy enamel copper wire is securely held in these threads assuring permanency at all times. The leads for each coil winding are securely soldered to the coil plugs. These plugs fit snugly into the coil base prongs. The total contact area is 3/8 square inches. The moulded coil base holds the 6 spring contacts. The base is so arranged that the coil will only fit in one position.

3 plug-in coils and one base constitute a Cat. No. 182 coil kit. The coils are designed to cover the 14000, 7000 and 3500 KC bands. Each coil form is wound with three separate windings which can be used for primary, secondary and tickler or any other combination to adapt itself to the circuit employed. — Price $10.00

RADIO ENGINEERING LABS., 100 Wilbur Ave., Long Island City, N. Y.
A Remarkably Small, Light and Efficient Combination for A.C. Current Measurements

0.2 to 200 Amperes

These two instruments constitute a miniature testing set for a wide range of current measurements. Exquisitely made and unusually sensitive — fully in keeping with highest Weston standards. Handsomely encased in mottled red and black bakelite.

These instruments will be found especially useful in electrical repair shops, research and industrial laboratories, educational institutions and particularly in radio and electrical manufacturing plants and commercial service organizations where relatively high current values must be determined with a reasonable degree of accuracy.

Summary of Transformer Characteristics

Ranges: self-contained — 2, 5, 10, 20 amperes; inserted primary — 50, 100, 200 amperes. Secondary, one ampere. Secondary burden, 2 volts, 1 ampere maximum. Accuracy, 1% from 25 to 150 cycles. Weight, 2 1/2 lbs. Self-contained ranges are changed by means of a unique range-changing switch — fool-proof, positive and easy of operation.

WESTON ELECTRICAL INSTRUMENT CORPORATION
602 Frelinghuysen Avenue Newark, N. J.

A QSL Suggestion

Editor, QST:

Being a student, I have little time for operating. In spite of this, I am able to experiment a little, make a few good friends, meet a few interesting people, swap a few ideas, get a few inconsequential weather reports, and handle a reasonable amount of traffic. In order to do this, I must be on the air at all times available to radio. I am sure there are hundreds in the same boat. If I were to QSL, as has been suggested, every station that I work, it would take about eight hours a month out of my operating time, and about $36 per year out of my pocketbook.

Now to the rich this may not seem very much, but to me, as it is to many others, it is the price of a good rectifier, or the means to that crystal and its accessories, or to that better frequency meter, or to that new monitor, or a hundred and one other things that go to make a better station.

Now if these fellows are really in earnest about this card business, I would like to suggest a little scheme which I don’t think is entirely original, but which would put the load where it ought to be. Get these double government post cards, and have one side printed for the one who is to receive it, and the other side printed for the dated and signed report and return acknowledgment.

As it is usually the answering station who wants the card worst, let him send the card unless some other arrangement is definitely made over the air.

This would save a lot of ill feeling, and, especially in the case of foreigners, would even up the load wonderfully.

— Howard T. Chasman, W9DNS

Rarity


Editor, QST:

May I take this opportunity of thanking you for your prompt attention to the QSL cards I have sent you from time to time.

— George A. Heald, Jr.
Once again Thordarson steps into the foreground, this time with three new audio transformers of unrivaled performance—fitting companions for the Famous R-300.

The R-100 is a quality replacement audio transformer for use by the service man in improving and repairing old receivers with obsolete or burned out audio transformers. The universal mounting bracket of this replacement unit permits mounting on either side or end, and is slotted in such a way as to fit the mounting holes of the old audio unit without extra drilling. List price $2.25.

The R-260 introduces a new standard of performance for small audio transformers. Wound on a core of Thordarson “DX-Metal” this audio unit is capable of reproducing plenty of “lows.” It is entirely devoid of resonant peaks and performs with unusual brilliance over the entire audible band. List price $5.00.

The R-300 needs no introduction to the discriminating set builder. It is commonly recognized by set manufacturers and individuals alike as the peer of audio coupling transformers, regardless of price. The high frequency cut-off at 8,000 cycles confines the amplification to useful frequencies only. List price $8.00.

The R-400 is the first and only audio transformer built expressly for use with A. C. tubes. It is similar to the R-300 type in appearance and performance but possesses a better inductance characteristic when working under high primary current conditions such as are encountered in coupling the first and second stages of audio amplifiers using 226 or 227 type tubes in the first stage. List price $9.00.

For Sale at Good Parts Dealers Everywhere

THORDARSON ELECTRIC
MANUFACTURING CO.
Transformer Specialists Since 1895
HURON, KINGSBURY and LARRABEE STREETS

Thordarson Radio Transformers
Supreme in Musical Performance
The nature of my experiments demands the particulars of stations received during my test periods, and I have been fortunate enough to receive a reply from practically every American station reported upon. These replies have been of inestimable value, and have enabled me to carry out a number of successful tests.

Am I indebted to you for postal fees? If so, I shall be pleased to know to what extent, so that I can clear the amount.

—Frederic C. Rand, G2AHC

This Chopper Racket
5209 Vernon Ave., St. Louis, Mo.

Editor, QST:
I have just been boiling over lately, regarding this other bustling, buzzing, QRMing, chopper brand of e.w. that we hear on our 40-meter band during the early evening hours. I am temporarily off the air rebuilding my transmitter for an 829 with 50's for rectifiers. For a receiver, I am using the four-tube 1929 a in QST. It is the berries, but this i.e.w. jams up the works. Last night at about 8 p.m., I couldn't copy more than one signal out of twenty because of 5th, 5th, 4th, and 9th district i.e.w. All signals were audible all over the house. To it has been impossible lately to hear anything less than an R7 signal here with the new receiver. Every U.S. district is readable all over the room. Now it isn't the low-power amateurs that need a little help in getting through the evening QRM that use the chopper. They are the high- and medium-high-powered fellows that get through anyway and want a QSO every time they call. Is this the A.R.R.L. spirit?

This letter is written to register a healthy kick against i.e.w. on 40. If I knew T 0 MI's QRA, I would write him, too, for I pity his cat if he gets in the way.

—Chester B. Franz, W8GEK

The Off-Band Birds
Box 615, Vandergrift, Pa.

Editor, QST:
This is another crack at the fellows outside the amateur bands. I have a 1929 receiver as built from good ideas in QST. Also, it's calibrated thanks to W9XL and others. Often I have been pleased to attempt to bring some of the off-wave fellows back into the fold. I have called many of them, asking to hold down the key and QSY up slowly until I get them up within the band. They appreciate it and so do I.

But there are many of them who don't give a damn, and I can't understand why. The other day I got Q8A5 from one who has been in the game for four years. I asked him to QSY up as he was on 40 S. Guess he thought I was talking about 40 hommes & S cheveux for he says "thanks for the info, OM, CUL 78--- --- --- --- --- --- CQ CQ CQ. 15 minutes later, I heard him CQing at the same place. Perhaps I'll talk to him again some time when he learns my lingo. Hi.
The NEW Crosley
7-tube GEMBOX
A-C ELECTRIC

Redesigned and improved without increasing the price

Last year the radio industry acclaimed the Crosley GEMBOX. At $65 it was the world's greatest value. Sales showed its popularity and its customer-getting ability.

Now, even this great value is enhanced. New features are added. Proven elements are retained. The price remains $65 — incredible — astounding — unmatchable.

Now full Neutrodyne circuit especially designed in the Hazeltine laboratories for this set.

A new chassis layout — efficient — rugged — with switch on front of receiver.

A new volume control of exceptional smoothness. 3 tuning condensers and regeneration in the detector tube eliminated.

With these new features are retained the modern illuminated dial, the self-contained power supply equipped with the famous Mershon self-healing condenser and the high voltage power output tube in the last audio stage.

A neutrodyne-all-electric-self-contained-power speaker operating radio of unusual sensitivity and selectivity.

$65 WITHOUT TUBES

The Crosley Dynamic DYNACONE

The Dynacon is the armature type dynamic speaker — a developed principle by Crosley that eliminates the resonant peaks of most dynamic speakers and reproduces every tone in true relation to every other.

The Dynacon is the fastest selling speaker on the market. It gives natural reproduction in satisfactory value for $25, and ears that judge keenly consider no fancier priced equivalents.

Listen to it. Compare it with any speaker on the market. Tell if you can a $10, $15, or $40 difference. Laboratory curves don't show them. Ears cannot hear them. $25.

The Crosley Radio Corporation
Dept. 18, Cincinnati, Ohio
Powel Crosley, Jr., President
Owners of WFLW — The Nation's Station

CROSLEY RADIO

Say You Saw It in QST — It Identifies You and Helps QST
Interference Problem

R. F. D. 1, Tonawanda, N. Y.

Editor, QST:

I have noticed in a number of letters printed in the Correspondence Dept. of QST in which it is said that not much more QRM is found in the new bands than before the change. The majority of stations I've worked since January 1st on the 7000 - to 3500-kc. band have mentioned the interference and it has been my experience that there is a great deal of it. In fact it is hardly possible to hold a conversation with another amateur station for any length of time. Of course, there is a great deal of improvement in the type of signal now as compared to the 1928 and earlier signals but there is still a great deal of room for improvement.

I've heard any number of stations that sounded as if they were using raw a.c. for plate supply. They covered such a broad band that it was impossible to work in the wide area in which they were located. And these broadly tuned stations were using either 25- or 60-cycle a.c.

We are using low power with storage battery plate supply, here, and get good reports as a rule. However, we have difficulty in raising fellows. This seems to me to be an indication that Mr. Average Amateur can't copy a good note if he hears one, or prefers to listen to a note many kc. wide rather than tune you in. It almost seems necessary, then, to modulate the note. This appears to work out because those stations with 210- or 500-cycle always get a reply and with low power, too. Of all the stations I've heard, not more than 15% or at the most, 20%, approached anything near a d.c.e.w. note. It seems that "hams" have to have a signal that is QSA4 and r.a.c. or their reply is usually "sorri OM but nd hr -- pse rpt" or "nd OM sorri --- hope eu agn 73 -- QSU." This all sounds as if I'm a pessimist or "calumny Jane." This is far from the truth. It is my purpose first to state things as I see them, then suggest a remedy or two and ask the gang what it thinks.

Supposing the country is divided into several sections according to the ham population, and that each section is assigned a very definite portion of each band and is requested to operate in it. I believe this could and should be done for this reason: If you desire to work a certain area or district, it would only be necessary to tune your receiver to the frequency band assigned to that district and find a station to work with. While the stations in one district might all be grouped together in the band, this would be a great thing because those stations in your own section wouldn't QRM you simply because you would be listening to another part of the band.

Another suggestion that I would offer is, that beginners, those who for the first time have re-

— W. D. Myers, W8DGW
A Well-Balanced Line!

Uncle Sam's fleet is not composed solely of ships of the line. You will find Dreadnaughts, Scout Cruisers, Destroyers and Submarines—each ship with a definite task to perform and each built so as best to fulfill its mission.

Cardwell condensers play their part in maintaining communication between the ships and with their base and scouting planes.

Variable condensers of many types are necessary. Transmitting and receiving—large and small—and the Cardwell line meets every requirement.

Your needs may not be as diversified as those of the Navy, but somewhere in the Cardwell line is a condenser for you.

Transmitting condensers for powers to 50 k.w. Receiving condensers in all standard capacities. Fixed (Airdielectric) transmitting condensers. Send for literature.

Cardwell Condensers
The Standard of Comparison

31 Prospect St. Brooklyn, N.Y.
If your dealer does not stock, order direct.
A new Defense system previously mentioned. Amateurs associated with the Defence network will be allowed the use of the 3500-kc. band. It is hoped that eventually it will be opened to all amateurs, but they will have to prove their right to operate there before the government takes any such steps. As a result, there is much talk in amateur circles at the moment stimulating interest in 3500-ke. operation.

Go to it, Aussies! Here in the States we consider that 3500-ke. band our most valuable national relaying band, and we know that you will become just as devoted to it after a little work there.

BRAZIL

At this writing, the government of Brazil has not yet ratified the International Radio Treaty. As a result, Brazilian amateurs do not feel themselves bound to observe the Washington allocations, and we are advised through PY2AK that received their operator and station licenses, be assigned to the long-wave band (150-175 m.) say for six months, during which time they would become sufficiently familiar with operating to enable them to handle their station on the traffic and DX bands in such a manner that would be a credit to themselves—and not a source of anguish to others.

I would like to hear what others think about all this.  

— Francis N. King (KG) and George Kovell (GK), WSATM

I.A.R.U. News

(Continued from page 62)

us to have such information on file. At present, we have definite information only for the United States, Canada, England, Denmark and Australia. We want to hear from other countries; if your governments have issued regulations, please send us copies and full details; if regulations are being contemplated, we would like to know as much as possible just what is being considered.

Send all information to the Secretary, International Amateur Radio Union, 171F Park St., Hartford, Conn., U. S. A., whether or not your country is a member of the Union.

AUSTRALIA

As related last month, a great step was taken forward in amateur circles in Australia the first of this year when there was effected a merger between the Wireless Institute of Australia (the national section of the I.A.R.U.), and the Australian Radio Transmitters’ League. Already the benefits of a unified effort are becoming apparent.

Perhaps the most recent development in Australia is a marked revival of interest in the 3500-ke. band. Australian amateurs have neglected to use this band in the past, and as a result suffered almost the same fate as their English cousins and were virtually prohibited from using this territory when the new 1929 regulations were issued. Fortunately, a way out is found in the new Defence system previously mentioned. Amateurs associated with the Defence network will be allowed the use of the 3500-ke. band. It is hoped that eventually it will be opened to all amateurs, but they will have to prove their right to operate there before the government takes any such steps. As a result, there is much talk in amateur circles at the moment stimulating interest in 3500-ke. operation.

Go to it, Aussies! Here in the States we consider that 3500-ke. band our most valuable national relaying band, and we know that you will become just as devoted to it after a little work there.
"Here at last is The Book that we of the Radio profession have needed for a long time. It is the best and most complete handbook ever published" says J. H. Bloomenthal, Chief Radio Operator, U. S. S. B. Steamship "East Side".

THE RADIO MANUAL

By G. E. STERLING, Radio Inspector and Examining Officer, Radio Division, U. S. Dept. of Commerce.

Edited by ROBERT S. KRUSE, for five years Technical Editor of QST.

Here's the answer to every question about the principles, methods, or apparatus of radio transmitting and receiving. A complete course in radio operation in a single volume. A handbook for students, amateurs, operators, inspectors. For the first time an entire course of training in one book - the most complete and up-to-date work on radio. Developed simply and clearly from the elementary stage right through all phases of principles, practice, and apparatus so that a beginner with no knowledge of electricity may get all he needs either for amateur operation or to qualify for a government license as operator or inspector.

Complete Handbook of Principles, Methods, Apparatus for Students, Amateur and Commercial Operators, Inspectors

1. Elementary Electricity and Magnetism
2. Motors and Generators
3. Storage Batteries and Charging Circuits
4. Theory and Application of the Vacuum Tube
5. Fundamental Circuits Employed in Vacuum Tube Transmitters
6. Modulating Systems Employed in Radio Broadcasting
7. WAVEMETERS, PIEZO-ELECTRIC OSCILLATORS, WAVE TRAPS AND FIELD STRENGTH MEASURING APPARATUS
8. MARINE VACUUM TUBE TRANSMITTERS including detailed description of Model ET-3626
9. Radio Broadcasting Equipment including, for the first time in any text book, the complete equipment of Western Electric 5 Kilowatt broadcasting Transmitter used in over 15% of American broadcasting stations
10. Arc Transmitters including description of Federal Marine 2 Kilowatt Transmitter Type AM 415; also models "K" and "O"
11. Spark Transmitters including description of Navy Standard 3 Kilowatt Transmitter
12. Commercial Radio Receivers and Associated Apparatus including, for first time in any text book description and circuit diagram of Western Electric Superhetodyne Receiver Type 6004C
13. Marine and Aircraft Radio Beacons and Direction Finders
14. The Development of Amateur Short Wave Apparatus. Complete details of construction, operation and licenses
15. Radio Laws and Regulations of the U. S. and International Radio Telegraph Convention, Quotations of all Important Sections
16. Handling and Abstracting Traffic

Examine It Free

Never before has so complete a treatise of radio theory and operation been compressed into a single volume. Here is information that otherwise you could secure only by consulting many different books. And every detail is vouched for by authorities of the first rank. The Manual is profusely illustrated with photographs and diagrams. There are 700 pages, bound in flexible fabric that is extremely durable. The immediate demand for so valuable a handbook has already nearly exhausted the fourth large edition. To be sure of receiving your copy without delay, order at once. The volume will be sent for free examination. Pay or return in 10 days.

Order On This Coupon

D. VAN NOSTRAND CO. INC.,
8 Warren St., New York City

Send me THE RADIO MANUAL for examination. Within ten days after receipt I will either return the volume or send you $6.00 — The price in full.

Name.................................................. qst-24
St. and Number.................................
City and State.................................

Say You Saw It in QST — It Identifies You and Helps QST
National Rectobulb
Type R-3

ARLELABLE and efficient rectifier tube — low impedance due to mercury vapor — long life due to low temperature filament and oxide coated cathode of large area — of sturdy design which defies the rough handling incident to shipping them.

Normal Rating... 250 Mills
Normal Plate Volts... 3000
Filament Amps... 1.7
Filament Volts... 10

Of equal utility for amateur and small broadcast stations — also for power amplifiers or all types — fitted with a plate connection at top and UX base at bottom — full operating instructions with each tube.

Sent postpaid if cash with order — Safe delivery anywhere in U.S.A. GUARANTEED

Price, $10 each
We repair 203A tubes... $19.00
204 tubes... $50.00
204A tubes... $75.00
WE 211 tubes... $16.50

ALL REPAIRS FULLY GUARANTEED

National Radio Tube Co.
3429 18th Street
San Francisco, Calif.

THE HEAVY DUTY GIANT!

POWER RHEOSTAT

Centralab offers a variable resistance that is capable of handling the greatest power loads under all conditions and is extremely small in size. This unit is constructed completely of metal and asbestos — no wire to warp or burn out under heavy duty use.

The resistance wire is wound on an asbestos insulated metal core and presents a large area for heat radiation. It will carry a continuous current load through the unit of 75 watts at 175 degrees Fahrenheit.

The mechanical construction is simple but very sturdy, making it an ideal unit for manufacturers. The contact is positive smooth to the touch and noiseless. This unit is particularly adaptable to primary control of power transformers for A.C. sets or "A" type power supplies to maintain the light socket voltage at a constant average and the secondary output well within rated limits.

The current carrying capacity is so great that it can be used in any radio power circuit without danger of burning out — at the fusion point of the wire is the only limit of capacity.

Made with two and three terminals in resistances from 25 to 5000 ohms. May be had in the 2000 and 8000 ohm size with a fourth terminal for "H" eliminator control.

Priced very low. Write or write specifications for your needs. Quotations and samples gladly furnished.

CENTRAL RADIO LABORATORIES
18 Keele Avenue
Milwaukee, Wisconsin

anyone wishing to QSO Brazilian amateurs will find them on the same old wavelengths, which we presume are those in the vicinity of 35 to 35 meters.

DENMARK

By Helmer Petersen, OZ7S

Conditions in Denmark were generally about the same as in February of last year, i.e., very different from day to day. Some days were excellent, and many DX stations came in with very good strength, while on other days the air was practically dead.

7 mc. is not at all good at present. During the day a few stations may be heard and generally with very low QSD; at night there is but little improvement. Southern Europe, western Asia, northern Africa and Ireland are almost the only localities heard. OZ7S reports his best DX during February on this band: NX1XL (Greenland) QRM 42.5; tone RAC; QTU 1921 GMT.

14 mc. is absolutely the best band at present. Almost all countries may be heard; only W stations are weak, although they were heard with very good strength during the end of January. Best working hours seem to be about 10 to 15 GMT.

28 mc. has not had much progress during February in this country. Only OZ7T has been heard by BRS152 (British receiving station) QSA5, and other hams report having heard some French stations, but no W stations. However, we hope to be able to give a better report next month.

BRITISH NOTES

By J. Claricotts, G6CL

On the 7-mc. band considerable activity occurred during February. Local European stations have again been fairly consistent during daylight, while after dark, many distant Europeans were received. It was noted that Portuguese stations which are normally regularly heard at this time of the year were almost inaudible, most evenings. Signals from North American stations were generally very strong and made the reception of all but loud European signals very difficult. This condition seems unavoidable with the present restricted wavebands. It is again noted that very few low power British stations effected DX contacts at night on this wave. If conditions follow the same phase as in 1928, the low power stations may hope for success between 0300 and 0800 GMT, during March. Attention is again drawn to the amateurs who send very long CQ calls before signing with their station call. Many British stations lose patience waiting for them to finish.

On the 14-mc. band considerable activity has prevailed, especially during weekends. Most of the European countries could be worked during daylight with inputs under 10 watts, while occasionally communications with other continents was possible. Several of our 10-watt stations succeeded in working all continents on this wave. Fading has been very pronounced on many occasions, and has rather spoilt several interesting
$4 Bradleystat No. E-210. Special $1.60

THORDARSON TRANSFORMER
Listed at $2.00
While they last, only $2.95

ACME TRANSFORMER
Listed at $5.60. The universal transformer for Super Hot. 30 K. C. Limited quantity at $1.10.

Television Lamp
The large K. H. lamp 4½ inches high — contains 1½-inch plate — carrying 5 to 50 M. A. Special... $5.50

ANNOUNCEMENT
LEEDS RADIO LABORATORIES!
Under the supervision of the famous Short Wave Specialist, Mr. Jerome Gross, we have installed a new department. We are equipped to design, construct and advise on any material for the "Ham," Broadcasting Station, or laboratory. Write to Mr. Gross, who can help you with your problems.

THORDARSON TRANSFORMER
Listed at $2.00
While they last, only $2.95

ACME TRANSFORMER
Listed at $5.60. The universal transformer for Super Hot. 30 K. C. Limited quantity at $1.10.

Television Lamp
The large K. H. lamp 4½ inches high — contains 1½-inch plate — carrying 5 to 50 M. A. Special... $5.50

ANNOUNCEMENT
LEEDS RADIO LABORATORIES!
Under the supervision of the famous Short Wave Specialist, Mr. Jerome Gross, we have installed a new department. We are equipped to design, construct and advise on any material for the "Ham," Broadcasting Station, or laboratory. Write to Mr. Gross, who can help you with your problems.

Everything in Cardwell
Acme
Thordarson
Jewell
Flechtheim
Signal
Bradley
Tobe

We carry the largest stock of GENERAL RADIO PARTS in the country

Type 558-P Amateur-Band Wavemeter
The increased congestion and decrease in width of the amateur bands make necessary the use of a more accurate wavemeter than has heretofore been available to amateurs at a low price. To meet this need the General Radio Company has developed a hand-type wavemeter which employs a system used in broadcast station frequency meters in order to secure great refinement over a limited band. Two coils are used, covering the following amateur bands:

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5.6 to 5.8 Meters</td>
</tr>
<tr>
<td>B</td>
<td>8.4 to 10.9 Meters</td>
</tr>
<tr>
<td>C</td>
<td>16.5 to 21.5 Meters</td>
</tr>
<tr>
<td>D</td>
<td>21.0 to 31.0 Meters</td>
</tr>
<tr>
<td>E</td>
<td>31.0 to 55.0 Meters</td>
</tr>
</tbody>
</table>

Type 558-P Amateur-Band Wavemeter... $18.00

ANNOUNCEMENT
LEEDS RADIO LABORATORIES!
Under the supervision of the famous Short Wave Specialist, Mr. Jerome Gross, we have installed a new department. We are equipped to design, construct and advise on any material for the "Ham," Broadcasting Station, or laboratory. Write to Mr. Gross, who can help you with your problems.
A regular encyclopedia of wire-wound resistor knowledge, this —
new sizes, new mountings, special units, bracket specifications and
drawings.

In fact, complete engineering data with simplified charts for working out your own requirements are within its covers.

Every electrical and radio manufacturer should have Catalog No. 429. Send for it today.

HARDWICK, HINDLE INC.
SALES DEPT. FACTORY
122 Greenwich 215 Emmet St.
St., New York Newark, N. J.

RESISTORS

MORE POWER PER STAGE
Sharper Tuning and No Oscillation Difficulties

Radio Science proves neutralization the only satisfactory method of controlling oscillation in tuned radio frequency circuits, thus increasing actual power per stage of amplification from 30'to 300'.

MODEL "N" VARIODENSER

Apply the Neutralizing principle to your set by the simple installation of X-I. Variodensers.
The result is an amazing increase in the efficiency and power of the receiver.
Model "A" has Variable capacity, adjustable from 1.4 to 30 micro-micro farads. Price each $1.00.
Model "G" with grid clips made in three variable capacity ranges. Price each, $1.50.
New Bakelite Insulated X-I Push-Pull the most perfect binding post made. Plain or all standard markings. Price each 15 cents.

Write for free book of circuit diagrams showing use of X-I. Units.

X-I. RADIO LABORATORIES
Dept. D
1224 Belmont Avenue, Chicago, Ill.
O\text{NLY} two months old is the \text{S-M} dynamic speaker yet already it has taken its proud place among \text{S-M} audio products—the acknowledged aristocrats of tone quality. \ldots \text{"Sweetness"} is taking on a new meaning for owners of \text{S-M} speakers. All the mellow flow of the \text{"lows,"} as well as the brilliance of the \text{"highs,"} come out smoothly on an \text{S-M} dynamic—with a surprising absence of all rumbles, roars and rattles. \ldots As always, there are underlying engineering reasons. Sound design in the speaker head is coordinated with similar mathematical correctness in the built-in \text{S-M} 229 output transformer, which has various taps to insure proper impedance matching for 171A, 210, 245, or 250 type tubes, singly or in push-pull. \ldots The 110-volt d.c. type (881), at $29.10 net, is ideal where the field winding is to be connected as a choke in a power circuit. \ldots The a.c. type (850), at $35.10 net, operates on 60 to 60 cycles, 105 to 120 volts. Thorough rectification of field current, with a 280 tube and a 2-mfd. filter condenser, reduces hum to the point of defying detection. \ldots Either type fits an 8\frac{1}{2}" baffle hole. \ldots Try an 850 or an 851 unit in the next set you build—and the \text{S-M} speaker will become your speaker.

\section*{S\text{-}M Audio Transformers—Supreme in Performance}

\text{S-M} Clough-system audio transformers have accomplished—just as we predicted last June—a revolution in tone fidelity. Adopted at once by those familiar with earlier \text{S-M} triumphs in standard transformer design, these new-type transformers have since received the practical endorsement of repeated and continuous use by the foremost custom-builders in America. Now that they are available in a complete line for interstage, output, and push-pull circuits, their consistent use throughout every kind of amplifier is the surest means of enhancing a builder's reputation for tone quality.

\text{255 and 256 Audio Transformers, for standard use in first and second stage respectively, Each} \ldots \$5.60 net

\text{225 and 226, similar to the 255 and 256, but larger and slightly more perfect in frequency characteristic. Each} \ldots \$5.40 net

\text{247 Push-Pull Input Transformer; effective transformation ratio 1-8\frac{1}{2}; frequency characteristic flat from 45 to 8,000 cycles when operating out of one 201A, 112A, 226, or 227 tube, into two 201A, 112A, 226, 227, 171A, 210, 245, or 250 tubes. Each} \ldots \$4.20 net

\text{S-M Plug-In Coils and Coil Forms}

Accuracy, handiness, and dependability are found to a most satisfying degree in the new \text{S-M} plug-in coils, fitting any 5-prong tube socket. Plug-in coils with 39 different windings are accurately described in the \text{S-M} Catalog—besides unwound bakelite coil forms—such as 131P with smooth surface and 131T cut with 98 threads—either type 39c net.

\text{Ask about our Authorized Service Station Appointment!}

\text{Silver-Marshall Inc., 6409 W. 65th St., Chicago, U. S. A.}

Send your new 1929 Summer Catalog, describing \text{S-M} Speakers, transformers, and other new products; also sample copy of the Radiobuilder.

\begin{tabular}{|l|}
\hline
\text{Name} \hfill \\
\hline
\text{Address} \hfill \\
\hline
\end{tabular}
DODGE RADIO SHORTKUT
KILLS HESITATION—PRODUCES RESULTS
Here have raised receiving speed from 15 to 25 in three and a half hours—16 to 25 in five hours—90 to 15 in one hour—4 to 12 in four hours, etc., etc. Beginners master code and quality in few days.

REPORTS FROM 500 USERS
Sending complete story and who with each order, for with Holt—Diller coupon at 30c each. specimen reports on request—sufficient to justify this cut.

W2ATK reports: “Surprised self by getting code pat in few hours and soon had license. Now read at 35 easy. If asked would tell any ORS to ‘grab’ your Short-kut.” W4YF reports: “Method looked NG to me but by using it raised reading speed from 15 to 30 per in 3 hours. Hope you get Shortkut into the den of every Harm.” W2AAD reports: “Long stuck at 5 per and discouraged. Four hours with Shortkut raised to 12 and license.”

DODGE HIGH SPEED METHOD
(Intensive Speed Practice)
Most efficient code learning booster known for 25 per Ham. Per speed raised from 25 to 75 in 75 minutes practice time. Full details in reports.

W2AHM reports: By five practice sessions 15 minutes each raised speed from 25 to 39 per actual count.

DODGE MORSE SHORTKUT
Most efficient code learning booster known for 25 per Ham. Per speed raised from 25 to 75 in 75 minutes practice time. Full details in reports.

W4CBK reports: Also tried your easy Morse method and can now copy at 20 per. Best previous effort about 8 and much confusion with conventional. That trouble entirely disappeared after memorizing Morse your way.

Radio Shortcut $3.00, High Speed or Morse $2.50, Money Order, Name, Address, Foreign and Fifty Cents.

C. K. DODGE
Box 100
Manaroneck, New York

MICROPHONES
2-Button Type

For Public Address, etc., list. ................................ $25
Standard Broadcast Model. List ......................... $75

Also Desk and Floor Stands, Covers, Cases, etc., Miniature Microphones, Paper Work, Radiator Ornament, Die Cast, Bronze finish available on receipt of $1.00.

EXPERT MICROPHONE REPAIRS


Wire Your Home for Radio
For every radio need, in brushed brass or Bakelite. Fit standard electrical switch or outlet box. Single plates in many in many combinations.

No. 136—For Load Speaker ................................ $1.00
No. 138—For Load Speaker ................................ $1.00
No. 139—For Aerial and Ground ....................... 1.00
No. 137—For Battery Connections ..................... 2.50
No. 138—For A, C, Connections ......................... 1.00

(Bakelite, 25c additional per plate)

SAY YOU SAW IT IN QST—It Identifies You and Helps QST

SWEDISH NOTES

By Osborn Duner, Secretary S.S.A.

The Swedish amateur society, the S.S.A., was founded in 1925, and its progress during the past four years has been splendid. At present about 140 Swedish amateurs are members, of which 100 are the owners of transmitters.

Beginning with 1929, Sweden has been divided into seven districts, each comprising the territory covered by two degrees of latitude; the first district comprises lat. 69 degrees N. to 67 degrees N., and so on to the 7th district, 37°—35 degrees. The new calls are the same as the old ones, but the figure of a district is inserted after SM, i.e., SM2ZZ.

The system of districts and new calls has been sanctioned by the telegraph administration, and were proposed by the S.S.A. In accordance with the Washington convention, the Swedish telegraph administration will probably prescribe an ability to send and receive at least ten words per minute before issuing a transmitting license. No restrictions beyond those of the convention are planned. (FB!)

QSL cards to Swedish amateurs should be sent to the headquarters of the society, S.S.A., qsl Section, Stockholm 8, Sweden.

At present the Board of the S.S.A. consists of the following five officers: President, Dr. Bruno Rolf; vice president, Goran Kruse, SM5TN; secretary Osborn Duner, SM5ST; treasurer, Emil Barksten, SM5V1, and technical secretary Evert Aulin, SM5UI.

Only a few of the Swedish amateurs are working DX with a power over 100 watts. The rest prefer to QSO with QRP transmitters on the 7-me. band. During the dark season a few have made successful tests on 3500 kc. and it would be very fine if more European hams would use this excellent winter traffic band. A few have had fine DX results on 14 me, and interest in 28 me, is growing, several SM's having transmitters and receivers for this territory.

Every Sunday a radio bulletin is transmitted from the headquarters of the S.S.A. at 1400 GMT under the call SM9NSA—the general call to the members of the S.S.A.—on the 7-me. band. The bulletin contains traffic news and other news of interest, and is repeated at low speed. In addition to our own official magazine, QHC, the Swedish magazine Popular Radio publishes short-wave items.

It is our intention to join the I.A.R.W. in the near future, and thus take a part in international ham cooperation. The editor is happy to announce that plans for the admission of the S.S.A. into the Union are now almost completed.

The S.S.A. and all Swedish hams send their best greetings to amateurs all over the world.

Calls Heard

(Continued from page 62)

with high watt power 50w 200w 400w 500w 1000w 2000w 4000w 10000w

Say you saw it in QST—It Identifies you and helps QST

Say you saw it in QST—It Identifies you and helps QST
**BARGAINS**

**ARMY AND NAVY RADIO SURPLUS**

- **Voltmeter**, Westinghouse, No. 49210 cabinet portable, 2
  ann. $15-19, List 49-50
- **Voltmeter**, Westinghouse, No. 27 D.C. 0-70...$7.50
- **Ammeter**, Westinghouse, No. 27 D.C. 0-70...$1.75
- **Ammeter**, Westinghouse, No. 90 D.C. 0-20...$1.75
- **Ammeter**, Westinghouse, No. 275...$7.50
- **Waterproof, Holter, A.C. and D.C. 0-750...$17.50
- **Amp, hour meter, Sagamore, bat. charge and discharge, type**
  **MC-2 4-0-4000...$10.00
- **Ammeter, Westinghouse, A.C., 8" dials, external shunt**
  **0-800...$8.00
- **Ammeter, Westinghouse A.C., 8" dials, external shunt**
  **0-175...$3.50
- **Generator, self ex., A.K.W. 500 cycle, 110 volt...$12.50
- **Dynamo motors, twin, Westinghouse, C.W. 979, 30/75 volt, 280...$25.00
- **Dynamo motor, single, Westinghouse, C.W. 977, 30/75 volt, 280...$19.00
- **Dynamo motor, Elec. 12/35 volt, 143 amp...$15.00
- **Croker Wheeler, 25/275 volt, external shaft...$12.00
- **Geary type C, 6/40 volt, 300 watt...$15.00
- **Motor Generator, Crocker Wheeler, 110 D.C., 220 A.C., 300 watt, 300 cycle...$12.00
- **Motor Generator, 110 volt, 300 D.C. generator, 300 watt...$35.00
- **Generators, 90 volt, 25 K.W. Westinghouse and G.E. $900 and $200.00
- **Motor, Edison, universal, var. speed 110 volt...$5.00
- **Motor, Edison, universal, double shaft 110 volt...$5.50
- **Generator, U.S. C., 0-10, List 49-50, (List $10.50...$2.00
- **Generator, U.S. C., 100 volt, D.C., 15 volt, 1200 K.P.M., 110 volt...$3.00
- **Dynamotor, Westinghouse, C.W. 252, 110 volt, 15/60 cycle...$15.00
- **Dynamotor, Westinghouse, C.W. 977, 20/150 cycle...$14.00
- **Dynamotor, Westinghouse, C.W. 977, 10/20 cycle...$12.50
- **Dynamotor, Westinghouse, C.W. 977, 50/10 cycle...$11.50
- **Dynamotor, Westinghouse, C.W. 977, 300 cycle...$7.50
- **Transformer, Westinghouse, 120 mid., 6-10-15 volt output, 1/2 K.W., 60 cycle...$7.50
- **Transformer, G.E., battery type, 125 to 250, with center tap, 60 cycle...$7.50
- **Transformer, Amer. Fran, 220 to 30000 open, 35 cycle...$7.50
- **Transformer, Amer. Fran, 220 to 30000 closed, 1 K.W., 60 cycle...$7.50
- **Transformer, G.E., 110 volt, 300 cycle...$5.00
- **Transformer, Amer. Fran, 220 to 12000 closed, 2 K.W., 60 cycle...$5.00
- **Transformer, Special 350, primary, 30 transformer, 1 KVA, 60 cycle...$5.00
- **Regulator, Ward Leonard, 5 sizes, 400, 600, 900, 1200, 2000, Edition 1924...$6.00
- **Rheostat, variable, 400 ohm, 1 ampere...$0.75
- **Potentiometer, 110 volt, 0.5 amp, air slip...$1.75
- **Amber glass, 1 ohm, 500 watt...$1.50
- **Gasoline Engine, 1 cylinder 2 cycle Smith 2 horse power complete...$25.00
- **Gasoline Engine, 2 cylinder 2 cycle Smith 2 horse power complete...$50.00
- **Gasoline Engine, 4 cylinder 1 cycle Hendee, 20 horse power, air cooled with Stevart air filter, mounted on aluminum body, complete with hand starter and separate trans- mision...$75.00
- **Condensors, West Elec, 22/8 1000 volt 1 mid, very good quality...$1.00
- **Condensors, West Elec, 22/8 1000 volt 2 mid...$1.00
- **Condensors, Wireless Specialty, copper leyden glass jar, 10000 volt, 0.002 mid...$2.00

**WANTED**

- **CONDENSERS** — 2000 to 10000 volt, all capacities. **RECEIVERS** — all types, with automatic volume control, all wave lengths. **QUENCHED GAPS** — From spark transmitters. Navy types S.E. 908-1001-1002-1005. Give complete particulars and price.

**HIGH POWER**

Takes a Mercury Arc to handle it — 2750 mls at 15,000 volts — Arecost installation — demonstrates the tremendous capacity of the Mercury Arc Rectifier. No voltage or current limits, single or polyphase rectifiers for broadcast, commercial stations, and amateur W1Zs. If you’re a peep-peek station in the West, 2000 will do just what you need. You’re happy. Tubes in stock. Filament transformers, time delay relays, hi-regulation plate transformers.

**RECTIFIER ENGINEERING SERVICE**

4837 Rockwood Rd, Radio W8ML Cleveland, Ohio

**P-A HORN**

93" long — 16" of outer aluminum, large end fiber, 31" dia. Can use large end for dynamic cones. $60.00.

Two-button broadcast microphone, standard type, precision- made. Quality second to none. $300.00. Guaranteed — Trial order.

E. E. PATTERN

5042 42nd Ave., S. W. Seattle, Wash.

**LARGEST R & S SURPLUS**

Largest Radio and Electric Supply House in U.S. devoting eight floors to and specializing on Army and Navy Surplus. Write as your particular requirements. New items are continually arriving. Sufficient postage must accompany orders. NO C.O.D. ON CANADIAN ORDERS.

**MANHATTAN ELECTRIC BARGAINS HOUSE**

Dept. Q, 105-7 Fulton St., New York City
E. I. P. Box WEST, arid operating conditions with the highest possible output and with an accuracy of one tenth of one per cent.

1715 to 2000 Kilocycles .......... $15.00
3500 to 4000 Kilocycles .......... $15.00
7000 to 7500 Kilocycles .......... $25.00
Oscillating Blanks ................ $ 6.00

WEST COAST RADIO LABORATORIES
P. O. Box 1918
Los Angeles, Calif.

Quartz Oscillating Crystals

Our crystals are guaranteed to meet all standard operating conditions with the highest possible output and with an accuracy of one tenth of one per cent.

1715 to 2000 Kilocycles .......... $15.00
3500 to 4000 Kilocycles .......... $15.00
7000 to 7500 Kilocycles .......... $25.00
Oscillating Blanks ................ $ 6.00

FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO

FROST - RADIO MICROPHONES

Unusually sensitive, therefore ideal for use when the smallest sound is desired. Made in various forms, on all kinds of equipment, and prices from $1.35

FROST RHEOSTATS

Highest rated, most serviceable little rheostat ever designed. Special design of contact arm insures positive contact. Remote control. Available in flexible Bakelite case. 3 to 30 ohms. $1.00

HERBERT H. FROST, INC.
Main Office and Factory. ELKHART, IND.
CHICAGO SAN FRANCISCO

FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO FROST-RADIO

Radio Operators

Raise Your Speed 50 to 100% in Short Time

Write us if you are interested in The Candler System Course in High-Speed Telegraphy and Self-Mastery — the only "shock-out" to greater speed, accuracy and endurance that mean BIGGER PAY. DOUBLES speed of slow operators. Makes fast operators FASTER. Takes the strain out of slow ones. Athletic "glass" arm. Restores the arm. Prevents fatigue, cramps, paralysis and relieves many other conditions. We have successfully taught over 40,000 operators, and many of them have been trained by us. Improved, up-to-date course. Begin now. In a few weeks you'll be faster than you ever thought possible. Our money-back guarantee protects you. Write now.

THE CANDLER SYSTEM CO., Dept. RL.
6543 S. Keedle Ave.
CHICAGO, ILL.
QSL CARDS FREE
to Stations using Vitrohm Radio Resistors

Ward Leonard wants all amateur stations using Vitrohm Radio Resistors to have a supply of printed QSL cards — with our compliments.

Twenty-five of the new QSL cards, printed on both sides, ready to use, will be sent free upon request to any station using Vitrohm Resistors. More of the cards if you want them. Send in your request now. There is no charge or obligation of any kind.

New Bulletin 507 Covering Vitrohm Resistors for Radio

A complete line of Vitrohm Resistors for radio receivers and transmitters is included in this new bulletin. Every up-to-date station will want a copy. It will be sent anywhere upon request free of charge.

Ward Leonard Electric Company
31 South Street Mount Vernon, N. Y.

The A.R.R.L. Diamond Is the Emblem of a Real Amateur!

The League Emblem comes in four different forms. Its use by Members is endorsed and encouraged by the League. Every Member should be proud to display the insignia of his organization in every possible way.

THE PERSONAL EMBLEM. A handsome creation in extra-heavy rolled gold and black enamel, 1/4" high, supplied in lapel button or pin-back style. There are still a few fellows who are hiding their light under a bushel. Wear your emblem, OM, and take your proper place in the radio fraternity. Either style emblem, $1.00, postpaid.

THE AUTOMOBILE EMBLEM. Introduced last spring, already more than 800 cars are proudly displaying the mark of the “Radio Rolls-Royce,” 5 x 2 1/2”, heavily enameled in gold and black on sheet metal, holes top and Bottom, 50c each, postpaid.

THE EMBLEM CUT. A mounted printing electrotype, the same size as the lapel button, for use by Members in any type of printed matter, letterheads, cards, etc. $1.00 each, postpaid.

THE "JUMBO" EMBLEM. You've taken care of yourself, your car and your printing. How about the shack wall or that 100-footer? Think of the attention this big gold-and-black enamel metal emblem will get! 19 x 8 1/2", same style as Automobile Emblem, $1.25 each, postpaid.

Mail your order and remittance NOW to

The American Radio Relay League, Hartford, Conn.
Getting the most out of the Screen-Grid Tube

Well, O.M., you know the potentialities of the screen-grid tube as well as we do. But are you getting the most out of that tube?

Most hands are not. Why? Because they fail to bias the control grid at 1/4 volts negative potential. It's troublesome; and that's why most of us don't bother.

But with the Clarostat HUM-DINGER, it's a cinch. This tiny device serves as filament resistor and grid bias in one, by connecting one end to negative A, another to filament, and center to ground side of antenna tuning unit. And oh! What a difference it makes!

Meanwhile, don't forget, the HUM-DINGER is also an ideal center-tap resistor for A-C power tubes.

Write for dope on the Clarostat line — a resistor for every radio purpose — fixed, adjustable, variable and automatic. Or ask your dealer to show you the Clarostats themselves.

Clarostat Manufacturing Co., Inc.

RADIO OPERATORS WANTED

THE EASTERN RADIO INSTITUTE can train you quickly and thoroughly because MODERN AND EFFICIENT METHODS THOROUGH INSTRUCTION under staff of COMMERCIAL OPERATORS MODERN APPARATUS including SHORT WAVE TRANSMITTER SIXTEEN YEARS A RADIO SCHOOL THE OLDEST, LARGEST AND MOST SUCCESSFUL SCHOOL IN THE U.S. RECOMMENDED BY THE A. R. R. L.

Day or Evening Classes Start Every Monday

SPECIAL CODE CLASSES

Write for Illustrated Prospectus

EASTERN RADIO INSTITUTE
99 BOYLSTON STREET
BOSTON, MASS.

RADIO TRANSFORMERS

Factory Sale

Unmounted, 250 watts, 300-500 and 1000 V, each, side jumper, 25¢, 50¢, 75¢. Mounted, 250 volts, 100 watts, 75¢, 100¢, 125¢, 150¢, 200¢. Write for complete list and specifications of transformers, also chokes with handle for gain adjustment. 250 MA — 30 Henry $3.75. Specials for order. 100 grade material, all guaranteed. Made by HILET, Inc., CO.

RADIO PARTS SALES CO. ORANGE, N. J.

More Profits To Set Builders

Sports, baseball games, big National events will boost radio business this year. Set builders will respond. Barrywick ad will make two sales. Everything in A-1, with short wave, intercom, parts, supplies. World's largest stock on hand. In stores shipped same day. Lowest prices possible wholesale prices.

BARRY WIK CO. 15 Canal St. CHICAGO, ILL. INC.

Say You Saw It in QST — It Identifies You and Helps QST
Synchronous Motors for Television

In addition to building reliable and satisfactory motor generators, "Esco" has had many years of experience in building electric motors for a great variety of applications.

Synchronous motors, small, compact, reliable self starting are now offered for Television equipment. They require no direct current for excitation, are quiet running and fully guaranteed.

Other types of motors suitable for Television may also be supplied.

Write us about your requirements.

**ELECTRIC SPECIALTY CO.**

25 South St.  
Trade "ESCO" Mark  
Stamford, Conn.

---

**3000 V. Recto Bulbs**

Now in stock — 3,000 Volt, New Type R3 Rectobulbs.  
Net price each $10.00. Also Leach Relays — R.E.L.  
Products, Omnigraphs — Vibroplexes.

**Complete Parts for Silver-Marshall**

No. 730 "ROUND-THE-WORLD" 4  
A COMPLETE short wave receiver (174 to 204 meters) and two-stage audio amplifier. All wave lengths are covered with no dead spots. Amateur bands fall well to center of tuning dial. Net $40.00. Completely constructed $39.80, C.O.D., or mail with order. Package or insurance extra.  
Send for New 1929 Ham Book — FREE

**CHI-RAD**

CHICAGO RADIO APPARATUS CO.  
41S S. DEARBORN STREET  
CHICAGO

---

**RADIO IN BRASIL**

When in Brasil, apply to M. BARROS & CIA for anything you need in connection with radio.  

**M. BARROS & CIA**

70 sob. Rua S. José 70 sob.  
Postal Box 89  
Rio de Janeiro  
Telegaph address, Radioparte, Rio de Janeiro  
Branch: Avenida S. João 4, S. Paulo, Brasil

---

**QST OSCILLATING CRYSTALS**

**Constant Temperature Control Equipment**

We are now in a position to supply you with Thermostatically Controlled Heater units for accommodating two crystals (one used as a spare) with provision for instantaneous change-over, said unit maintaining a guaranteed constant temperature to a tenth of one degree Centigrade. This unit is easily adjusted and is entirely automatic, operating from the 100-Volt supply mains. Delivery 10 days after receipt of order. Price $400.00. More details upon request.

We also grind crystals for use in the Broadcast Band accurate to plus or minus 500 cycles of your assigned frequency for $5.00 fully mounted. Prices for grinding crystals in the Amateur bands are as follows:

1715 to 2000 Kc band $20.00, unmounted  
3500 to 4000 Kc band $7.50.  
7000 to 7,300 Kc band $5.00.  

**SCIENTIFIC RADIO SERVICE**

P. O. Box 86, Dept. E  
The Crystal Equipment Specialists

Mount Rainier, Maryland
To Our Readers who are not A.R.R.L. members

WOULDN'T you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only amateur association that does things. From your reading of QST you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on page 8 of this issue. We should like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio. You will have the membership edition of QST delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

A bona fide interest in radio is the only essential qualification for membership.

AMERICAN RADIO RELAY LEAGUE
Hartford, Conn., U. S. A.

I hereby apply for membership in the American Radio Relay League, and enclose $2.50 ($3 in foreign countries) in payment of one year's dues. This entitles me to receive QST for the same period. Please begin my subscription with the . . . . . . . issue. Mail my Certificate of Membership and send QST to the following name and address.

Do you know a friend who is also interested in Amateur Radio, whose name you might give us so we may send him a sample copy of QST?

Thanks

Official Frequency System
(Continued from page . . .)

Reports on Standard Frequency Transmissions are solicited from all who take advantage of this service. Regardless of how far from or near to the transmitting station you may be, your report is of interest to us. Standard blanks which will facilitate your compilation and our handling of the reports are available on request. All reports should be directed to: Experimenters' Section, American Radio Relay League, 1711 Park St., Hartford, Conn.

After your report has been checked and acknowledged, it will be forwarded to the Standard Frequency Station upon whose signals it comments.

QST's Station Cup
ONLY one month later than promised, here is the beautiful cup which QST offers for the best station description published in its columns during 1929. It is of sterling (solid) silver and the cup itself stands 9 inches high, 12 inches overall with pedestal.

Say You Saw It in QST — It Identifies You and Helps QST
We thought at first that we might offer a silver plated cup. We had in mind that, for the same value, the cup would be enough larger to contain the works for a monitor. It would be easy to mount the control knob on a disc of metal fitting the top of the cut. You know — combining utility with beauty, and all that sort of thing. But then we decided that any station winning our prize is extremely likely already to possess a good monitor and in fact to be so good a station that nothing less than sterling would be an appropriate award for its description. So the cup is real.

We ask attention to the details of our contest offer, published on page 37 for March. QST wants to reinstitute its "Amateur Radio Stations" department, with descriptions of "1929-type" stations, and to set the ball rolling it offers four prizes. First prize is the really handsome trophy here illustrated, and then there are three cash prizes, of $25, $15 and $10. The rules are very simple.

We're awfully anxious to engrave some one's name on this cup and so we're all prepared here to receive your descriptions. Come on with 'em!

— K. B. W.

Roanoke Division Convention

WITH three directors and an A. R. R. L. Headquarters' representative present, the division was more than favored at this third annual convention held at Charlotte, March 8th and 9th. Moreover it had the largest attendance this year, and those amateurs who did not show up surely missed a very fine time.

E. J. Gluck, who acted as chairman, kept things moving from the very beginning. With the introduction of Captain Glover, W4EI, who gave us a good talk on his crystal control set, the lectures were well started and resulted in good discussions. Director Woodruff, of the Atlantic Division, proved most entertaining in the several talks he gave. The doctor always has something unique with him and this time it proved to be the smallest crystal oscillator in "captivity." Director Painter of the Delta Division gave us a surprise by showing up, driving some 650 miles from Chattanooga, Tenn. The first day ended with a theatre party at the Carolina Theatre, and a visit to the Club House where "manifesting" was carried on till the small wee hours of the morning by a few of the "boiled owls."

With everybody registered on Saturday morning, the meetings planned for the day were well attended. One of the interesting events was a visit to the studio and to the transmitting station of WBT, located several miles out of town. This installation is the very latest unit of the G. E. and was an eye opener to all the delegates. Thanks to Gluck and Rosekranz for their courtesies.

The climax of this convention is always the banquet and this year's was no exception, and — you could have two helpings of everything, too.
Mr. Hall, President of the Charlotte Amateur Radio Association, welcomed all guests and then introduced the toastmaster, Director Gravely. The principal speaker was Treasurer Fieldman Hobert from A.R.R.L. Headquarters, who reviewed amateur radio and also talked on the 1929 requirements, emphasizing the point that we should think more and more in kilocycles instead of meters. During the evening several good stunts were staged, a film showing a number of good crystal-controlled stations taken by W2WC was thrown on the screen, and finally came the distribution of the prizes which made so many of the delegates happy. But we did surely miss Bob Morris.

With expressions of good will from every one to the committee in charge we all signed off for another year — SK.

--- A. A. II. ---

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF QST, Published monthly at Hartford, Conn., for April 1, 1929.

State of Connecticut
County of Hartford

Before me, a Notary Public in and for the State and county aforesaid, personally appeared K. B. Warner, who, having been duly sworn according to law, deposes and says that he is the business manager of QST and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

2. That the owners are: (Give names and addresses of the individual owners, or if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent, or more of the total amount of stock).
The American Radio Relay League, Inc, an association without capital stock, incorporated under the laws of the State of Connecticut, President, Hiram Percy Maxim, Hartford, Conn.; Vice-President, Charles H. Stewart, St. Davids, Pa.; Treasurer, A. A. Hebert, Hartford, Conn.; Communications Manager, F. E. Handy, Hartford, Conn.; Secretary, K. B. Warner, Hartford, Conn.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent, or more of total amount of bonds, mortgages, or other securities are: (if there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if there be any, contain not only the list of stockholders and security holders as they appear on the books of the company but also, in cases where the stockholder or security holder stands upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that said two paragraphs contain statements, embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear on the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds, or other securities, as stated by him.

5. That the average number of copies of each issue of the publication, sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is: ........................

(This information is required from daily publications only.)

K. B. WARNER.

Sworn to and subscribed before me this 28th day of March, 1929.

George F. Bronch

Are We Right?

You should have at least two of them — one for your complete 1928 file of copies, and one for each 1929 issue as published.

KEEP THEM AS A UNIT IN A

QST Binder

One-fifty each postpaid

A binder will keep your QSTs always together and protect them for future use. And it's a good-looking binder, too.

QST
1711 Park St. Hartford, Conn.

Say You Saw It in QST — It Identifies You and Helps QST

CA-2168's, $2.00 each. Want 50 watters, will swap Ross-Hill Power, Transmitter, extra Hartman antenna or what do you want? Box 21, Seddon, N. Y.

SEIF, 600 Denver television kit new $200.00, 104 RCA speaker with tubes $45.00. W3AAJ.

SELLING out — 2204 A, 2205 A, 85 meter xtal. State condition, price exact frequency: $15.00. Write Box 4, Institute, Univ. of Penn., Dormo. Box 285, Philadelphia, Penn.

MOVING out of town — best offer buys 1000VW Willard storage B batteries with special battery rack, aw, charging system. Write W8EFOX.


JEWELL, No. 54 special, 9-5000 voltmeter, dash, Dr. with resistor 3, Service man's name as above reads 10-500-5000 volts, 1000 ohms per volt. With resistor, $15.00. Edison battery, $12.00. M.A. 8001 choke, $1.00. Lineman's phone $12.00. 6-10X AC $5.00. M. Leitoh, Park Drive, West Orange, N. J.

QUARTZ crystals or blanks, guaranteed, write W8AHH, 29th, Oakland, Cali.

PORTABLEキッド for sale complete. Write for pictures and details. N. Ray, 520 Cooper St., Palo Alto, Calif.

SELL Silk dress shirt, $15.00 each. W8AWW.

MAKE your remote control & success and forget about your buying troubles with one of our guaranteed relays. Hoax relays sold out in a matter of minutes. Send $2.00 and get 8,000 volts, 12,000 ohms per volt, plenty of volts. Will operate off the storage battery from your receiver or dry cells. Many other uses. Also UX 210 17 watt transmitter tube. Send $3.00. will guarantee. Special at $2.00, Prefixed, Mitchell Radio Company, 635 Waveland Ave., Chicago, Ill.

U8294 with mounting perfect, $80. Two E6X rectifiers: $55.00 each, 1939, 1940, 1941, 12 years, 18 months, 9 months, 3 months. 2000 volts, 1000 ohms per volt. Will operate off of 8,000 volts if you have. Length: 14 in. Width: 8 in. Height: 8 in.

Plates 5V, 10V, 20V, 30V, 50V, 100V, 200V, 300V, 500V, 1000V. Guaranteed, write W91:DK.

SELL, 1000 watt transmitters, guaranteed. Made by G. L 10:30, 15:30, 19:30 all time, $400 each, all have tremendous broadcast stations, will run 861, 12320 ft. o. b. Detroit, F. G. Dawson, 7470 Woodrow Ave., Detroit, Mich.

WESTERN electric 7A amplifier with 3 W. L, 216A tubes and 12 condensers, good working condition, no plates, no rectifiers, complete, $100.00. In good working condition, $100.00. Special price to W5YI, 210 71.


SAY: You Saw It in QST — It Identifies You and Helps QST.

PLATE POWER for your set, the very heart of its performance. For quiet DX stuffy, life-long permanence, absolute dependability. The Direct Plate system, which approaches the achievement of an Edison steel-alkaline storage B battery. Built painstakingly; every joint pure nickel, up-to-date. With a 1500 volt battery you will have no trouble with your power supply. We ship complete batteries, construction parts, enamelled air, fine steel. Available immediately, filament and plate transformers for the new rectifier, complete plus lamp sockets. Resistor service, radio W8LFL, 3837 Rockwood Rd., Cleveland, Ohio.

IMAGINE an organization with over 4000 clients scattered throughout the world, all radio amateurs, builders, experimenters, hams. Over 50,000,000 stock of high grade receiving and transmitting parts only, no sets. Spend $3000 yearly on our own experimentation. Carry nothing until it has gone through our test rooms. Precision parts, precision parts, circuits, data, etc. Weekely data (more than all radio magazines together) — 20 weeks — $1.00, 22 weeks — $2.50. Sample "The Soldering Board." Write for your free issue of our magazine or our free catalog. We guarantee every part. We do not ask what do you need? B很Box 21.

INSAIL. Radio Laboratory receivers and Transmitters are of the modern designs and are supplied to meet any particular requirements of the radio art. Transmitter designs for radio phone or G. W. Our long experience in the designing of special apparatus is your guarantee of quality and efficient apparatus. We also build to order any items desired. Literature on any subject relating to radio and the latest developments of the Radio Laboratory, 1206 Grandview Ave., Warren, Ohio.

SPECIAL made reefiler aluminum with small percentage copper and more salvage, being in long strips, 116 x 20, $1.50; 116 x 16, $1.25; 116 x 12, $1.00; 116 x 8, $0.75; 116 x 6, $0.50. 116 x 4, 116 x 3, 116 x 2, 116 x 1, $1.00 each. Packed in boxes with bolts and nuts, kind 116 x 4 150, 116 x 6 174, pair prepaid. Rest Silicon steel 0144, 0148, 0150 to order 25-35-55 lbs. Postage extra. Geo. Schult., Calumet, Mich.

PANEL, engraving — finest workmanship on radio laboratory apparatus. Request price list. A. L. Woody, 10 W. 87th St., Chicago.

LIFEUSE: the quickest way to learn the world, see for yourself. Designed for protection of instruments, tubes and delicate equipment generally. Capacities: 1, 2, 6, 12, 18, 24, 30, 48, 60, 72, 90, 120, 150, 180, 225, 300, 600, 800, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 5000, 6000, 7200, 8400, 10,000, 15,000. Price: 5c - $1.50. 100.00 — $1.00. Postpaid Mounting blocks 20c. Discount to dealers. Littlefuse Labs., 1772 Wilson Ave., Chicago.

POLYMET filter condensers 2 mill 1000 working volts, 1 mill 1000 working volts, 2 mill 500 working volts, 3 mill 500 working volts, 4 mill 850 working volts, 5 mill 500 working volts, 6 mill 500 working volts, 7 mill 500 working volts, 8 mill 500 working volts, 10 mill 500 working volts. Price: $1.00 each.

DUTIHY 711 1379 2000 volt condenser $3.50; Strasbourg Carbon 530 2000 volt condenser $3.50; Burdon 2000 volt condenser $3.50. Timmons power amplifier uses 281 and 210 $15.00; push-pull amplifier $25.00; two tube Brown-Dryse $20.00, Herbert Ingeholz, 31 Washington Ave., Osceola, N. Y.

SELLING out — Write for list of receivers, transmitters and parts, W8EXX, New, Ill.

QSL cards, 40c per 100, samples Redfield, North Sacremento, Calif.

HAVE for sale: One Majestic "B" Eliminator with tube $10.00; one All American "B" Eliminator with tube $9.00; one Valley "B" Eliminator $5.50. All practically new and in excellent working order. Write Box 21, Seddon, N. Y.


TRANSMITTING tubes, 50 to 500 watts, specifications and prices on request. Box 21, Seddon, N. Y.

SAYE: Specimen of 1000000, 6400000, 1.15, 6-15 volt AC $2.50, GR will insulators 18c. Write your needs. We have everything. Anything built to order. Finite Radio Laboratory, W8EFL, 100 Grove St., Syracuse, N. Y.
WIMK
A.R.R.L. Headquarters

The following calls and personal data below the members of the A.R.R.L. Headquarters group:

W1A. H. P. Westman "ws."  WIBDI-W1X. F. E. Handy "th."
W1BWH-W1K E. W. Werner "th."
W1HMM-W1F G. D. Meserve "dm."
W1BUD A. L. Budlong "bud."
W1CEJ J. L. Lamb "jm."
W1ES A. A. Hebert "ab."
W1KP F. C. Beeley "beek."
W1PC G. Keneke "kc."
W1SW-Z. B. Rodman "rod."
L. R. Huber "mt."
R. A. Hall "rah."

BECOME A RADIO OPERATOR

See the World, Earn a Good Income, Duties Light and Fascinating

LEARN IN THE SECOND PORT U.S.A.

Radio inspector located here. New Orleans supply operators for the various Gulf ports. Most logical location in the U. S. A., to come to for training.

Nearly 100% of radio operators graduating on the job during the past seven years trained by Mr. Clemmons, Superintendent of Instruction.

All graduates placed to date. Start training now for summer runs.

Member of the A.R.R.L. - Call "WSGR."

Day and Night Classes - Enroll any time. Write for circular

GULF RADIO SCHOOL

844 Howard Ave.
New Orleans, La.

HERE THEY ARE!
The Tubes You've Been Waiting For

We are now making deliveries on these and several other types of transmitting tubes.

Type 550 - 5 to 85 watts input at 800 to 1000 volts, filament 5.8 volts 2.5 amperes, Plate and grid terminals at top of tube. .... $12.50

Type 650, illustrated, 150 to 200 watts input at 1000 to 2000 volts, filament 9.5 volts 6.5 amperes, Plate terminal at top. This tube deserves to be the most popular of any medium power tube on the entire market. .... $25.00

Type 570, similar to type 560 but without bases, 500 to 700 watts input at up to 5000 volts, filament 18 volts 4 ampers. A splendid tube for the high power station. .... $46.50

Rectifiers. We stock and recommend the new 6EX Mercury Vapor Rectobuls for plate supply to the above and any other tubes. .... $10.00

E. F. JOHNSON CO., Waseca, Minn.

HAM'S Get our Samples and Prices on Printed Call Cards made to order as you want them. W9APY Hinds, 19 S. Wells St., Chicago, Ill.

S. ELL Grebe CR18, full set of coils in A1 condition, Dope tree, W9FHZ, Wisner, Nebraska.

SACRIFICE - 30-40-80 M. 50 watt tubes, used, 2929 HC type, Crystal d.d. spaced conds. in all, $2 bill. Supply only. 237 tubes. W9AJE. $50. Sale price supply HC tubes. $50. 50 watt emitter complete tubes, all for $10. 2 short wave receivers 3 tubes and all coils only $6 each. Smith, W9FJS. Mo. Valley, Iowa.


QTH - ORG? Calibrate your receivers and frequency meters.

A list of over 500 high frequency stations of the world and their exact frequencies in kilocycles listed alphabetically by call letters. Compiled from authentic sources by an amateur for amateur use. Price ONE DOLLAR, W3NR, 2631 Garfield St., N. W., Washington, D. C.

SACRIFICE two W. E. 212 tubes, used, thirty dollars. One W. E. 211D used, ten bucks. W9AGU, Boise, Idaho.


FILV - 7 watt tubes, guaranteed, $1 each. Rennho Tube Co., Atlantic, Ia.

WANT: GR 588 band wavemeter, GN-800, 281's, 281's. Sell or trade. Most new $15, used $10-$25. 81 meter crystal, and other parts. What have you and what do you want? W9ARA, Butler, Mo.

GOOD conditioned used apparatus sell as follows: 60 watt, 1000 volt d.c. Westinghouse dynamat $6. 75 watt, 12-300 volt d.c. G.E. dynamat $3. Crocker-Wheeler half kw. 500 cycle dynamotor, 110 volt d.c. drive with control equipment $55. 925 Westingh RF nutshell model $31.10; PT337 mecanue $11.85. 3/4 kw. tube mounts. $7.40. Aluminized EOB Auburn, W9AQ, W. M. Garrard, Box 857, Auburn, Alabama.

$75 volt generators used but good order. $8. Give up to 500 volts. 200 watt 300 cycle generators, $10. R. Wood, 60-20 102nd St., Corona, N. Y.

IDEAL, plate supply operated from storage batteries. High speed ball bearing dynamotors and generators designed for use. May be operated by external motor or engine when ordered with shaft extension $10.00 additional. General Electric 24,1500 volt 350 watt $47.50. 24,750 volt 150 watt $75.00. 12,350 volt 50 watt $15. Crocker-Wheeler 24, 1500 volt 400 watt $45.00. Hollingshead 12 volt 350 watt $29.00. Western house 27.5,350 volt $15.00. Two machines for 700 volts $105. 0-15 volt 500 watt $15. 10-450 volt $15.00. 900 cycle 200 watts with exciters $22.50. 1-W. 1-KW cycle, 15 $195.00. Transmons, with tubes. Henry Avenley, 501 East 84th St., New York.

Amazing screw-holding screw driver! New patented invention! Remains, inserts screws instantly inaccessible places. Sells $1.20. 50c. 25c. 10c. Practical, invaluable. Can be ordered, and will ship on sight! Exclusive territory. hefty 1834 Wlnthrop Blvd., Boston.

SPECIAL, summer prices on crystals: 3500 ke. $14.00, 1700 ke. $9.00. Blanks 4.00. First reasonable offer buys monograph with key and buzzer. Hollister, W9BDD, Edwardsville, Kansas.

Q R A SECTION

50c straight with copy in following address form only:


W2AAE - Dr. A. Kornegiowski, 330 Crane St., Schenectady, N. Y.

The New Power Amplifier CX345

Most recent addition to the line of Cunningham RADIO TUBES

TYPE CX-345 is capable of delivering a power output equal to that of CX-310 type, but at a plate voltage not exceeding 250-volts.

This new tube is not interchangeable with the CX-371-A type, or any other Cunningham power amplifier. It has been designed for use in the last audio amplifying stage of power-line operated sets, which supply not more than 2.5 volts to the last audio socket, as well as proper grid and plate voltages. The filament is of the coated ribbon type, assuring great strength and high emission.

E. T. CUNNINGHAM, INC.
NEW YORK CHICAGO SAN FRANCISCO
DALLAS ATLANTA

For Your Convenience
QST'S
INDEX OF ADVERTISERS
IN THIS ISSUE

Acme Wire Company 26
Aero Products, Inc. 84
Allen-Hazard Company 3rd cover
Aluminum Company of America 4
American Sales Company 25
Arturus Radio Company 96
Aurora, Inc., Md. 74
A.V.H.L. Application Blank 88
A.M.I.L. Emblem 80
A.R.R. Handbook 81 and cover
Bayneik Company 96
Burrus & Co., M. 57
Burgess Battery Company 86, 90
Candler Western Company 84
Cardwell Mfg. Corp., Allen D. 73
Central Radio Labs. 78
Chicago Radio Alimentaire Co. 87
Chicago Manufacturing Co. 86
Corning Glass Works 96
Crosety Radio Corp. 72
Cunningham, Inc., E. T. 94
Dodge, C. L. 82
Eastern Radio Institute 86
Electric Specialty Co. 87
Frost, Inc., Herbert H. 84
General Radio Company 6
Gutham Engineering & Sales Co. 65
Greshen, F. 83
Gulf Radio School 93
Hardwick, Hardwick, Inc. 80
Jewell Electrical Instrument Co. 92
Johnson Company, E. T. 93
Leeds Radio Company 79
Loomis Publishing Co. 72
Manhattan Electrical Bazaar House 83
McGraw-Hill Book Co. 98
Moore Radio Company 90
National Company 83
National Radio Tube Co. 78
Parent Electric Co. 88
Patten, E. K. 93
Potter Company, The 76
QST Back Copies 95
QST Binder 89
Radio Corporation of America 1
Radio Engineering Labs. 69
Radio Parts Sales Company 86
Raytheon Mfg. Company 90
Reefer Engineering Service 83
Roeley, John T. 79
Scientific Radio Service 87
Silver-Marshall, Inc. 81
Teleplex Company 74
Theodarowski Elec. Mfg. Co. 71
Universal Microphone Co. 82
Vacuum Tube Exchange 88
Van Nostrand Company, D. 72
Vibrations Company 72
Ward Leonard Electric Co. 83
West Coast Radio Labs 70
Western Electrical Instrument Corp. 70
X-L Radio Labs 80
Yale Mfg. Company 82

Say You Saw It in QST — It Identifies You and Helps QST
A Rare Opportunity!

Forty-Three Back Copies of
QST for SIX DOLLARS
POSTPAID

Four years of QST back copies,
nearly complete, with index

YOU HAD BETTER ACT QUICKLY AS MANY
OF THESE SETS ARE FAST DISAPPEARING

Reference is continually being made in QST articles
to previous issues. You should have these copies. Available
at a special price.

All 1925 copies (except January, May
and July) $2.50
All 1926 copies—complete $2.50
All 1927 copies (except January) $2.50
All 1928 copies (except January) $2.50

All four years for $6.00, a saving of $4.00, if all four
years are ordered complete. If you do not want all
copies, state which years are wanted.

Binders to keep these files in order
$1.50 each

Each binder holds 12 issues of QST and does not
mutilate the copies.

QST

1711 Park Street ★ Hartford, Conn.
Pyrex Insulators make records at the North Pole, at the South Pole—and everywhere between

Little America, Antarctica, Feb. 3rd, 1929

Uniformly excellent satisfaction from PYREX Insulators employed exclusively in all antenna systems all our ships, airplanes, base and portable stations, also extensively in construction various transmitters.

— Hanson 9:55 P.M.

The messages from Commander Byrd when he flew across the North Pole traveled out from an antenna equipped with PYREX Insulators.

Commander Byrd — and PYREX Insulators — recently set a new world’s record in aviation radio, when near the South Pole his plane “Stars and Stripes,” 3000 feet above Antarctic ice, established perfect two-way communication with the New York Times station in New York City, 10,000 miles away.

The transmitting and receiving equipment in the “Stars and Stripes” is small, weighs only about 40 lbs., and is of the short-wave (34 meter) type with a power of only 50 watts. Plane radio sets are always of low power because of weight limitation. The attainment of 10,000-mile range of short-wave signals from such a tiny set indicates the height of insulation achievement, and by many radio experts is considered the greatest feat ever performed by radio.

You will make no mistake by following the judgment of these leaders. Protect your set, transmitting or receiving, with PYREX Insulators.

Antenna, Strain, Entering, Stand-off, Pillar and Bus-bar Types of various sizes offer correct selection. Buy from your dealer or at least write to us for complete illustrated file catalog.

Corning Glass Works
Dept. 64
Industrial and Laboratory Division
CORNING, NEW YORK

PYREX RADIO INSULATORS

Say You Saw It in QST — It Identifies You and Helps QST
110 Divisions — Readable to 1-10th Divisions

The Aero Wavemeter was designed for the radio amateur and the experimenter. It is designed mechanically and good electrical construction and meets the exacting requirements of the properly conducted amateur station. Using the principle of the 'series gap,' and having a definite fixed minimum capacity, the amateur wavelength bands are spread over a great many dial divisions. The velvet vernier dial has 100 divisions, each of which may be read to one-tenth of a division. The 5-meter band covers 40 dial divisions; the 10-meter, 40 divisions; 20-meter, 17 divisions and the 40-meter band, 25 divisions. For the 80-meter band, two coils are used.

One (72 to 82 meters) covers 45 divisions, and the other (68 to 70 meters) covers 10 divisions.

Each coil excepting the 5-meter, uses No. 18 enamelled wire tightly wound into grooves of the bakelite tubing. The tubing has a 1/4 in. wall and is 2 in. in diameter. The Aero heavy duty plugs and jacks make positive contact. The heavy bakelite dial has a black enameled finish. The 3/16" black bakelite top has a hexagonal shape to prevent rolling. The indicator is a standard neon lamp. Each wavemeter is individually hand calibrated. Standard coils shown are 20, 40 and 80 meters, included in price, S- and 10-meter coils extra.

Write for prices and special circular.

Aero High-Power Xmitter and 150-Watt Amplifier

For operation on 10-20-40-80-100M. Bands

The first high-power amplifier to use the UX-852 screen grid tubes. 1929 In Every Detail. Satisfactory performance in all amateurs. Bloomfield, N. J. new "Aero-Call"" Cava. One of the latest types of this amplifier. With two screen grid UX-860 power tubes in this arrangement, it requires a centralizing, F. C . A. New power supply for this type. Power supply delivers 2000 volts at 250 M.A. Employing two of the R.C.A.’s newest rectifiers, UX-656. Due to the construction of the UX-860, unusually high voltage may be applied safely to them.

Model A for A.C. Sets $25.00
Model D for D.C. Sets $25.00

Aero Listening Monitor

The Aero Monitor is a completely shielded unit enclosed in a black metal cabinet, size 9 x 5 1/2 x 7 in. Filament and B supply is included. It operates with a UX-190 type of tube and employs a stable circuit, delivering a signal intensity of about R-5 at 550. Used with automatic filament control. The battery supply is thoroughly shielded from the R.F. A reliable, scientific instrument. Ship, about $5.00, net.

Model M-29 Aero Monitor, including Dry Batteries, but no tube. List Price $15.00
Send for Aero Green Book and Price Supplement showing newest Short Wave Products. Price, $11.00.

Send for new Short-wave supplement showing new 1929 products. It is free to QST readers.
The World's Record! Direct two way radio communication between the New York Times Radio Station and Commander Byrd's Airplane flying over the Antarctic.

Every Radio Amateur should know that Burgess Radio Batteries are used in the Antarctic Expedition radio stations.

Ask Any Radio Engineer

BURGESS BATTERY COMPANY
MADISON, WISCONSIN