Cunningham Radio Tubes

The Superior Tube for Radio Receiving Sets

Cunningham Radio Tube

Type C-299 is a Detector and Amplifier of the high vacuum type, designed especially for dry battery filament current supply. The special filament in this tube draws a current so low that as many as four tubes may be readily operated from a single set of three standard No. 6 dry cells. The ideal tube to use in your set.

The care and operation of each model of Receiving Tube is fully explained in our new 10-page "Radio Tube Data Book." Copies may be obtained by sending ten cents to our San Francisco office.

Home Office: 182 Second Street
San Francisco, Calif.
154 W. Lake Street 30 Church Street
Chicago, Ill. New York City, N. Y.

Cunningham

Cunningham Radio Tubes

C-301 A—5 Volts 1-4 Amperes filament

C-299—5 Volts .05 amp. Dry Battery Det. and Amp. $6.50

C-200—5 Volts Gas Content Detector $5.00

C-11—1.1 Volts .5 amp. Dry Battery Det. and Amp. Special Base $6.50

C-12—Similar to C-11 with standard base $5.50

PATENT NOTICE

Cunningham tubes are covered by patents dated 2-18-08, and others issued and pending. Unauthorized use in radio communication by any other than our company will be an infringement.
A Radio Statement to the Public

Keeping its pledge to the public, the Radio Corporation of America has concentrated its vast research and engineering forces upon the solution of certain fundamental problems facing the art—problems which have become more apparent as broadcasting stations and radio receivers multiply.

The phenomenal expansion of the radio industry, and the universal and ever-increasing appeal of radio represent an outstanding development of the present century—for this industry has grown from infancy to maturity in a space of but two years.

Briefly stated, there is today a necessity for:

—A **radio receiver providing super-selectivity**—the ability to select the station you want—whether or not local stations operate. A selectivity which goes to the theoretical limits of the science.

—**Super-sensitivity**—meaning volume from distant stations—along with selectivity.

—**Improved acoustics**—more faithful reproduction of broadcasted voice and music than has ever been possible before.

—**"Non-radiating" receivers**—a new development—a type of receiver which, no matter how handled, will not interfere with your neighbor’s enjoyment.

—**More simplified operation**—a super-receiver requiring no technical skill, thus making the greatest achievements of entertainment immediately available to all members of the family.

—A **receiver for the apartment house** and populated districts, requiring neither aerial nor ground connection.

—**Another type of improved receiver for the suburban districts**, equally capable to that above, for use where the erection of an aerial presents no problem.

Painstaking search in quest of these ideals has led to new discoveries, setting new standards of excellence and performance—discoveries, which have established:

**First**—that improved acoustics are possible—a matter of scientific research and not of haphazard design—for truly melodious reception.

**Second**—that dry battery operated sets can be so designed as to give both volume and distance.

**Third**—that the regenerative receiver is susceptible to marked improvement providing selectivity, sensitivity and simplicity of operation hitherto deemed impossible of accomplishment.

**Fourth**—that the Super-Heterodyne—the hitherto complicated device requiring engineering skill to operate—could be vastly improved—improved in sensitivity and selectivity and simplified so that the very novice and the layman could enter new regions of entertainment and delight.

**Watch For Further Announcements**

Radio Corporation of America

**Sales Offices:**

233 Broadway, N. Y. C. 10 So. LaSalle St., Chicago, Ill. 433 California St., San Francisco, Cal.
E. T. Flewelling, inventor of the famous Flewelling circuit, recently tested a number of Bradley leaks in his laboratory and after a thorough test writes as follows:

"The radio market has been sorely in need of apparatus of such a high type as the Bradley leak, and I feel that you are to be congratulated because of the action of this grid leak as shown under test. I do not hesitate to say that, so far as my tests are concerned, it is the best grid leak that I have tried and the only leak that comes anywhere near approaching the ideal. It is a high-grade piece of apparatus in every respect and I am only too glad to congratulate you again."

The Bradley leak is the result of 20 years' experience in the manufacture of graphite disc rheostats. It contains no carbon or metallic powder. It is distinctly a disc rheostat. A smooth range from ¼ to 10 megohms is obtainable without steps or jumps by simply turning the adjusting knob. The Crosley laboratory found it unaffected by atmospheric conditions.

Many of the new circuits, such as the Flewelling or other highly-selective circuits, work best when equipped with the Bradley leak. Try one on your radio set and you will be amazed with the improved operation.

Mail this Coupon—Today!

ALLEN-BRADLEY CO.
227 Greenfield Ave., Milwaukee, Wis.

Please send me your folder describing the Bradley leak and its construction.

Name
Address

Manufacturers of graphite composition rheostats for over 20 years.

Is Your Grid Leak Correct?
The following table gives the approximate values of grid leak resistance recommended by vacuum tube manufacturers:

- Audion (DeForest) DV-6, 2 Megohms
- C-200 - - - - - - 2 Megohms
- C-290 - - - - - - 2 to 5 Megohms
- C-301-A - - - - - 2 Megohms
- UV-190 - - - - - 2 to 5 Megohms
- UV-200 - - - - - 2 Megohms
- UV-201-A - - - - - 2 Megohms
- WD-11 - - - - - 3 Megohms, or more
- WD-12 - - - - - 3 Megohms, or more

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
THE TRAFFIC DEPARTMENT, A.R.R.L.

ATLANTIC DIVISION

Manager
A.D.M. D. of C.

C. H. Stewart
70 V St. N.W.

H. J. Wadsworth
Chapel Gate Lane, Ten Hills, Baltimore

G. L. Deichmann, Jr.

R. F. Engel
White Street

H. W. Densham
140 Washington St.

Dr. E. A. Cyriax
219 E. 71st St.

S. W. North
125 Brownell St.

J. F. Rau
2005 E. Kingston St.

P. E. Wiggan
5106 Liberty Ave.

H. H. Layton
305 Washington St.

CENTRAL DIVISION

Manager
A.D.M. Georgia

R. H. G. Mathews
332 S. Michigan Ave.

A.D.M. Alabama

C. E. Varr
137 Hill Ave., Highland Pk.

C. H. Nichols
739 Woodcock Ave.

N. C. Smith
912 N. Glen Oak Ave.

G. N. Crapo
1176-2nd St.

M. W. Hutchinson
1299 Washavew Ave.

c/o Seymore Elec. Co.

J. E. Bell
1101 E. Broadway

J. A. Kolb

DAKOTA DIVISION

Manager
A.D.M. No. Dakota

N. H. Jensen
Box 394

D. C. Wallace
54 N. Penn Ave.

Orrville Wheelon
800 East Capitol Ave.

Bert Wick
1025-3rd St.

DELTA DIVISION

Manager
A.D.M. No. Texas

W. W. Rodgers
1106 Union Ave.

V. L. Rosson
Box 418

W. L. Kennon
University Post Office

W. C. Hutchinson

Dr. L. M. Hunter
2974 Main St.

EAST GULF DIVISION

Manager
A.D.M. Oklahc,ma

H. L. Reid
69 E. Park Lane

C. L. Pringle
1926 Buncomb St.

V. V. Melliavine
106 W. 3rd St.

C. P. Clark

c/o Western Union Tel. Co.

C. H. Pransou
309 Greenwood Ave.

Luis Raxach
Box 319

MIDWEST DIVISION

Manager
A.D.M. So. Dakota

G. S. Turner
S.W. Bell Tel. Co. Rm. 611, Tel. Bldg., Kan. City, Mo.

Dr. C. L. Klenk
420 Metropolitan Bldg.

J. G. O'Rourke
8064 South 32nd St.

D. E. Watts
115 High Ave.

NEW ENGLAND DIVISION

Manager
A.D.M. New England

L. Vernilya
85 Franklin St.

D. B. Fancher
Brook St.

R. H. Stevens
U. of Va.

R. E. Sloan
20 Wood St.

L. Hilton
635 Armory St.

A. S. McLean
39 Chester Ave.

B. H. Chase
1622 Main St.

D. C. Comstock

NORTHERN DIVISION

Manager
A.D.M. No. Calif.

Glenn E. West
Box 517

H. E.Manage
8219 North 24th St.

K. W. Weingarten
423-14th Ave. S.

LaVerne Martin
1538 Williams St.

P. M. Hoppe

PACIFIC DIVISION

Manager
A.D.M. Cal. Central Calif.

J. V. Wise
Box 175

H. J. Gooding
211 West St.

G. M. Lewis
688 W. 40th St.

M. E. McCreezy
166 Eullwood Ave.

E. C. Garrette

ROANOKE DIVISION

Manager
A.D.M. No. Carolina

W. T. Gravely
354 Main St.

J. L. Rock
Main St.

J. F. Wohlford
118 Cambridge Ave.

T. M. Simpson
Peoples Nat'l Bank

WILKES MOUNTAIN DIVISION

Manager
A.D.M. No. Carolina

N. R. Hook
1022 S. Ash St.

H. C. Wilson

c/o Deseret News

P. A. Brineck
604 Interstate Trust Bldg.

P. N. Mitchell
Box 375

WES T GULF DIVISION

Manager
A.D.M. Missouri

F. M. Corlette
2318 Catherine St.

Louis Falconi
Box 421

C. E. Whartenby
211 News Bldg.

H. T. Wherret

c/o F. A. Hardy & Co.

E. A. Sahn
Box 509

HAWAIIAN DIVISION

Manager
A.D.M. Hawaii

K. A. Cantin
1830 Pilkito St.

MARITIME DIVISION

Manager
A.D.M. New England

W. C. Borrett
14 Sinclair St.

ONTARIO DIVISION

Manager
A.D.M. No. Dakota

G. H. Langford
238 Cheapside St.

Wm. Chest
241 Robert St.

QUEBEC DIVISION

Manager
A.D.M. No. Canada

J. V. Argyle
493 Deearie Blvd.

WINNIPEG DIVISION

Manager
A.D.M. Manitoba

J. E. Brackett
260 Athabaska St. E.

E. M. Gerhard
Box 239

G. C. Patterson
612 Beresford Ave.

VANCOUVER DIVISION

Manager
A.D.M. British Columbia

A. J. Ober
Cor. Main & Minerva Sts.

St. David's, Pa.

Washington

Baltimore

Red Bank

Collingswood

New York City

Syracuse

Philadelphia

Pittsburgh

Wilmington

Chicago, Ill.

Detroit

Lima

Peoria

Milwaukee

Ann Arbor

Louisville

Sioux Falls, S. D.

Minneapolis

Firre

Devil Lake

M. M. Tenn.

Plaquemine

Mississippi

Wind Rock

Little Rock

Atlanta, Ga.

Greenville

Sheffield

Jacksonville

Atlanta

San Juan

Evansville

Mettapioasett, Mass.

Wesleyer

Manchester

Burlington

Lewiston

Springfield

Wintthrop

E. Hartford

Polytechnic, Mont.

Boxeran

Tacoma

Nampa

Eugene

Walnut Grove, Cal.

Douglas

Reno

Los Angeles

Los Gatos

Colusa

Danville, Va.

Farmington

Roanoke

Winston-Salem

Casper, Wyo.

Salt Lake City

Denver

Greaybull

Dallas, Texas

Bewell

Enid

Ummalillo

New Braunfels

Honolulu, T. H.

Dartmouth, N. S.

London, Ont.

Toronto, Ont.

Montreal

Moose Jaw

Morse

Winnipeg

Vulcan, Alberta
The GREBE “13”
A Real Receiver for Radio Men

Dear Mr. James,

Back home since four days only I have reinstalled my station for 100 meter work. I am glad to say the GREBE GR-13 which I brought back has already done splendid work. I tuned down to 100 meters for the first time this morning at 0110 G.M.T., and immediately heard KDKA. I followed him until 0500 and all the time his carrier wave was good, he could have been easily read in telegraphy. At times excellent orchestral music and some words were plainly heard in spite of heavy static and arc interference.

The distance from Pittsburgh to Nice must be about 7,000 kilometers (roughly 4,400 miles); I have all reasons to think this is the world record distance transmission on 100 meter wave.

Please express my hearty congratulations to the GREBE Co., for their wonderful receiver.

Very sincerely yours,

[Signature]

It is significant that the Grebe “13” is the choice of those Amateurs who have established worth-while distance records. Each detail of Grebe craftsmanship is fitting testimony of its efficiency.

Combining Regeneration and Tuned R. F., it affords sharper tuning, greater range and quieter operation. Its wavelength range is:—80-300 Metres.

Ask your dealer or write us for complete information.

A. H. GREBE & CO., Inc.
76 Van Wyck Blvd., Richmond Hill, N. Y.
Western Branch: 481 East 3rd Street, Los Angeles, Cal.

Licensed under Armstrong U. S. Pat. No. 1,118,149
VOLUME VII

FEBRUARY, 1924

No. 7

Editorials
Low Loss Tuners
Direct Contact With Japan
The Progress of Transatlantic Amateur Communication
An Amazing World's Record
Get Ready for "UU" Work With Foreign Amateurs
Amateur Wave meters
Information on Receiving Tubes for A.R.R.L.
Questioners—Part II
Coolidge's Holiday Greetings to MacMillan
Travel Via Amateur Radio
Australian Amateur Radio Puts To Sea
What the Department of Commerce Says About Us
What the Work With F3AB Teaches the A.R.R.L.
QRV Pan-American Tests?
Notice—N. E. Traffic Department Convention
Emergency Railroad Communication
Wolverine Convention
South Dakota Radio Convention
A Code of Conduct for A.R.R.L. Members
How I Operate UV-202 Radiotrons
Electrostatic Cloths
Transatlantic Test Report
Help Wanted for a Book of American Amateur Stations
ULAB and C2CG Help in Emergency
The Fourth District-East Gulf Convention
A New Type of R. F. Transformer
"CJ Urgent de 7BP"
The Improved "S"-Tube Rectifier
Automatic Radio Relaying
Motor and Generator Bearings
Rotten Problems
Amateur Radio Stations—F8XAB, GcKF
With the Affiliated Clubs
"Straws"
The Amateur Builder
Some Characteristics of Electrostatic Rectifiers
Radio Communications by the Amateurs
Experiments Section
HAM-ANS
QST's Directory of Advertisers

QST is published monthly by The American Radio Relay League, Inc., at Hartford, Conn. Kenneth B. Warner (Secretary, A.R.R.L.), Editor and Business Manager; S. Kruse, Technical Editor; H. F. Mason, Department Editor; F. C. Beekley, Assistant Editor; Edwin C. Adams, Advertising Manager.

Subscription price in United States, Possessions, and Canada, $2.00 per year.

Entered as second-class matter May 29, 1919, at the post office at Hartford, Connecticut, under the act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized September 8, 1922.

Copyrighted, 1923, by the American Radio Relay League, Inc.

THE AMERICAN RADIO RELAY LEAGUE, Inc.

HARTFORD, CONN.
THE AMERICAN RADIO RELAY LEAGUE

The American Radio Relay League, Inc., is a national non-commercial association of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, for orderly operating, and for the practical improvement of short-wave two-way radio telegraphic communication.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a board of seventeen Directors, elected every two years by the general membership. The officers, in turn, are elected by the Directors from their number. 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 worth-while amateur in America and has a history of glorious achievement as the standard bearer in amateur affairs.

Inquiries regarding membership are solicited. Ownership of a transmitting station, while very desirable, is not a prerequisite to membership; a bona-fide interest in amateur radio is the only essential. Correspondence should be addressed to the Secretary.

OFFICERS

President
HIRAM PERCY MAXIM
Hartford, Conn.

Vice President
CHAS. H. STEWART
St. David's, Pa.

Traffic Manager
F. H. SCHNELL
1045 Main St.
Hartford, Conn.

Canadian General Manager
A. H. K. RUSSELL
234 Westmount Drive
Toronto, Ont.

Treasurer
A. A. HEBERT
Hartford, Conn.

Secretary
K. B. WARNER
Hartford, Conn.

DIRECTORS

H. M. ANTHONY
Muncie, Ind.

H. A. BEALE, JR.
Parkesburg, Pa.

A. H. BABCOCK
Berkeley, Calif.

V. F. CAMP
Brightwaters, L. I.

F. M. CORLETT
Dallas, Tex.

C. E. DARR
Detroit, Mich.

A. A. HEBERT
East Hartford, Conn.

S. KRUSE
Hartford, Conn.

H. P. MAXIM
Hartford, Conn.

A. H. K. RUSSELL
Toronto, Ont.

F. H. SCHNELL
West Hartford, Conn.

C. A. SERVICE, JR.
Glastonbury, Conn.

C. H. STEWART
St. David's, Pa.

K. B. WARNER
West Hartford, Conn.

K. W. WEINGARTEN
Tacoma, Wash.

M. B. WEST
Lima, Ohio

G. L. BIDWELL
Washington, D. C.

ADVISORY TECHNICAL COMMITTEE

STUART BALLANTINE
WM. C. BALLARD, Jr.
LERoy M. E. CLAUSING
FRANK CONRAD
LEO C. YOUNG

MINTON CRONHITE
J. H. DELLINGER
C. L. FARRAND
PAUL E. GODLEY
F. C. BLAKE
MELVILLE EASTHAM

L. A. HAZELTINE
C. D. TUSKA
R. H. G. MATHEWS
GERALD M. BEST
S. KRUSE
D. G. McCAA

Address General Correspondence to Executive Headquarters, Hartford, Conn.
The amateur movement is on the boom the world around! Do you realize that in our Transatlantic Tests of this year there are entries not only from France and the several countries of Great Britain, but from Holland, Belgium, Luxemburg, Italy, and the Madeira Islands? We have our own brand of amateurs in Porto Rico, Alaska, and Hawaii; Cuba and the Philippines have theirs too. We are very much aware of the extraordinary activity of our conferees in Australia and New Zealand. We know there are hundreds of amateurs to be heard from in South America and in the English-speaking countries of South Africa. Just recently we were immensely surprised to learn of the existence of five hundred active amateurs in Japan! Why, if we could locate an amateur station to better than a dozen we might name, in, say, Cairo, and another in Calcutta, do you realize that a relay could be run around the world by amateur stations—right this month!

The transocean communication accomplishments of the past few weeks, linking Europe with our east coast and Asia with our west coast, have suddenly pitchforked the American amateur into numerous international relations. This intercontinental amateur contact is bound to give a tremendous impetus to amateur activity in every civilized country. One does not have to be a prophet to foresee the result: International Amateur Radio has arrived. With it comes new friendships and the joys of new conquests and accomplishments, but with it come new problems too. Just as we American amateurs always have found it necessary to have our cooperative arrangements, our divisions of hours, our standardized practices, so we believe there will have to be arrangements to govern our international activities, an international forum to which amateurs from all around the world can bring their ideas for cooperative advancement.

Isn't the answer self-evident? We need, as quickly as it can be arranged, an International Amateur Radio Relay League, in which the A.R.R.L., representing American amateur radio, can join the other amateur societies of the world in a common effort. Our president is sailing for Europe at this writing, and he carries this idea with him to lay before the amateur bodies of other countries. We hope that before long our dream of an I.R.R.L. may become a reality.

Our New Constitution

The American Radio Relay League has a new constitution, which went into effect by action of the Board of Direction on December 18, 1923. It is printed in its entirety elsewhere in the membership edition of this issue of QST. This Constitution and the By-Laws thereunder are the result of many months of study and hard work on the part of the Board and the officers of the League. Probably they are not perfect documents, but they represent a serious effort to give you readers of the A.R.R.L. membership what you want. You should read the new constitution carefully and acquaint yourselves with all its provisions.

With the resumption of amateur activities after the war the League operated under a constitution which provided for the government of its affairs by a Board of seventeen directors, elected at large by the entire membership. While we were a small and rapidly growing organization this probably was the best possible form of government for us. It was lacking, however, in that it did not take into account the idea of representation, and there were many large areas of the country which had no particular representation on the Board—the director was a director-at-large, and merely one-seventeenth of the whole governing power. The time has now come when we are a big enough organization to adopt the idea of divisional representation, and the new constitution provides that there shall be one director from each division in the United States, charged with the duty of keeping himself informed on the needs of the membership in his division, that he may act as their representative in the guiding of A.R.R.L. policies. The new Board will consist of these Directors, a Canadian General Manager representing all of A.R. R.L. north of the boundary, and a President and a Vice-President which will be elected by the new Board at its first meeting; the salaried officers of the League will not be directors.

The new Board will be elected immediately, and nominations are called for in notices published elsewhere in this issue. The new Constitution was not submitted to popular
vote, and it is possible that members will find some features of it not to their liking. It provides for the democratic election of a new Board, however, and the new Board will be the League's governing body, so if there is anything you don't like about the new document, give your suggestions to your new director when he is elected—he is to be your personal representative on the Board.

There is a certain element of inefficiency in any democratic form of government, and the dangers arising from this are in proportion to the expansion of the idea of true democracy. Our new form of government is more democratic than our old and, altho offering much-sought advantages in better representation, introduces added hazards simply because the new directors to a large extent will be primarily the representatives of certain areas. A.R.R.L. members everywhere therefore should give deep consideration to the choice of their new directors and choose men not merely for their ability to represent the division but for their executive ability, vision and wisdom—men who in all things will act for the greatest good of our organization.

Low Loss Tuners

By S. Kruse, Technical Editor

"For the last few years most of us have been using very, very poor tuners—and most of us would not even believe that they were poor. But interference increases all the time and even the slowest are now admitting that we must have sharper tuners. We can so improve the plain two-circuit regenerative tuner that it will make most of the elaborate new circuits look rather sick!"

There has been a most remarkable amount of interest in the design of good tuners since we published Mr. Hassel's article "Short-wave Tuner Design" in the December issue of QST.* For the past few years most of us had been using very, very poor tuners—and most of us would not even believe that they were poor.

What is a Good Tuner?

Let us decide at the start what a good tuner must do—then we can start thinking of the ways to make it do those things. Very well, a good tuner must—

1—Cover the right wave-length range.
2—Tune sharply: that is, cut out unwanted signals.
3—Be simple and have few controls.
4—Not send out an electro-magnetic carrier wave when receiving C.W. with an oscillating tube.
5—Be absolutely reliable, so that the same dial settings will give the same result every time.
6—Be low-priced and easy to build.

These are 6 things that we are going to demand of our tuner. We will now think them over, but at the start I will tell you that, when we are done with requirements No. 1 and No. 2, we will automatically have taken care of the rest.

1—Wavelength Range

The average broadcast receiver fits the broadcast waves. The average amateur tuner is a crazy joke that starts at 180 or 190 meters and goes up (not down) to 700 meters or so. Last week I found that one of the strongest amateur stations in Illinois for years had been using a tuner that would not go below 185 meters; the Lord knows what its upper limit was. Yet the owner of this thing was dead sure that "the short waves ifre no good—they never get to us"! All hands will now guess who the man was.

Why is this? Partly it is a "hangover" from the times when amateurs had a 375-meter special wavelength, and partly it is just plain carelessness.

The effect of over-large coils and condensers is a very bad one. Not only are all short-wave stations tuned in at the bottom of the condenser scale but the extra hardware introduces needless resistance. Note that in the tuners pictured in this article the range does not go above what is actually needed.

If you don't want to make a new tuner then peel some of the extra wire off your coil and get rid of the extra condenser plates, until the wavemeter tells you that you are just reaching up to 220 meters—then you can get down to 100 without trouble.

2—Resistance and Sharp Tuning

A high resistance circuit will not tune sharply. There are no exceptions to this rule—a high resistance circuit will not tune sharply. Put that down as Rule A—the first commandment in making any tuner that will be worth using. Just to get it down good and solid let's say it once more, in capitals—A HIGH RESISTANCE CIRCUIT WILL NOT TUNE SHARPLY!!

Both amateur and commercial tuner-
Avoid composition sockets—they save 10¢ and ruin the tuner. Get a good socket that is made of porcelain, hard rubber or moulded bakelite. If you are in doubt as to your socket, write the maker and ask him what the material is.

When running leads from the "high" side of the coil to the stationary plates of a good coil, a good condenser and a good socket into a tuned circuit the whole result can be entirely ruined by too-close coupling to another circuit which has high resistance. Now an antenna circuit always has resistance that is very high; as a usual thing the resistance is 10 or more times that of a good circuit such as the one suggested.

A CAREFULLY DESIGNED REINARTZ-TYPE TUNER BUILT BY BOYD PHELPS AND USED AT IHX-10A-1XAA

1. L1—Secondary of the wave trap. 12 turns of No. 16 D.C.C. wound on a 3-½" tube.
2. L2—Primary of the wave trap. 5 turns of light single-conductor lamp cord wound directly over L1 and tapped at each turn to the upper switch on the panel. This switch changes the coupling of the trap to the antenna, or cuts the trap out when it is not wanted.
3. L3—12-turn secondary coil, wound of No. 16 D.C.C. wire over wedge-shaped wooden strips ¾" high. These strips rest on the surface of a bakelite tube 3½" in diameter. The turns of this coil are slightly spaced.
4. L4—5-turn primary coil, wound of the same piece of wire as L3. Turns are spaced so that taps can be taken easily to the lower switch on the panel. This switch does NOT tune but adjusts the antenna coupling.
5. L5—Plate coil. 18 turns of No. 16 D.C.C. wire wound closely on the Bakelite tube, ½" below the primary.

C1—Trap-tuning condenser. 1000 micromicrofarads (.001 microfarads).

Wavelength range with the windings shown is 90-225 meters, no secondary taps being needed for the amateur range. The tuning is practically unchanged with different antennas. Wavelength range of the trap is from 80 to 310 meters, allowing it to cut out troublesome 300 meter sparks such as NAO. To change this tuner to fit the broadcast range, increase the turns of the secondary coil L3 to about 40, increase the turns of the trap coil L1 to about 30.

The condenser, and from there to the tube, run them up in the air. 9 times out of 10 it makes no difference at all, but play safe.

Resistances "Coupled Into" the Circuit

When one is all through assembling a naturally it will spoil our beautiful secondary to couple closely to such a bad circuit —the signals will be louder but the sharpness of tuning will be entirely spoiled. The closest possible coupling is that ob-
tuned receiving circuit into four general classes: the coil resistance, the condenser resistance, the resistance caused by things connected to the tuned circuit, and the resistance that is “coupled into the circuit.”

Coil Resistance
About the worst defect of most tuners lies in the high resistance of the coils used. This resistance is not generally in the wire, at least not in the cases where wire larger than No. 16 A.W.G. (B. & S.) is used. The resistance is in the things that are near the wire—the tube on which the wire is wound, the varnish with which the coil is painted, sometimes even the insulation of the wire itself. A perfect coil would be one wound on air and insulated with air. We can’t make such a thing but we can come pretty close to it by using wedge-shaped strips as shown in the Rehnartz-type tuner of Fig. 4, or by making “basket” coils as shown in the other two tuners. If you absolutely must wind the wire right on a tube, then at least follow the methods given by Mr. Hassel’s article (QST for December*); they are very much worth while. Above all things, avoid heavy varnishes, stranded or “Litz” wires, and soldering pastes. Use good heavy solid wires, tie them into place mechanically instead of pasting them down, use rosin for soldering, and keep the coils at least two inches clear of all other parts of the set—panels, condensers and rheostats included.

Taps from Coils
Tapped coils in the tuned circuit are always poor business; only careful engineering will enable you to avoid trouble. Try to cover the wavelength range with a single coil and if you do not succeed use a separate loading coil, not too close to the main coil.

Condenser Resistance
As long as one uses a poor coil (like those of most tuners) it does not make much difference whether the variable condenser is good or rotten. But as soon as one uses a really good coil there is a big difference between a not-very-good condenser and a really good one. This difference does not show up as a grand increase on strong signals but in the form of a lot of new signals that were never heard before. In one particular case we found that we could read 6PL very nicely with a single tube when using a good condenser (a Cardwell in this particular test) but could barely hear him with a condenser having thick moulded-composition ends. A General Radio 247 condenser gave about the same results as the Cardwell, while it was entirely impossible to hear the signal when using a fibre-insulated condenser.

What Makes a Condenser Good
It is rather hard to set down air-tight rules for recognizing a good condenser by looking at it. In general a good variable condenser is of the air type and is built so that leakage must go thru long paths in material that is not too thick or wide. In the case of condensers with end-plates this means that the stator bolts should be far from the rotor bearing and that the end plates should be as thin as possible. Where insulating bushings are used they should be large and be turned spool-shaped (as in the large Coto-coil condenser) so that only the rims will touch. Naturally the use of thin insulating washers or small-diameter bushings will result in a poor condenser; it will have high resistance and the zero capacity will be high. In any case the insulating material must be good—black fibre and low-grade compositions are never good, while hard rubber or Pyrex glass can always be trusted. Moulded bakelite is also good, if carefully used, but sheet bakelite does not seem to show up quite as well, although much superior to fibre and compositions.

Measured Resistances
Different manufacturers measure their condenser resistances at all sorts of frequencies—the result being that no one knows anything. When writing a maker ask what the resistance is at 1000 cycles, a convenient value which ought to be standard. A 500 micromicrofarad (.0005 μF) condenser, set at full capacity, should not have a resistance of over 60 ohms at 1000 cycles; a really excellent condenser will not have a resistance of more than 20 or 25 ohms at 1000 cycles; assume the same capacity.

Mounting the Condenser
Always connect the condenser so that the wire to the grid-leak and grid condenser comes from the stationary plates and the wire to the filament comes from the rotary plates. It is then possible to tune in signals without trouble from “hand capacity”, one of the most exasperating things in radio. This connection puts the stationary plates at high voltage, hence the screws that hold the condenser to the panel must not connect to the stationary plates. If they do, get a different condenser. Do not, however, make the mistake of throwing out a condenser, just because it has metal end plates. This construction is perfectly o.k. as long as the metal end plate is not connected to the stationary plates.

Resistances “Connected Into” the Circuit
We are not through when we have made a good coil, mounted it carefully, and connected it to a good variable condenser. The whole affair can be ruined by connecting in a “moulded mud” socket or a camswitch of poor construction. In general stick to the idea of not having any switches at all in the tuned circuit—it is a bad practice.
Avoid composition sockets—they save 10¢ and ruin the tuner. Get a good socket that is made of porcelain, hard rubber or moulded bakelite. If you are in doubt as to your socket, write the maker and ask him what the material is.

When running leads from the “high” side of the coil to the stationary plates of good coil, a good condenser and a good socket into a tuned circuit the whole result can be entirely ruined by too-close coupling to another circuit which has high resistance. Now an antenna circuit always has resistance that is very high; as a usual thing the resistance is 10 or more times that of a good circuit such as the one suggested.

A CAREFULLY DESIGNED REINARTZ-TYPE TUNER
BUILT BY BOYD PHELPS AND USED AT 1HX-10A-1XAQ

A wave-trap is built into this tuner.

L1—Secondary of the wave trap. 13 turns of No. 16 D.C.C. wound on a 3-\( \frac{3}{8} \)" tube.
L2—Primary of the wave trap. 5 turns of light single-conductor lamp cord wound directly over L1 and tapped at each turn to the upper switch on the panel. This switch changes the coupling of the trap to the antenna, or cuts the trap out when it is not wanted.
L3—12-turn secondary coil, wound of No. 16 D.C.C. wire over wedge-shaped wooden strips \( \frac{3}{8} " \) high. These strips rest on the surface of a bakelite tube 3-\( \frac{3}{8} " \) in diameter. The turns of this coil are slightly spaced.
L4—5-turn primary coil, wound of the same piece of wire as L3. Turns are spaced so that taps can be taken easily to the lower switch on the panel. This switch does NOT tune but adjusts the antenna coupling.
L5—Plate coil. 18 turns of No. 16 D.C.C. wire wound closely on the Bakelite tube, \( \frac{1}{2} " \) below the primary.
C1—Trap-tuning condenser. 1000 micromicrofarads (.001 microfarads).

Wavelength range with the windings shown is 90-225 meters, no secondary taps being needed for the amateur range. The tuning is practically unchanged with different antennas. Wavelength range of the trap is from 80 to 310 meters, allowing it to cut out troublesome 300 meter sparks such as NAO. To change this tuner to fit the broadcast range, increase the turns of the secondary coil L3 to about 40, increase the turns of the trap coil L1 to about 30.

the condenser, and from there to the tube, run them up in the air. 9 times out of 10 it makes no difference at all, but play safe.

Resistances “Coupled Into” the Circuit

When one is all through assembling a Naturally it will spoil our beautiful secondary to couple closely to such a bad circuit —the signals will be louder but the sharpness of tuning will be entirely spoiled. The closest possible coupling is that ob-
tained in a single circuit tuner—which is enough to account for the well-known broad tuning of that ancient circuit.

Therefore keep the coils well in the clear as stated before.

A RADICALLY DIFFERENT LOW-LOSS COUPLER
BUILT BY F. H. SCHNELL AND USED AT IMO-1BHW-1XW

L1—Antenna coil, 5 turns, 3/4" diameter, wound and mounted as in the IBGF tuner.
L2—First section of secondary, 6 turns No. 18 D.C.C. wire, basket-wound as shown below, diameter 1/2".
L3—Second section of secondary, 12 turns wound same as L2.
L4—Secondary loading coil, 30 turns, wound like L2 and L3. Other positions for this loading coil were tried but it disturbs the tickler action if not cut in where indicated. A really satisfactory switching system has not been found; still the results are excellent over the entire range.
L5—Tickler coil, 11 turns No. 28 D.C.C., 1/4" diameter, arranged to be turned by tickler shaft.
C1—Allen D. Caldwell condenser, 3 rotary, 4 stationary plates, capacity about .0002 microfarads.
C2—Grid condenser, mica, capacity 1000 micromicrofarads (.001 microfarads).
C3—Mica by-pass condenser, capacity .001 microfarads.

Ratio of belted verniers is 6/1:1 on the secondary tuning condenser, but 4/1:1 on the tickler and the primary coil. The two-part secondary completely avoids interaction between the tickler and the antenna-coupling. Either one of them can be moved without causing the note to slide around, as is the annoying habit of ordinary tuners.

The grid leak has a resistance of 4 megohms as a UV-201-A tube is used.

Short wave range, 63 to 123 meters; long wave range, 113 to 227 meters. For broadcast range L2 should have 12 turns; L3, 20 turns; L5, 22 turns; and C1 a capacity of .0005 microfarads. Other values and dimensions unchanged.

There are still other ways of coupling resistance into a circuit; any piece of metal placed near a coil will raise the resistance, so will any large piece of insulating material. Therefore keep the coils well in the clear as stated before.

**Shielding and Cabinets**

Several experimenters have written in to complain that their sets do not work as
Cutting Down Resistance by Regeneration

We are told by text books that regeneration has the effect of reducing the resistance of a poor input circuit. Ballantine does not agree with this and says (page 209, 1st edition) "The fact that the tickler coupling, or rather the feedback energy, compensates for the actual resistance of the grid circuit, at least so far as signal response is concerned.........is also shown by the several curves, representing the effects of various inserted resistances in the tuned grid circuit."

Those who are interested in the theory of the matter may look up Ballantine's Fig. 117. It is only necessary to say that some dozens of us have experimentally checked Ballantine's statement and find that in practice he is entirely correct—regeneration does not make a poor secondary into a good one. The signal strength can be brought up by regeneration but it will never be as high as with a good secondary. Neither will the tuning ever be as sharp as if we had started with a low-resistance secondary; and, finally, the good secondary will bring into audibility some stations that cannot be heard with the poor secondary. These statements are of course beyond doubt when operating non-regenerative, but I am insisting that they are also true when operating regenerative and when operating with the tube oscillating.

About the worst form of the "compensation-of-resistance-by-regeneration" idea is the business of attempting to turn the antenna itself into a low-resistance circuit by regenerating into it. In the first place the desired result does not take place—the thing never tunes sharply—and in addition there is sent out a carrier wave that makes life miserable for a 5-mile radius around, for anyone who happens to listen on the same wavelength.

Planning a Good Tuner

If we are to use the lessons learned above it would be a good idea to start by trying them on a very simple tuner; perhaps it will be so much improved that we do not need a more complicated one. The simplest tuner of all is the "single circuit"—but I draw the line at that. It is entirely too good a sending set when it starts oscillating, and it never can be made to tune really sharply, as I have stated above. The next most simple tuner is a two-circuit tuner in which the antenna is not tuned. This has no more adjustments than the single-circuit, but it does tune much more sharply, and it does not transmit so strongly. Then we may add regeneration by means of a tickler or a voltmeter in the plate. Personally I prefer a tickler as it has much less effect on the secondary tuning, also because it is far less "tricky" in handling.

What Is New About It

What is there new about a loose coupler with a tickler? Not a thing—not a thing in the world. But just the same there will be something very new and different in your radio shack if your coupler is rebuilt along the lines suggested in this paper. That something will be the results obtained. You will hear stations not heard before, you will forget interference that was terrible in the past. This is not mere talk, it has been plentifully proven by a large group of our members. The old "loose coupler with a tickler" is still with us, and doing beautifully in its new form. In broadcast reception also we can so improve the plain two-circuit regenerative tuner that it will make most of the elaborate new circuits look rather sick.

The Other Four Points

The other four requirements have now been taken care of, for we have a tuner that is (3) equipped with very few controls, (4) does not send out a strong carrier, because the antenna coupling is low, (5) is absolutely reliable in operation and (6) is about the cheapest receiver in existence.

Shortening Up the Conversation

We have been talking about our two most important points—Wavelength Range and Sharp Tuning. This leaves four more points but luckily we do not have to take them up; they will take care of themselves, as we shall see.
Direct Contact With Japan

U7HG Works Japanese JUPU, over Distance Considerably Greater Than Transatlantic Work. Tacoma Gets Over With 100 Watts

A SINGLE unaided amateur has worked across the Pacific! No prearranged schedules were used, no special station erected, yet two-way amateur communication has been accomplished between Tacoma, Washington, U.S.A., and Tokio, Japan, a distance of 4650 miles.

Our dream of International Amateur Radio rapidly is becoming a real and living thing. When the world-wide net is complete, U7HG can be proud of having station. The call is not listed in any of our records. Was it an American ship operator with a ham set abroad? We don't know yet, but amateur wavelengths were used and it has to rate as two-way amateur working.

This excellent work is right in line with the previous performance of 7HG, which has carried on two-way work with c1AC in Nova Scotia, u6CEU in Hawaii, and has been heard in all districts. The station is located on a high hill and gets out beauti-

Charles York at His Station, 7HG, First To Work Two-Way Across The Pacific.

added one of the most difficult threads of all by working into a country where the mere existence of stations capable of doing the job was not suspected.

Here is how it all happened. Charles York, 7HG, got on the air about midnight of November 25-26 and was engaged in handling traffic as usual. At 1 o'clock he heard a pure C.W. signal on 200 meters calling him and signing JUPU. He returned the call at once, and tho QRM was bad, managed to hook up QRK with good communication. The operator at JUPU was an American, and gave York a message to his mother in Cambridge, Illinois. He gave his QRA as Tokio, but unfortunately QRM and QRN brought an end to the contact before his exact location could be learned and whether ship or land

fully. The transmitter itself is a very compact job on a 12x16 panel, using two Telefunken D.R.P. type RS5C2 tubes in a Hartley circuit, with 1000 volts A.C. rectified and filtered to the plates. Altho the set is capable of handling higher power, the input was 100 watts and the antenna current 2.8 amperes at the time of the record. 7HG’s antenna is a 6-wire flat-top 50 ft. long, supported by a 65-ft. pole at the free end and a 40-ft. one at the lead-in end; counterpoise used. The receiver is a homemade spider-web affair, condenser-tuned, and uses detector and one-stage audio for traffic work.

This accomplishment is certainly F.B. art, and 7HG has our very hearty congratulations. Well done!

—K.B.W.
The Progress of Transatlantic Amateur Communication

Many More Stations in England, France and Holland Hook Up With U.S.A. and Canada on the Shorter Wave

A MONTH ago in these pages we waxed hugely enthusiastic over the first transatlantic amateur contact, made possible by the pioneering work of Deioy, Schnell and Reinartz. Following in their footsteps there have been developments in the past few weeks which make our first article seem amusing, accomplishments before which the original one shrinks into relative insignificance. Great Britain has followed closely on France in connecting up with us and at least four British stations have worked America; another Frenchman and a Dutchman have been in communication with our men. On this side at least nine of our fellows have hooked up across the "herring pond" at this writing (goodness only knows what it will be when these words get into print) and the short-wave Europeans have been heard by literally hundreds of Americans, some of them as far west as the Pacific.

It is hard for us yet to realize the tremendous and far-reaching consequences of this new contact. It is revolutionizing many of our technical ideas, it has caused the transfer of much amateur interest from 200 meters to the shorter waves. It is the absorbing topic of amateur conversation these days, on both sides of the ocean. The lucky ones to hook up transocean are enjoying a brand-new sensation in communicating with the amateur of another country, with their new expressions, new abbreviations, new styles. The need for an international auxiliary language looms large. Governments are taking cognizance of the new work their private citizens are doing, and radio legislation both international and domestic probably will be affected. A new kind of "fist" is coming into being—a heavy, firm style that will make each dot carry across separately—the transocean "fist." Old-time amateurs who thought they had exhausted every thrill of the game are returning now, to tackle Europe. Oh! for the pen of a Wells, to picture the possibilities opened to amateur radio on both sides of the Atlantic, now that we are QSO!

Working England

Probably the most important development of the past month has been the establishment of communication between England and America. It was the Editor's good fortune to be the first American ham to hook up with a Britisher, when f8AB connected 1MO on the morning of December 8th with g2KF, the station of Mr. J. A. Partridge at 22 Park Road, Collier's Wood, Merton, London, S.W.19. Contact was first established at 1:13 a.m. E.S.T. and lasted until 8:30 a.m. E.S.T., or 8:36 a.m. in London, at which time 1MO was still readable! G2KF is described in greater detail in "Amateur Radio Stations" of this issue; the station used 100 watts input, with 1.8 amperes in the antenna on a low wave; 1MO used the same equipment and wave as in the communication with f8AB, described last issue. A surprising feature of the communication was that as dawn wore on, on the other side, signals at 1MO became somewhat better. 2KF's signals were quite good up to 3:14 a.m. E.S.T., readable up to 3:21, and last heard at 3:27. It was a great night in the life of both operators.

Since that time 1MO-1XW has worked g2KF eight times, on one occasion hearing his voice on phone, and 2KF has also connected with 2AGB, 1XAQ, 1XAM, 2AWS and c3BP, working some of these stations several times. All the low-power records go to Porter of 2AWS, Freeport, N. Y., who did the job with but two "5-watters", with 0.8 amps antenna current: tie that!

The next Englishman to get QSO was g2SH, Frederick L. Hogg, of Highgate, London, probably QST's most indefatigable British correspondent. Again the Editor had the pleasure of tying up with an Englishman for his first U. S. A. communication, when 1MO and 2SH hit it off on the morning of December 12th from 12:47 a.m. to 2:53 a.m., E.S.T., four messages being handled and the old sock thoroughly chewed. Since that time c1BQ speared him with three "5-watters", and c3BP, u2AGB, and u1XW have worked him several times.

Canadian 1BQ gets the honors with g5BV, working him first on the morning of Dec. 28th and passing messages both ways. U1XW tied up with him the evening of that same date for 20 minutes, but it was pretty unsatisfactory.
More With the Continent

Another Frenchman got in the swim on the morning of Dec. 16th when f8AB connected the Editor at 1MO with f8BF, the station of Mr. Pierre Louis, 8 Rue Mouillere, Orleans, for 30 minutes of perfect working. F8BF has long been a member of the A.R.R.L. and was one of the most successful receivers in last year's Transatlantics. Since then u2AGB has also worked him.

2AGB gets the laurels for the first has been lost—it's several dozen times, anyway, and the messages handled run in the fifties.

The Short Waves

All of this transocean work has been done on waves between 108 and 118 meters. Probably we went thru so many years of vain struggling for contact with Europe simply waiting for a Deloy and a Schnell to try it on the shorter waves. It is interesting to contemplate why it was successful then, altho all previous attempts on 300

THE FIRST BRITON TO WORK ACROSS THE POND: Mr. J. A. Partridge, at his station G2KF in London. Mr. Partridge is an A.R.R.L. member; his certificate hangs framed on the wall, and on the table is a copy of QLD.

Hollander, having worked PCII on the night of Dec. 27th, taking a long message from him for A.R.R.L. headquarters. 2AGB has the record at this writing for the greatest number of Europeans worked, having communicated with f8AB, f8BF, g2SH, g2KF, g2OD (no particulars), and nPCII. All of this was done with one 50-watter with a hole in the plate, putting 1 lonely ampere in the antenna at 118 meters.

Meanwhile f8AB keeps up a merry tattoo and is by long odds the best European bet. His signals have been copied by 7LR in Eugene, Ore., and 7WT in Arlington, Washington, both on the Pacific coast, and he has worked 9T2, 2CFB, 1CMP, e1BQ (three 5-watters), as well as 1XQA, 1XAM, and 1MO-1BH, 1XQA was one of the first three stations to work him, after which there followed quite an interval before any new ones showed up, and 1XQA's record really belongs in last month's story of the original contact. 1MO-1XW has worked f8AB so many times that count meters had failed. Radiation at the higher frequency is somewhat better, it is true, but not enough of itself to account for the difference; QRM is less, it is true, but that can't account for it. As our Technical Editor points out in another article in this issue, the secret undoubtedly lies in the simple fact that we finally have tried a wave which is well below the fundamental of our aerials, and the greatly increased radiation caused by that method of working has done the trick! Probably if we build special small aerials for 100 meters we would be no better off than in past years on 200 meters. Get below your fundamental if you want some real radiation.

1IMO-IXW's signals are reported the loudest transatlantic signals ever heard by European amateurs, including the American high-power stations! F8AB has been read 25 ft. from a loudspeaker operating on but one audio step at many American stations. Don't these results speak for themselves?
And the receivers? 2AGB uses a superhet, and 8AB has a Grebe CR-13, but most of the other stations used our old familiar autodyne circuit and a single audio stage. When 1MO and 2KF compared notes and found out that both were using this kind of receiving equipment, 2KF said: “Wot abt supers?” “Hi”, said the op at MO, “keep the supers”. Take a tip: see the article on low-loss tuners in this issue.

The reliability of the short-wave communication is its most surprising feature. While the transatlantic signals are not of the same intensity every night, and sometimes gradually change during a night, we have never observed anything that could be called fading on those short waves! Strays and QRN permitting, communication can be had any night, it seems. Deloy of 8AB in fact found his signals doing so exceptionally well that he has cut his power in two to save tubes. The British amateurs seem to be working on short waves by virtue of short aerials, and not by creeping below the fundamental through the use of series condensers, and as a result their signal strength is vastly inferior to that of the French and Dutch amateurs (at least as observed at Hartford), but in spite of that handicap, that faint little peeping note, barely readable, will maintain that same constancy for hours at a time and never swing. It’s marvelous!

Some Historic Messages

As in every historic amateur communication, many formal messages of greeting have been handled across the Atlantic in the new contact. Perhaps foremost amongst these was one to Senator Marconi from our A.R.R.L. president, sent as u1MO’s Nr. 3 to 2KF on the morning of December 11th:

MARCONI LONDON.
AMERICAN RADIO RELAY LEAGUE PRESENTS ITS RESPECTS AND THIS EVIDENCE OF DAWN OF INTERNATIONAL AMATEUR RADIO.
HIRAM PERCY MAXIM

Mr. Marconi’s gracious reply, a facsimile of which is shown as an illustration in this issue, came back by commercial radio instead of amateur, but perhaps that is useful in certifying the reality of the original amateur contact:

LONDON DEC 17
MAXIM RELAY LEAGUE
HARTFORD, CONN.
PLEASE ACCEPT MY THANKS AND APPRECIATION WHICH I OFFER YOU AND ALL CONCERNED FOR YOUR CORDIAL MESSAGE TRANSMITTED AND RECEIVED BY AMATEUR STATIONS.
MARCONI.

A message was sent to Admiral Sir Henry Jackson, past president of the Radio Society of Great Britain (forgetting for the moment that Dr. Eccles is now the president of the society), as follows:

SIR HENRY JACKSON L.G.
A.R.R.L. HAS GREAT PLEASURE IN SENDING R.S.G.B. GREETINGS BY DIRECT AMATEUR CONTACT ACROSS ATLANTIC EXPECT VISIT YOU IN LONDON FEBRUARY.
HIRAM PERCY MAXIM.

G2GF’s Nr. 5 on the night of Dec. 15th contained the reply:

THE PRESIDENT AND PAST PRESIDENT OF R.S.G.B. HAVE RECEIVED YOUR GREETINGS AND JOIN WITH YOU IN TENDERING CITATIONS TO THE AMATEURS OF AMERICA AND OF BRITAIN NOW UNITED BY THIS TRIUMPH.
ECCLES PRESIDENT R.S.G.B.

QST exchanged greetings with its British contemporary, Wireless World & Radio Review, and A.R.R.L. officers shook hands across the pond with the gentlemen in charge of arrangements for this year’s tests, Mr. P. R. Coursey in England and Dr. Pierre Corret in France.

Scooping the Tests

The Traffic Manager has said that at the conclusion of the annual tests this year we can all try for first transatlantic communication. Hi!—the short waves have
scooped the tests. But at that we suspect there will be some brilliant additions to the record when the lid goes off of 200-meter work on January 10th.

Meanwhile the Tests have been highly successful, and the following European amateurs have been heard in this country up to January 2d:

British: 2FN, 2FQ, 2IN, 2KF, 2KL, 2KO, 2LO (broadcasting station using code), 2NM, 2KW, 20D, 2SH, 2SZ, 5AT, 5BV, 5LC, 5PU, 6NI, 6XX, 6YA.

French: 8AB, 8AÉ, 8AZ, 8ARA, 8BÉ, 8BF, 8BM, 8CD, 8CS, 8CT, 8LY.

Dutch: PA9, ODV, PCH, PAR14.

Which means, by the way, that Burnham, 2FQ, owes us a clock. Thanks, gang.

It's getting to be a common thing now to overhear a pair of foreign hams chewing in their native tongue. What do you say, fellow amateurs, about all of us taking up Esperanto or Ido?

—K.B.W.

An Amazing World's Record

*Australian Station Sets New Standards for Amateurs*

By F. Basil Cooks, F.R.A.S.*

In the early morning of September 25th the following message went from New Zealand 4AA to Australian 2CM:

"OK Sigs QSA strong and steady throughout. Another world's record gone west! Congratulations O.M. GM-Bell."

BELL'S STATION, 4AA, IS 1500 MILES FROM 2CM AND HAD JUST COPIED A TEST SENT BY 2CM WITH AN INPUT POWER OF .004 WATTS!!

There is no doubt about this—it absolutely happened.

—Editor

THE experimenters in Australia, especially in the cities, are only allowed 10 watts of power, consequently great attention has been given to reaching long distances with a minimum of power. Mr. C. D. Maclurcan (2CM), of Sydney, is so far the leader in this work. He has just recently conducted some experiments with Melbourne (500 miles) and New Zealand (1500 miles) using a power of only a few thousandths of one watt. The writer feels that the details of these experiments will be of great use and interest to the experimenter.

How the Tests Were Run

Mr. Maclurcan started up on Monday, September 24th, at 5 P.M., while there was still an hour of daylight, and called 3JU (Mr. Hull of Melbourne at 500 miles). Arrangements had previously been made for conducting low power tests, a code letter to be used for each reduction in power. The code letters were known only to Mr. Maclurcan and it might be mentioned that Mr. Hull was not aware of the power being used. After establishing connection Mr. Maclurcan commenced reducing power and sent the following test on 210 meters.

<table>
<thead>
<tr>
<th>PLATE</th>
<th>PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT</td>
<td>CURRENT</td>
</tr>
<tr>
<td>VOLTS</td>
<td>M.A.</td>
</tr>
<tr>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>390</td>
<td>20</td>
</tr>
<tr>
<td>270</td>
<td>16</td>
</tr>
<tr>
<td>220</td>
<td>10</td>
</tr>
<tr>
<td>122</td>
<td>4</td>
</tr>
<tr>
<td>80</td>
<td>3</td>
</tr>
<tr>
<td>52</td>
<td>1.5</td>
</tr>
</tbody>
</table>

At this test Mr. Maclurcan took the readings himself and had no witnesses. Consequently at the next test on Tuesday,

*—Vice President, Australian Radio Relay League; Secy., Wireless Section, Pan-Pacific Congress, 1923; Director of Radio for David Jones, Ltd.
September 25th, Mr. J. S. Barling was present throughout and certifies to every meter reading.

The readings of this test are of interest:

<table>
<thead>
<tr>
<th>PLATE VOLTS</th>
<th>M.A.</th>
<th>WATTS</th>
<th>CODE LETTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>380</td>
<td>18</td>
<td>6.8</td>
<td>F Received</td>
</tr>
<tr>
<td>192</td>
<td>6</td>
<td>.96</td>
<td>K Received</td>
</tr>
<tr>
<td>120</td>
<td>3</td>
<td>.36</td>
<td>R Received</td>
</tr>
<tr>
<td>60</td>
<td>2</td>
<td>.12</td>
<td>U Received</td>
</tr>
<tr>
<td>44</td>
<td>1</td>
<td>.044</td>
<td>L QRM VIM</td>
</tr>
</tbody>
</table>

VIM (2 k.w. spark) is only about two miles from 3JJU while 2CM was 500 miles away, as stated before.

1500 Mile Tests

On the following Wednesday Mr. Mac-

lurcan called Mr. Frank Bell (4AA) of Waihemo, Shag Valley, New Zealand (1500 miles away over land and water), who replied and asked 2CM to conduct a low power test with him then and there. After chatting for half an hour (with an input of about 8 watts!!—Ed.) the test commenced at 9:30 P.M. Conditions for receiving in New Zealand were good. (By American standards they were more nearly miraculous!!—Ed.)

The first test went out at 175 volts with a plate current of 4 milamps., making a power input of 0.7 watt. 4AA replied "QSA QRP give plate current and voltage."

The power was then reduced to 0.04 watts to the plate. (40 volts and 1 mil-amp.) Again 4AA that unnecessarily great power was being used.

The next test was at 20 volts, absorbing .5 milamp. This also did not seem to satisfy 4AA who not only received the code letter but received and repeated whole sentences.

As it was past midnight in New Zealand and nearly that in Sydney, only one further test was agreed to. Mr. Maclurcan this time determined to satisfy even Mr. Bell, so he reduced his plate voltage to 15, thereby securing a plate current of .25 milamp. The input was only .004 watts. After repeating the message back, 4AA concluded:—

"OK QSA signs strong and steady throughout. Another world's record gone west. Congratulations OM GM. Bell"

Checking Up

The following day Mr. Joseph, an expert in this work, certified Mr. Maclurcan's instruments as correct within one percent.

On the 4th, 2CM received this telegram:

"Heard your lowest power last night, writing. Odjers. Charters Towers, Queensland."

The confirming letter repeated the whole proceedings, altho Charters Towers is 1400 miles north of Sydney, whilst 4AA is about 1500 miles to the east.

Station 2CM

Mr. Maclurcan stated that he considered his success was entirely due to an absolute regard for detail. He has an ideal site for his station and has very carefully designed his aerial and all component parts, there are no loose wires or poor contacts in his station, and every part of his gear has been thoroly measured and tested.

The antenna consists of a 6-wire cage, T type, with a top 100 feet long and 80 feet high, spaced on 6 hoops 4 feet in diameter. The downlead tapers from 12 inches to 4 inches. The counterpoise is fanned out in a circle of 100 feet in diameter, 7 feet above ground. (A la 9ZT et
8AQO—Ed.) The natural wavelength of the antenna system is 185 meters and the resistance at 210 meters is 8.7 ohms. The capacity is .0083 microfarads.

The power input to the set was regulated by the filament rheostat of the Kenco-tron rectifier valves. The instruments used to measure the input to the sending set were a Weston volt-ammeter Model 280, and a Paul Unipivot Galvanometer with a thermo-couple, the combination having been certified correct within one percent by Mr. Joseph.

Some special tests were run to see with just how low an input the tubes would oscillate. The president of the Kurringai Radio Club, Mr. W. E. Wilson, manipulated the oscillating wavemeter, which was used to determine when the set was oscillating. Other members of the same club took the meter readings. It was found possible to make the set oscillate with powers lower than those used in the transmission tests; the following readings were taken with the aerial connected. The transmitter oscillated strongly but the antenna ammeter was not sensitive enough to show any current. However, the signals were actually getting out as several amateurs 10 and 12 miles away heard everything and reported good signals.

Low Power Oscillation Test at 2CM

<table>
<thead>
<tr>
<th>Plate volts</th>
<th>Plate current</th>
<th>Plate power-watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td>4.2 milamps</td>
<td>.01470</td>
</tr>
<tr>
<td>1.1</td>
<td>1.3</td>
<td>.00200</td>
</tr>
<tr>
<td>.4</td>
<td>.8</td>
<td>.00032</td>
</tr>
</tbody>
</table>

Finally a well-used dry cell was used instead of the usual source of plate power and with this Mr. Maclurcan was able to talk to a friend several miles away.

As a result of these many experiments, conducted by Mr. Maclurcan, it occurred to him that this low power transmission could, and should, be turned to some account for the public generally.

(The outcome of this planning is a test of such great interest to all A.R.R.L. that we have set this part of the story aside as a special article, which will be found in another portion of this magazine.—Editor.)
Get Ready for "IL" Work With Foreign Amateurs

By Oscar C. Roos*

February, 1924

QST

21

Now that transocean amateur communication is with us, what are we going to do when we can’t talk the other fellow’s language and when he doesn’t know ours? There is a way out of the difficulty, if amateur radio the world over will adopt an auxiliary international language which everybody can use in addition to their native language. There are two such projects, each well recognized and with its host of followers. For over a year A.R.R.L. Headquarters has been studying the problem with a view to eventually adopting some project for official A.R.R.L. use. In this article Mr. Roos shows how easily these synthetic languages may be learned. Some day we hope to teach one of them thru a regular department in QST. We will be glad to have expressions on the general subject from our readers.—Editor.

What is going to happen to DX work during the next eighteen months? The amateurs of Europe are organizing everywhere. They have their amateur periodicals and they are working overtime to perfect mutually beneficial arrangements. If anyone had said a year ago that amateurs would be talking at 3000 k.c. across the ocean for hours, the prophecy would have been ignored or scoffed at. Now it is here as an accomplished fact, and amateurs, broadcast listeners and studio directors will have to figure out quickly a new attitude towards foreign fans.

The American amateur may ask what concern this is of his. He may think, “Suppose Europe does DX us, what of it? Can’t we go ahead and wait for their dope to be translated? Don’t they understand our ham abbreviations?” This is the amateur’s natural attitude of dislike for new policies. European amateurs are very much interested in our performances, and, besides, we want to talk with them. The barrier of a foreign language is a formidable one. It takes five days to cross the United States by rail, and in the journey we encounter but one tongue; Europe can be crossed in two days, yet there are dozens of languages. One can’t spend the time to learn them all.

As a result, numerous international-language radio societies are being formed in Europe, where the fans are convinced that some new and very simple language must be used for international DX work, letters, postals, and for radio press service. This is not at all a movement for a universal language to replace national languages; its object is to perfect an auxiliary international language. The I.L. being used by these European amateur societies is called “Ido” by some, but its original name was “Ilo” from “International Language,” with an “o” added to show it is a singular noun. I. L. grammars can be had from 20¢ to $1.50 by applying to the writer at Beacon Chambers, Boston, Mass. For the best translation of the following specimen of the I.L. a prize of a complete grammar will be given by the writer. You can get an elementary grammar and 1600-word vocabulary to assist you for 20¢ in stamps.

SPECIMEN-O

La progres-i di la eienc-o e di l' industri-o
dum la dek-non-esm-a yar-cent-o mult-ig-is
grand-eg-e la relat-i inter omn-a civiliz-it-a
popul-i la ter-voy-i e la vapor-nav-i

* Fellow I.R.E., Consulting Engineer.

this winter.—Ed.) They do not need to learn French, German, Dutch, etc. All of them will recognize roots from his own language in the I.L., which is based on 11,000 roots found in four to eight modern languages. A Frenchman naturally finds most, as French is the “most international” language we have today. But whereas the French verb is a terror, you can learn to write postal cards in ten lessons using I.L. Next to the Frenchman comes the Italian with 83% of the roots readable at sight: Spaniard and Englishman and American, 79%; Scandinavian, 75%; German 65%; Russian 52%. All in all, the I.L. contains 76% of words found in from four to six modern languages. Its predecessors had root vocabularies half of whose words, like “puk” for “speech” or “ehiam” for “always”, were purely arbitrary. In the I.L., “speech” is “parolado”, “always” is “omnatiempe”. Which do you think is the more natural?

The grammar of the I.L. is absurdly simple—one rule for applying fourteen grammatical terminations! Here’s a sample:

Me havas .......... I have
Me havis .......... I had
Me havos .......... I will have
Me vidas il .......... I see him
Il vidis me .......... He saw me
El vidos me .......... She will see me
Me videsas .......... I am seen
Il vidus ol .......... He would see it
proxim-ig-is li reciprok-e, la telegraf-il-o, la telefon-il-o supres-is la dist-o inter li. Mem ti, qui ne ek-ir-is e nul-temp-e ek-ir-os sua patri-o, pov-as su vid-ar subit-e koram stranjer-i ven-int-a per motor-vetur-o o per direkt-ebli-a aer-navo. Or nul-u pov-as sav-ar omn-a stranjer-i, e mem tre pok-i en omn-a nacion-o pov-as sav-ar un do lingu-i di vicen-a land-i. Es-as do nesees-a, ke la mond-o hav-ez un lingu-o help-ant-a komun-a por la relat-i internacion-a omna spec-a. Or ca lingu-o dev-as es-ar lern-ebl-a e kompren-ebli-a sen-pen-e da la maxim grand-a nombr-o de person-i; konseuqe la maxim bon-a lingu-o inter-nacion-a es-as ta, qua prizeni-as la maxim grand-a facil-e-so por la maxim mult-a homi: e ca defin-o sufic-as por determin-ar komplet-e la solv-o di la problem-o (1).

Think this situation over. The need of a special means of international communication between radiomen for business and progress is upon you. It has come like a flash from the blue sky. What are you going to do about it?

(1) Hyphens are only used for beginners to separate the elements of each word.

Amateur Wavemeters

By S. Kruse, Technical Editor

SINCE WWV has begun to send standard-frequency signals there has been an increasing demand for a review of the subject of amateur wavemeters. This review is made here, much of the material being drawn from the Bureau of Standards paper "Portable Wavemeters for Short Wave Radio", which originally appeared in QST for September 1922. Those wishing to go over the complete article may obtain this number from the Circulation Dept.

Factory-Made Wavemeters

Among the factory-made wavemeters none is more useful than the General Radio type 247W wavemeter and filter, Fig. 1. This well-built little instrument is not only useful as a wavemeter with a range of 150-500 meters but can also be used as a wave-trap and as a calibrated condenser for measurement work. When measuring the wavelength of received signals the device can be connected in the usual wave-trap fashion, the switch put on the second point and vernier knob turned until the signal in question is trapped out. Then read the scale. Sometimes this can be done with the switch on point 1 instead. There is a prospect that this meter will be modified so as to spread the amateur band over the entire scale, making more accurate readings possible.

At the Second National A.R.R.L. Convention Mr. John H. Miller of the Jewell Electrical Instrument Co. displayed a very nice amateur wavemeter having a scale with one division per meter. We hope to hear soon that this wavemeter has been put on the market.

Home-Made Wavemeters

A wavemeter consists of a variable condenser and a fixed inductance plus an indicating device of some sort. The condenser and the coil provide the tuned circuit while the indicator shows when the tuned circuit has been adjusted for resonance. To make this tuned circuit a good one it is necessary to use a good condenser and a good coil—the indicator does not matter so much.

The Variable Condenser

The first requirement for a wavemeter condenser is that it be very solidly built; the best condenser for the purpose is one of the type that you "can't hurt with an axe". One can even put up with some electrical losses for the sake of getting such a condenser. The plates should be heavy, with plenty of spacing, should be very securely connected together and to their supports, and the bearings should be as substantial as possible. Flimsy plates, spring-supported bearings, or shafts simply run thru the insulating end plates are not satisfactory—the wavemeter will change calibration and get you into trouble. Shielding the condenser is not necessary but is desirable. The metal can (or other shield) should be connected to the moving plates,
Having the fixed ones insulated. Cone bearings are good and a geared vernier is very desirable, tho a long extension handle is almost as good and sometimes better.

Too large a condenser should not be used; one with a capacity of 500 micro-microfarads (.0005 microfarads) is amply large. Such a condenser is not nearly as likely to get off wavelength as is a large one.

The Coil

The requirements of a wavemeter coil are: first, that its inductance be such that, with the condenser used, it can cover the wavelengths desired; second, that the resistance and capacity be low; and, third, that the resistance, capacity and effective inductance all be constant. Let us start with the first requirement which has to do with the range of wavelengths. It is well to restrict the part of the condenser scale used to the parts shown in Figure 2. Since the capacity at 170° (or 95/100) will almost always be more than four times the capacity at 15° (or 8/100) this will mean that the highest wavelength reached by the wavemeter will be at least twice the lowest wavelength. This makes it possible for a single coil to cover the range from 175-375 meters and another coil to cover the range from 150 down to 75 meters, etc.

The following coils will do the required work. It will be noticed that the size of the wire and the spacing between turns are not specified. This is not an oversight; the inductance of the coil is nearly independent of the size of wire used as long as the proper number of turns is used and spaced as directed. It is absolutely necessary to make the winding one inch long as directed. This can be done with the size of wire given or with smaller wire.

Wavemeter Coils

Diameter of coil: 4 inches. Length of winding, one inch. Wire must be so spaced that winding is exactly one inch long. Condenser is to be one with capacity of 500 micro-microfarads (.0005 microfarads).

Number of turns in coil (Winding to be one inch long), D.C. wire that will wind in 1 inch

<table>
<thead>
<tr>
<th>Wavelength Range</th>
<th>Number of turns</th>
<th>Largest Size of D.C. wire that will wind in 1 inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 to 175 meters</td>
<td>16</td>
<td>16 A.W.G. (B&amp;S)</td>
</tr>
<tr>
<td>175 to 375 meters</td>
<td>23</td>
<td>20 A.W.G. (B&amp;S)</td>
</tr>
<tr>
<td>375 to 750 meters</td>
<td>33</td>
<td>23 A.W.G. (B&amp;S)</td>
</tr>
</tbody>
</table>

The wavelength of the coils should overlap somewhat. If they do not, reduce the number of turns on the two larger coils until the desired overlap is secured.

The Coil Form

The second requirement was that the resistance and effective capacity must be low. No one will attempt to defend high resistance. The reason for requiring low effective (distributed) capacity is that it acts as a fixed condenser across the variable one and prevents one from covering the desired wavelength range. The best core for the coil of an amateur wavemeter is a hollow spool of dry wood, lightly varnished. Wood is chosen in preference to Bakelite, glass and pasteboard. Bakelite and similar compositions increase the resistance of the coil. Glass is mechanically poor; as is pasteboard.

Putting on the Windings

The wire should be of the size stated above or smaller, but not less than No. 24 A.W.G. (B.&S.). Double cotton covered wire is good. After winding, it should be fastened down with a light coat of shellac, Sterling varnish or the like, preferably baked on. Do not try fancy windings or litzendraht; almost invariably the coil resistance will be higher.

The Indicator

The third part of the wavemeter is the device that indicates resonance. The simplest device is the crystal detector and phones which should be connected as shown in Fig. 3a. This makes the calibration of the
wavemeter independent of the position of the phone cord, at least so long as they are not dragged across some part of the wavemeter.

For C.W. work the crystal detector is not very satisfactory and a small (so-called "miniature" or "flashlight") tungsten-filament lamp may be used connected directly into the tuned circuit as shown in Fig. 3c. To avoid any possibility of changing the calibration of the wavemeter the lamp should not be changed unless another of the same sort can be put in.

The best indicator is the so-called "thermo-galvanometer", such as the Weston. In addition to being more reliable than the hot-wire type it will stand more overload. See Fig. 3d.

Sometimes the instrument or other indicator is connected to a small coil (two or three turns) coupled to the main coil.

Assembling the Wavemeter

A very good mounting for the wavemeter is shown in Fig. 4. In any case it is convenient to have the coil horizontal and near one end of the box so that it can be coupled to easily. The leads by all means should be heavy, short, and rigid. The coil should be placed so that it is several inches away from the condenser.

Calibrating the Wavemeter

The calibration and use of the finished wavemeter will be taken up next month. In the meantime, don't put any faith in ready-made charts or curves printed in magazines; they are no good when tried on another home-made wavemeter of the same sort.

Information on Receiving Tubes for A.R.R.L. Questioners

By J. C. Warner*

In Two Parts: Part II

For radio frequency amplifier tubes the connection of the grid return depends to some extent upon the type of amplifier; that is, whether a so-called stabilizer is used to prevent oscillations or whether some other means is provided. If the stabilizer is used the grid return of one or more of the radio frequency tubes must be connected to the moving contact of the stabilizing potentiometer as in Figure 11. In this way a positive bias is given, the purpose of which is exactly opposite to that given previously. That is, the positive bias increased the grid losses and so prevents oscillations, also reducing the amplification incidentally, while the negative bias as already explained increases amplification by reducing the grid circuit losses. If some other means than a stabilizer is used to prevent oscillations the grid returns should be to the negative side of the "A" battery as shown in Figure 12 and even when using a stabilizer it is best to return only the first grid to the stabilizer and the others to the negative battery terminal if the oscillations can be stopped. In this way the amplification of the first tube is reduced.
somewhat, but the others work at full efficiency.

If it ever becomes necessary or desirable to use more than 60 volts on a radio frequency tube a grid biasing battery becomes very necessary in order to prevent excessive plate current. Usually the higher plate voltages should be employed only when some other means than stabilizer control is provided for stopping oscillations; otherwise the tube may be overloaded by the high plate current. Occasional departure from these rules given for radio frequency tubes must be allowed due to individual peculiarities of the circuit. For example, there may be times when it is convenient to connect the grid return of one tube to the positive filament terminal in order to prevent oscillations without the use of a stabilizer. This method, however, cannot be recommended for general use, although the rectifying action which may result does not cause noticeable distortion since the rectified components are not transmitted on to succeeding tubes.

The connection of the grid return on a detector tube depends first upon the type of tube. Gas tubes work best with the grid return connected to the negative side of the filament whether grid leak and condenser are used or not.

For the high vacuum detector the general rule is to connect the grid return to the positive side of the filament when grid leak and condenser are used. If no grid condenser and leak are used, that is, if the detection is made in the plate circuit by virtue of the curvature of the plate characteristic, the grid return should be to the negative side of the filament. The former method is the one commonly used and since it is by far the most effective of the two it will be considered in detail.

The reason for the connection to the positive side of the filament involves a brief explanation of the process of detection which goes on in a tube when a grid leak and condenser are used. The action is best explained by separating the process into two distinct parts—rectification in the grid circuit and amplification in the plate circuit. That is, the tube performs two functions: the grid circuit rectifies the wave and causes a change in the average potential of the grid and this potential then changes the plate current just as in any ordinary audio frequency amplifier. The grid and plate circuits should then be arranged according to their separate functions which are easily understood by reference to Figure 13.

Diagram A shows the grid circuit which, in this case, is the rectifier designed to supply the highest possible voltage to the amplifier circuit. For this condition the grid leak resistance $R$ should be high compared to the input resistance of the tube, that is, two megohms or above. When a radio frequency voltage is applied to the input, the rectifying action of the grid circuit of the tube causes a voltage to be built up across the resistance $R$, the action being much the same as in an ordinary two-element rectifier tube. If the incoming wave is modulated this voltage is alternating according to the modulation frequency. If the incoming wave is not modulated, the voltage across $R$ builds up to a fixed value and remains constant as long as the signal lasts. The condenser $C$ bypasses the radio frequency current around the high resistance leak. When the voltage across $R$ rises, this condenser becomes charged and after the wave has passed this charge must leak off through $R$, restoring the grid potential to its original value. For this reason, the values of $C$ and $R$ must be so chosen that this charge can leak off between suc-
cessive wave trains; otherwise distortion will occur. The rate of discharge depends on the product of RC so that for small values of C, R can be made large, and vice versa. However, since a rectifier gives maximum output voltage when the load resistance is high, it is usually customary to make C as small as is consistent with low reactance over the operating range of radio frequencies and then to make R as high as possible without causing distortion. If strong signals are to be received or if static is strong, the value of R cannot be increased too far or the charges will not leak off between wave trains, but for weak signals the leak resistance can be made much higher. The customary value of capacity is .00025 uf. and of resistance 2 to 5 megohms for strong signals and up to 10 megohms or more for weak signals. This assumes spark or telephone reception. For unmodulated C.W. reception with oscillating detector the grid leak resistance should not be over 2 megohms, otherwise when oscillations start there will be an objectionable click in the phones.

The detector action in a soft tube is similar to that described above except that no grid leak is required to carry off the negative charge on the grid, since the gas ions form a conducting path inside the tube, and that irregularities in the grid and plate characteristics probably influence the rectifying action to a large extent.

The mean potential of the grid is determined by the D.C. voltage drop in the grid leak and the point at which the grid return is connected. Taking the negative end of the filament as the reference point the average grid potential, if the grid return is to the positive side of the filament, is equal to the filament voltage minus the drop in the leak, which usually brings the potential down to less than one volt. If the grid return were connected to the negative side of the filament the average voltage of the grid would be negative because even under those conditions a very small grid current flows, which, however, is not sufficient to produce good rectifying action except on very weak signals. This is the reason for the recommendation that the grid return of a high vacuum detector be connected to the positive end of the filament. In some cases slightly better results may be obtained by connecting the return to a point between the positive and negative ends. This can be accomplished by using a potentiometer as shown in Figure 14. The gain in intensity is seldom worth the additional expense and the extra adjustment however.

Most circuits show the grid leak connected across the grid condenser but if the grid leak resistance is high compared to the input resistance of the tube, which should be the case as already stated, it makes little difference if the leak is connected directly to the filament. In some circuits this is absolutely necessary since there is no other D.C. circuit back to the filament. An example of this may be seen in Figure 15 where the detector tube is supplied from a tuned radio frequency amplifier. Here the grid leak cannot be connected across the grid condenser since this would place one end of the leak at the potential of the preceding plate. Hence the leak must be connected directly to the filament.

Rheostats

It will be noticed that Figure 7 indicates that the filament rheostat should be in the negative lead regardless of the type of tube or its use. In some cases, with the UV-200, for example, the position of this rheostat is of no importance, but since it is very important in other cases, such as with the audio amplifier tube, it is recommended that for convenience in wiring and for the sake of uniformity that the rheostat always be placed in the negative lead.

Very often tube sockets have their terminals marked F+ and F-. This is for convenience in tracing the wiring and does not mean that the polarity marked has anything to do with the action of the tube so far as the filament itself is concerned. Either end of the filament may be made positive without affecting the operation of the tube.

Detector Sensitivity

With regard to the sensitivity of detectors, reference has often been made to a so-called "threshold value" of signal voltage
below which the tube fails to respond. There is no theoretical or experimental basis for this idea, which has probably grown up from the fact that high vacuum detectors are more sensitive on strong signals than on weak. A gas content tube on the other hand is often as sensitive or more so on weak signals than on strong.

Much has been said and written recently concerning the great sensitivity of the old soft tubes of pre-war manufacture. It is quite true that some of these super-sensitive tubes were exceptionally sensitive detectors. But it is just as true that in order to find one of these super-sensitive tubes it was necessary to pick over and reject a number of tubes which were worthless. Also, these sensitive tubes were extremely critical and required very careful adjustment of plate voltage and filament temperature and they often had to be given precarious heat treatments to restore their sensitive condition after a period of use. Because of this lack of uniformity and difficulty of operation, it is very doubtful whether the modern amateur would be satisfied with these tubes if they were available in quantities today.

### The Choice of a Tube for a Particular Service

No general rules can be laid down for the choice of a receiving tube for a particular set or circuit, since much depends upon the other available equipment. However, each of the tubes has certain features which make it the most suitable under certain circumstances.

If dry cells are to be used to supply filament power the UV-199, WD-11 or WD-12 are usually the most suitable, although for single tube and even two tube sets the UV-201-A can be used with good economy. In the latter case four dry cells in series should be used with each tube.

The filament power consumption of the UV-199 is lower than in any other tube and for this reason the UV-199 is especially suitable for portable single tube sets since the filament may be operated from a single set of three flashlight cells.

The WD-11 or WD-12 is more conveniently used in stationary single tube sets since one standard dry cell may be used making the initial battery expense comparatively small.

If a storage battery is available, the UV-201-A is the best tube for use as an amplifier and the UV-200 as a detector, although provision for plate voltage adjustment must be made for the detector. If this is inconvenient the UV-201-A may be used both as amplifier and detector with excellent satisfaction.

For operating loud speakers the UV-201-A is the most suitable because of its great electron emission and high mutual conductance although if careful attention is paid to proper plate voltage and grid bias the UV-199 and WD-11 or WD-12 will operate a loud speaker very successfully.

In radio frequency amplification circuits the UV-199 gives less trouble from internal capacity effects than any other tube, but when such effect can be neutralized in some
way externally the other tubes become excellent for this purpose.

The number and arrangement of cells to be used with multi-tube sets must be determined for each individual case. Battery manufacturers recommend that the drain per cell should never exceed .25 ampere and that about .125 ampere per cell gives the greatest battery efficiency, also that sufficient cells should be used to allow the voltage per cell to fall to 1.0 volt before the battery is discarded. With these facts in mind, the number of cells to be used with a given set can easily be determined and with the aid of Fig. 16 which gives the average service life of a six-inch "general purpose" dry cell at various loads, the life of the complete battery may be found.

**Miscellaneous Answers**

Several questions were asked which do not fall into the groups already discussed, but which relate either directly or indirectly to receiving tubes. The answers to these questions will be taken up in the succeeding paragraphs which are necessarily somewhat disconnected.

The effect of a magnetic field on a high vacuum tube is to lengthen the path of the electrons as they pass from filament to plate. This has no beneficial effect on the action of the ordinary tube so that the use of such a field is of no advantage. The field strength of a small permanent magnet is too slight to produce any noticeable effect whatever. In a gas tube the lengthening of the electron path may increase the ionization of gas atoms and so produce a change in the characteristics of the tube. This explains the changes in sensitivity of such a tube when a magnet is brought close to the bulb.

The change in the light given off by an X-L filament when the plate voltage is applied is due to an actual change in the temperature of the filament which is caused by two independent effects. If the two ends of the filament are observed closely when the filament is lighted with the plate voltage off, it will be seen that at each end of the filament there is a region which is not glowing. This is due to heat being conducted away from the ends of the filament by the heavy leads. Now if the plate voltage is applied, particularly if it is 80 or 100 volts, it will be seen that at one end of the filament this dark section increases in length while at the other end it decreases. That is, one end of the filament has become hotter, while the other end has cooled. This is explained by reference to Figure 17. The double arrows on the inside of the filament show the direction of the normal heating current while the other arrows show the plate current. The plate current divides in the two ends of the filament according to the resistance of the two sides of the parallel circuit. Therefore, in one-half of the filament the plate current adds to the heating current and in the other half subtracts from it thus causing the difference in temperature of the two ends.

Another independent effect tends to lower the temperature of the whole filament so that the resultant effect is usually an apparent dimming when the plate voltage is applied. The electrons which leave the filament carry with them a certain amount of energy and since this must be supplied by the heating current there is less energy left for heating the filament and the temperature falls slightly. This effect is similar to the cooling of a liquid when evaporation is going on from its surface.
the voltage required to cause a current to flow, neglecting leakage currents, would simply be the breakdown potential of the tube parts, such as stem and base. Lighting of the filament would have no effect except in so far as the tube insulation might become warm and accordingly break down at a somewhat lower potential.

The last question to be answered is one which no doubt has often arisen in the minds of radio experimenters; that is, the possibility of using radium as a source of electrons for a vacuum tube. A gram of radium gives off approximately $10^{10}$ electrons per second. This seems like a large quantity until it is remembered that about $6.6 \times 10^8$ electrons per second are necessary to give one milliampere of current which would mean that 660,000 grams (about 1500 pounds) of radium would be required to furnish this current. In other words, not all the available radium in the world could directly supply the electron emission for one vacuum tube.

---

### Coolidge’s Holiday Greetings to MacMillan

**Travel Via Amateur Radio**

On December 22d President Calvin Coolidge filed a message of holiday greetings to the MacMillan Arctic Expedition with the Radio Corporation of America in Washington. That morning the traffic department of the Radiocorp in New York City called right then and there. The Traffic Manager we? Say, nu way of putting the message thru; didn't teurers eould communicate with MacMillan—know what to do; had heard that we ama... telephone and told us about it. 'rhey had decided to try the job all the way from Hartford hy amateur ,·adio, so Kruse of the darndest streak of hard luck that has... signals. Everything went like ,. radio set on the night you invite your friends over to stage a little demonstration—you know. First off, Hartford was blanketed by a line escape which drowned out all but the unreasonably loud signals. It was a freak night and the message got exactly as far as 8IJ—to no farther.

Darr of 8ZZ in Detroit was heard merrily chewing the rag with Mix of WNP, the MacMillan vessel “Bowdoin”, and so Kruse went after him—hard. No dent. So he got help, and soon a half-dozen real good eastern stations, including 1CKP, 8AGO, and 8BDA with his rock-crusher, were calling their heads off for 8ZZ. The only effect was to make Darr complain casually to WNP of the QRM! Could Darr have been hooked that night the Coolidge message would have been handed Capt. MacMillan a couple of days before Christmas; but Darr hit the hay without ever knowing how narrowly he missed a chance for still greater fame.

Then the attack centered on 9DKB of Minot, N. D., who had been the best hopping-off place to MacMillan since Jack Barnsley of c9BP went on vacation. 8IJ gave the message to 9AAW, who passed it to a Nebraska station, and 1HX gave it direct to 9AOG in Lawrence, Kansas. No luck. It was several days before we knew the reason—Weeks of 9DKB was spending the holidays in Detroit!

The next night Kruse went after Darr again. He wasn’t on, but two other Detroit fellows, 8APT and 8RM, were raised and they went around to Darr’s place and got him out of bed. 8ZZ then took the air with the message and made a valiant attempt to raise Mix, but WNP was not to be heard. Kruse gave the message to a few more good stations and then sat back to watch the fun. In all, 22 stations were logged that night actually at work trying to further the progress of the message. Apparently WNP was off the job, enjoying the holidays, for nobody heard him and the message continued to float around the country undelivered. Finally on the morning of Dec. 24th 8ZZ raised some “five station”, we don’t know whether Canadian or United States, who said he was QSO c9BP, Barnsley, and so the message came eventually to Prince Rupert, B. C., always the best point of contact with WNP.

Then more hard luck, for Mix could not be heard, and days rolled by. At length, on the night of January 1-2, Barnsley and WNP connected, and the message was delivered to MacMillan. Of all this stew and all this calling, this was the first that Mix had heard of it. Some beautiful little streak of freak conditions had almost ruined us. Our much-vaunted service to...
the North Pole took a real setback when it took us ten days to put thru a message from our country's president, but it was not the fault of the stations or the organization.

Barnsley, c9BP, went on a three-weeks vacation on December 1st and left the game wide open to all comers. U9DKB, Minot, N. D., had the best luck, and connected frequently with Mix, on one occasion copying a 1500-word press story all about how MacMillan had discovered where Santa Claus hung out, etc. It made good reading for the kiddies, anyway. C4HH in Moose Jaw, Sask., was probably the next best contact, and took part in much of the traffic handling. Many other stations succeeded in hooking up with WNP, and all in all it seems that the effort to keep the "Bowedin" in communication with this country was quite successful during December.

The following reports of WNP's signals were received during December:

**NOVEMBER**
- Nov. 14, e5GO
- Nov. 17, 9DKB
- Nov. 29, 9BFF
- Nov. 23, 6CBW
- Nov. 25, c9BP sent 10 and received 12 messages in addition to copying about 300 words of press.
- Nov. 26, 7PGS
- Nov. 28, 2CLA
- Nov. 29, 9ADQ
- Dec. 1, 9DKB
- Dec. 2, 9BOA
- Dec. 10, 6DKB
- Dec. 11, 6CKV
- Dec. 12, 6RA
- Dec. 13, 7AS
- Dec. 14, 9DKB
- Dec. 15, 6DKB
- Dec. 16, 6DKB
- Dec. 17, 6DKB
- Dec. 18, 6DKB
- Dec. 19, 6DKB
- Dec. 20, 6DKB
- Dec. 21, 6DKB
- Dec. 22, 6DKB
- Dec. 23, 6DKB
- Dec. 24, 6DKB
- Dec. 25, 6DKB
- Dec. 26, 6DKB
- Dec. 27, 6DKB
- Dec. 28, 6DKB
- Dec. 29, 6DKB
- Dec. 30, 6DKB

**DECEMBER**
- Dec. 1, 9DKB
- Dec. 2, 7GT
- Dec. 3, 7KS
- Dec. 4, 6CV
- Dec. 5, 6CV
- Dec. 6, 6CV
- Dec. 7, 7SFU
- Dec. 7, 7ABB
- Dec. 8, 7ABB
- Dec. 9, 7ABB
- Dec. 10, 9DKB
- Dec. 11, 9DKB
- Dec. 12, 9DKB
- Dec. 13, 9DKB
- Dec. 14, 9DKB
- Dec. 15, 9DKB
- Dec. 16, 9DKB
- Dec. 17, 9DKB
- Dec. 18, 9DKB
- Dec. 19, 9DKB
- Dec. 20, 9DKB
- Dec. 21, 9DKB
- Dec. 22, 9DKB
- Dec. 23, 9DKB
- Dec. 24, 9DKB
- Dec. 25, 9DKB
- Dec. 26, 9DKB
- Dec. 27, 9DKB
- Dec. 28, 9DKB
- Dec. 29, 9DKB
- Dec. 30, 9DKB

The wonderfully efficient transmission of Australian 2CM is described elsewhere in this issue under the heading "An Amazing World's Record". As a result of this work an amateur station, Australian 2CDM, is being put on the S.S. Tahiti. During February and March all A.R.R.L. stations should keep a bright lookout for 2CDM-Australian.

The amateur movement was never stronger than at present. The day is nearly here when amateurs all over the world will be able freely to exchange greetings and discuss points of mutual interest through their own organizations.

The American Radio Relay League was the first step in this direction and Australia announces the fact that a similar move-

**Australian Amateur Radio Puts to Sea**

By F. Basil Cooke, F. R. A. S.*

The wonderful efficiency of transmission of Australian 2CM is described elsewhere in this issue under the heading "An Amazing World's Record". As a result of this work an amateur station, Australian 2CDM, is being put on the S.S. Tahiti. During February and March all A.R.R.L. stations should keep a bright lookout for 2CDM-Australian.

*Vice President, Australian Radio Relay League; Secretary Pan-Pacific Congress, 1923; Director of Radio for David Jones, Ltd.
his remarkable long distance low-power work. (See the article "An Amazing World's Record" in this issue.)

As a result of the many experiments conducted by Mr. Maclurcan, it occurred to him that this low power transmission could, and should, be turned to some account for the public generally.

Reliable data is needed as to the range that could be reasonably expected when using low power transmitters.

With this object in view Mr. Maclurcan approached Messrs. The Amalgated Wireless (Australasia) Ltd. to see if it could be arranged to duplicate 2CM on a ship and establish definite two-way communication on low power and low wave length at sea.

After some negotiation with Mr. E. T. Fisk, Managing Director of the Amalgated Wireless, an arrangement has been made under which the Company is to install on shipboard a duplicate of Mr. Maclurcan's station at Strathfield.

The S.S. Tahiti, going to San Francisco and back, has been chosen. The transmitting and receiving sets will be quite apart from the usual ship's commercial equipment. A separate cage aerial will be run from the mainmast and an especially-tuned counterpoise erected. The station will be run as any other experimental station and will be operated by Mr. Maclurcan and Master Jack Davis. Master Jack Davis, aged 16, has been especially chosen as he has been doing some remarkable work on low power on his own account.

The Tahiti will leave Sydney about the end of February. The station call will be 2CDM. Tests will be carried on with 2CM and schedules will be worked with other experimenters in Australia and New Zealand and probably America. All signals will be measured by audibility meter and the ranges, day and night, logged. Special attention will be paid to the fading of low wavelengths and any other curious phenomena noted. A continuous watch will be kept and much valuable information should result.

The idea of the trip is not to break records but to determine what the low powers are good for.

A number of experimenters in Australia constantly log American amateurs, using power no greater than that used here when endeavoring to "get across" to America. At first sight it would look as if the conditions for reception are more favorable in Australia and the conditions for transmission more favorable in America. This latter is hardly likely, since it has been shown what can be done on low power here.

Mr. Maclurcan hopes, on the homeward trip, to conduct experiments with amateurs in America and it is hoped that this trip will cement a lasting friendship between the lovers of this wonderful science on both shores of the Pacific.

The writer has been given the honor of arranging the Australian part of the performance while Mr. Maclurcan is away and he will have the difficult, but interesting, task of seeing that no hitch occurs in the program. Final compiling of results will not take place until we collaborate upon the return of the wanderer.

In conclusion, again, it is to be hoped that this trip will be the first of many and that Australia will be honored by the visit of her wireless brothers from America. In this way we see the beginning of a new era when the amateur movement will recognize no boundaries and so bring about that long-prayed-for state; The Brotherhood of Man.

What the Department of Commerce Says About Us

THE following extracts from the annual reports of the Secretary of Commerce and of the Commissioner of Navigation show what the Department of Commerce thinks about us amateurs and our A.R.R.L.

From the Secretary's report we quote the following:

"There is no abatement in amateur activity. The number of licensed amateur transmitting stations has increased from 15,504 in 1922 to 16,570 on June 30, 1923. Serious effort is being made by the amateurs to improve their apparatus so as to reduce interference and increase the efficiency of their stations. Annually these experimenters conduct trans-Atlantic tests with European amateurs. The last test was in December, 1922, when 315 were successful in getting their signals across to Great Britain, France, and Switzerland. The record compiled by the American Radio Relay League shows that each of the nine radio districts had a successful representative.

"Few realize the importance of our amateur auxiliary communication system which can be put into immediate operation and
temporarily provide a means for dispatching trains, giving flood warnings, and transmitting emergency messages to and from sections temporarily deprived of wire facilities.

And the Commissioner of Navigation says:

"Amateur stations continue to increase in number. The amateurs are making all reasonable effort to improve and perfect their transmitters. The progress already made is noteworthy. Considering the number of amateur stations, the age of the operators, and the inability of our inspectors to get in touch with the majority of them it is essential that our service have the close cooperation they are giving us. Their respect for the law and rights of others is commendable."

Let us continue to earn that high reputation!

**What the Work With F8AB Teaches the A.R.R.L.**

*By S. Kruse, Technical Editor*

**The Lessons.**

1. Use a larger antenna with series condensers.
2. Get off the crowded waves by moving downward.
3. Make a wavemeter and calibrate it from WWV.
4. The "500-meter-plus" outlaw is THROUGH—his last excuse is gone.

The prime reason for the present success of two-way amateur transatlantic communication is in station F8AB, the first really capable European amateur station. Success was due mainly to the thumping signal that Deloy pushed across to us, and with the aid of which a number of other European stations have been connected with many American stations.

Two-way transatlantic work just happened to start on 100 meters; it has been done since on 90 meters and also at 130; in past seasons we have put good signals across on waves all the way up to 225 meters. There is not the slightest excuse for the present grand howl to the effect that we ought to have the 100-meter wave, regardless of the fact that it is already occupied. There are plenty of wavelengths on both sides of 100 which will do the trick as well.

Very well, if 100 meters is not a magic wavelength, how did it come to do the trick? For several reasons. One's first thought is that there was little interference. Compared to 210 meters that may be correct but there is more TRM on 100 meters than on 176, quite a bit more.

First of all there is KDKA's short-wave transmitter, then there is a large family of harmonics from all sorts of stations. In Hartford the most troublesome ones are those of NAO, NBD, WIM, WOR, 5EK, 4FT and GPL!! The last station can be copied beautifully on the harmonic when totally inaudible on his main wave. The most troublesome of these harmonics are those of the sparks at NAO and NBD—they have been that way for a long time, too. WOR is second, being especially troublesome because of its wavering nature, rather than its actual strength. No—the explanation does not lie in freedom from interference.

**The First Lesson**

*Larger Antennas with Series Condensers*

We are for the first time doing consistent 2500-mile work because we are (for the first time) using antennas that are large—very large—for the waves at which they are working. Working a small antenna that way gives high radiation efficiency.

The moment that statement is made the tribe of ampere-hounds will rise in protest—"But the series condenser causes a big loss—we only get half as much current with a big antenna and series condensers."

Buncombe, Brother—absolute and complete buncombe!! How on earth can the series condenser be using up power when it does not get hot? Don't you know that wasted electrical power will always show up as heat?

"B-but—" says the ampere-chaser, "if
there is less current we must have increased the resistance—we are wasting power somewhere.

Yes—we have increased one of the resistances in the antenna. *We have increased the radiation resistance.* We are now putting more power into the ether than before, even tho' the antenna current does drop. Certainly no one can object to that.

**Proving It**

A large part of the audience will now say "Rats!! More of this theoretical bunk that doesn't work out. Bet he never tried it."

Yes, originally the idea was theoretical. And right here is a good place to say that almost ever we have learned about radio has been worked out first on paper and then tried in the field. Don't sneer at the theoretical radio man. Now we have practical proof that the theory was absolutely right—that we did not know as much as we thought—and that our antennas are all wrong.

**Tests at 8XH-8AQO**

A few months from now we will offer a considerable surprise in the way of a report on some sending tests made from 8AQO-8XH at Cazenovia, New York. Just now we will only give a few of the results.

A large antenna 90 feet high was used in one test, working against a ground connection. The fundamental wavelength of the affair was almost 270 meters. Too big for an amateur antenna? Not a bit of it; that is the antenna which put the tremendous signals into half a dozen European countries last year at 200 meters and in these tests it developed that the antenna was not big enough for 200-meter work, but did its best work at a wavelength down around 176.

This was not "laboratory work"—it was actual transmission and the hardest-boiled brass-pounder will find it hard to doubt results that checked at half a dozen receiving stations in broad daylight and checked again when measured with a loop near the sending station.

Now here is the important point:—the waves around 300 meters could hardly be heard in Hartford (daylight) and no great change happened as the wave was lowered until we passed thru the fundamental. Then the signals built up until at 176 meters they were truly tremendous. Yet this wavelength was "handicapped" by a series condenser in the sending antenna and the antenna current was a small fraction of that gotten at 300 meters and upward.

**Tests at 1XAQ**

Naturally one would now expect that an ordinary amateur antenna would work best on wavelengths that are still lower. This has been tried out roughly at 1XAQ. The antenna is the sort of "compromise vertical" shown in Fig. 1, rather under-sized, and can be worked down to 160 meters without any series condenser at all. The location is a good one and transmission is very fair at even 200 meters. It has been very hard to test further down because so few stations have tuners that will receive even as far down as 180 meters—a disgraceful state of affairs.

**Average results at distances around 1000 miles (night) were as follows:**

<table>
<thead>
<tr>
<th>Series</th>
<th>Wave-Condensers</th>
<th>Ant. Power</th>
<th>Signals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>length (two used) Curr. to set</td>
<td>(Average)</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>No 6.4 600 Good—some QSS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>No 5.2 600 Good—less QSS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>No 4.8 600 Good—no QSS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>.00025 2.8 500 Stronger—no QSS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>.00012 1.5 400 Very strong</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>.00005 .6 350 Very strong</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Our antenna seems to be far too small for the standard amateur band—it ought to be much longer, somewhat like Fig. 2.

This was test work but now the idea has been put thru some weeks of steady work with European amateurs and in every case the successful American stations have been using big antennas with series condensers, the arrangement being that described by Reinartz in the last issue.

**What It Means to the Amateur**

Most of us do not have "X" licenses, so we cannot work at 100 meters, but the lesson is just as good at 150 meters. Make your antenna longer, give it a fundamental wavelength of at least 220 meters, put in a couple of series condensers as explained...
by Reinartz and ready for some real low-power long-distance work.

**Lesson No. 2**

The last few weeks I have listened at Hartford and logged the wavelengths of amateur stations in U.S. and Canadian districts, also in European countries. 90% of the U.S. amateurs are between 185 and (I regret to say) 225 meters. Below 190 there is little going on, below 180 there is almost perfect silence, and at 150 one can listen for hours with never a peep from an amateur except a canny few that are seeing the lesson of the FSAB work and get below the mob.

**Lesson No. 3—Make a Wavemeter**

FSAB was first located by using a wavemeter and hunting on the exact wavelength on which he had agreed to send. Then the sending set at 1MO was also set at exactly the wave agreed on and the first call brought results. Supposing that Deloy and Schnell had gone at it in the usual madhouse fashion—guessed at their wavelengths and "shot blind." Chances are they would still be hunting for each other. Since that time FSAB has QSP'd for several other English and French stations, giving the exact wavelength, and every time a careful search on that wave has located the man.

Things are not so with the American amateur. We had nine different amateurs in the 9th district tell us that 1XAOQ was "on about 150 meters" when we were actually on 180 flat—checked by Navy wavemeter and by WWV to within 1 meter. Several of these same men were immensely surprised to learn that they were from 10 to 30 meters on the wrong side of 200.

But that is not the worst of it—we have found that over half of the amateurs we work cannot receive below 180 meters. They never know this until we move our wave slowly downward to the limit of their tuners.

**Lesson No. 4—The Outlaw's Finish**

A.R.R.L. has long been patient with the member who worked on a "super wave"—again and again we have begged off someone who was above 200. Again and again the Inspection Service has restored licenses to such offenders, or let them off with a warning. This was because all hands felt that the longer waves were better and that it was natural for everyone to crowd up toward 200 and then accidentally get on the wrong side of it.

That excuse is now finished! We know that better work can be done with the ordinary amateur antenna at 175 or 150 than at 200. This is not guesswork—it has been proved through many months by 9ZN, 9XW, KDKA, 5XV, 3ALN, 1XA, 3XM, 1XAOQ, 9AOQ, 8XK, 1MO, FSAB, 1QP-1XAM, 2AJF, 2BRB, 8XH-8AQO, WNP—the list could be extended for many lines.

Since there is no longer any excuse for crowding to the upper waves it is time to do something that will cure the excess-wave pest. The broadcast listener is heartily sick of it, and he is right. The Department of Commerce has stretched its patience about as far as can be expected and our own Operating Department feels that it is time to use the axe.

Let's make a last effort to cure the thing peaceably. Alter your own receiving set so it will tune below 150 meters, make a wavemeter and keep it near the SPt, and then send a card or radiogram of warning to every man caught above 200 meters. If he got there by accident he deserves a fair warning and will get down. If he is doing it knowingly, the sooner he loses his license, the better for A.R.R.L.

**Build a wavemeter and calibrate it from WWV!**

**QRV Pan-American Tests?**

Tests with our southern cousins probably will be held during the month of April or May. Will your transmitter be ready for the job? And how about your receiver—is it all primed after the Transatlantic Tests? Interested amateurs are requested to signify their willingness to participate by dropping a card to A.R.R.L. Headquarters.

—F.H.S.

**NOTICE**

The annual New England Division Convention of the Traffic Department will be held in Springfield, Mass., during the month of March. Watch next QST for details.
Emergency Railroad Communication

By A. L. Budlong,
Secretary, A.R.R.L. Railroad Emergency Service Committee

Those who saw the editorial on "Railroad Service" in the November issue of QST and who filled out Traffic Department questionnaires regarding railroad emergency service, are no doubt wondering what has been done toward developing the service and giving the railroads what they want—a real, dependable emergency communicating system.

The plan, as was mentioned in the November QST, originated at the Chicago convention when a member of the American Railway Association was appointed to see our League officials as to the possibilities of the scheme. As a preliminary step, the railway representative was furnished with a list of the Official Relay Stations and was told in the event of emergency the nearest O.R.S. could be notified and would be willing to do all in his power to help. Naturally this was a purely temporary arrangement, designed to fill the need in some fashion while the League took hold of the scheme and developed a more efficient and detailed plan.

The first step after the convention, questionnaires were prepared by the Traffic Manager and sent to all O.R.S. At this writing several hundred returned questionnaires are on file, and have given us a great deal of statistical information that will be of help in laying future plans.

The second step in the work was the appointment of an emergency committee. The chairman of this committee is G. L. Bidwell, one of the Washington gang, and the man who is directly responsible for much of the present outlined scheme of emergency service. He was given authority to go ahead with the preliminary plans, the idea being that some scheme should be developed which could be put into immediate operation, as winter had already settled in the Northwest station, and the service might be called upon at any time. Mr. Bidwell has been conferring with Norman Hood, who has done so much excellent work in the Rocky Mountain Division, also several others of the division managers, and the plan for the immediate future is this:

It will be practically impossible to get any highly organized system into operation within several months at least, and for this reason it will not be attempted just now. Instead, every amateur station, whether O.R.S., A.R.R.L., or not, must automatically become an emergency relay point for any railroad that calls upon him during the winter, and do everything in his power to see that nothing ever fails to get through on his account. At the present time, the Committee wishes anyone who has an opportunity to go ahead on his own account in furthering this work to do so, the only thing asked of such individuals being that they report all activities to the traffic officials with whom they ordinarily communicate, who will in turn keep the Committee informed of important steps being taken in various sections of the country.

Later, as more detailed plans are worked out and a real organization begins to develop, we will map out communication lines along the more important railroads and divisions. From information already obtained it is also very apparent that we will have to get some stations who are not members of the League to serve at strategic and critical points, especially in the mountain divisions, with the probability, however, that they will become A.R.R.L. members in short order.

This railroad emergency work is assuming greater proportions than anyone realized at first. The railroads themselves are coming to us for service. Five big railroads have individually asked for immediate action. We are going to try to give them what they want, but the success of the whole plan will depend on each individual operating amateur. As we stated in the middle of the article, the work this winter will be more or less unorganized, and we are going to let each individual go ahead on his own hook, asking only that he report all such activities to his usual traffic officials. But let's go ahead with this thing and show the railroads and the public that when emergencies occur the North American amateur will be found ready and willing to jump into the breach and do his part in carrying on.

Wolverine Convention

The Third Annual Michigan State A.R.R.L. Convention will be held at the Hotel Fuller in Detroit on February 28-29 and March 1st. Preparations are being made for the biggest convention ever held in Michigan. The Original Wouff Hong Gang (Supreme Council) from Flint will put on the initiation. The "Glad Hand of Michigan" is extended to all.
South Dakota Radio Convention

SEVENTY-FIVE enthusiastic amateurs attended the Third Annual South Dakota Radio Convention at Sioux Falls on December 27 and 28. The Y.M.C.A. Radio Club of Sioux Falls had charge of the convention, and the entertainment consisted of two technical meetings, a stunt party for prizes, vaudeville show at a local theatre, a sight-seeing trip to local stations and points of interest in the city, and a banquet.

Prof. B. B. Brackett of the University of So. Dakota Engineering School delivered an interesting talk on the subject "Are Radio Waves Real". Winfred C. Hilgedick (SKUA) of St. Paul gave some good dope on transmitting circuits and apparatus; E. A. Grublake, a Sioux Falls amateur, talked on receiving circuits; and Norvell A. Canfield of Luverne, Minnesota, enlightened the gang on his DX station 9DTR. Twenty-five prizes were awarded to the winners of stunts which consisted of running races, swimming races, cracker-eating contest, liar's contest, code-test for accuracy and neatness, and other stunts. M. G. Goldberg, Supt. of Minnesota District No. 3, sent two special prizes which were awarded to the amateur in attendance having the best record for the past year determined by vote, and for the person having done the most to make the convention a success. The first named was awarded to 9CGA and the second to 9EHC.

A distinguished visitor was Lloyde V. Berkner, 9AWM, of Sleepy Eye, Minnesota. Mr. Berkner gave an interesting talk on his experiences as a commercial operator during the past summer. Huron was favored as a place for holding the convention next year.

A Code of Conduct for A.R.R.L. Members

Prize Winner at the Atlanta Convention

By Charles B. Transou, 4QF

1—Friendships. Let each man so conduct his station that sincere friendships will grow out of our relations on the air. The greatest thrill in amateur radio is in the making of such friendships.

2—Experimentation. Never forget that half of the joy in radio lies in experimentation. The pleasure and experience gained from such work will never be regretted.

3—Foreign Relations. We must not forget our foreign brothers. For years American Amateurs have had the co-operation of foreign amateurs but have given little in return; let no effort be spared to bring about inter-continental communication.

4—Your Neighbor. Let every amateur take it upon himself as a personal matter to see that co-operation, with the utmost sincerity, is given to the Broadcast Listener, who deserves his rights, even as we deserve and claim ours.

5—Traffic. The A.R.R.L. should advance some practical method for assuring the delivery of messages. Let us all work for it.

6—Membership. Every amateur should take it upon himself personally to bring into this organization those who are just beginning—to support the League by actions as well as by sympathy.

7—Development. Build your own equipment as carefully as you can.

8—Interference. The interference problem begins at your own sending set.

9—Co-operation. Let us put our personal enjoyment in our pockets and give the co-operation of every amateur in America when the League conducts a test or an experiment.

10—Proportion. Let no man among us lose sight of the greater things in life, friendships, education and health. These are the things that in later years will enable us to continue our true enjoyment of Amateur Radio.
How I Operate UV-202 Radiotrons

By H. H. Tilley, 1GV

The tube arrangement at 1GV is one of the prettiest things we have ever seen in an amateur station. The six tubes work together perfectly, altho it is generally thought impossible to make more than four tubes operate in parallel.—Technical Editor.

When tubes are to be operated in parallel the sockets should be mounted in such a manner that all the grid leads are of equal length and all the plate leads are of equal length. The photographs show a convenient way of doing this. The filament ring-busses go around in opposite directions, so that the voltage brought to all filaments is exactly the same.

Any standard amateur circuit may be used. Begin by putting tubes in all the sockets and connecting meters in the plate lead and in series with the grid leak. The plate meter should have a 300 or 400 milliampere scale and the grid meter should have a scale of about 100 milliamperes.

Tune the set using a low plate voltage. When the antenna current is highest and the plate current about normal (45 mils per tube) move the plate clip about three turns further out so as to add three plate turns. This will reduce the plate current—and of course the output also—but will raise the efficiency so that the plates run quite cool. Now apply a higher plate voltage and watch the meters closely. Do not allow the plate current to go above 50 mils per tube nor the grid meter to go above 5 mils per tube. The grid current is especially important, as if it is too high the tubes will heat very badly, and if the stems heat the plate power may arc across in the base of the tube.

If a tube sparks in the base or turns blue inside, remove it from the socket and lay it aside until it is thoroughly cool. If left in the circuit the sparking will continue and soon break down the seal, then the air will leak in and the filament will "go up in smoke".

If the plate current is too high it can be reduced as mentioned above by putting in more plate turns. If the grid current is too high it can be reduced by using fewer grid turns or else by using a higher resistance grid leak.

Overloading the Tubes

When the set is properly adjusted high voltages can be applied safely. (We can hardly agree with this—perhaps the tubes do not blow up at once but they will not last very long if more than double normal voltage is used.—Tech. Ed.) During last year's Transatlantic Tests 2000 volts were applied to these 6 UV-202 tubes. The plate current was 400 milliamperes (which is 800
ELECTION NOTICES

To All A.R.R.L. Members Residing in the Central, New England, Northwestern (including Alaska), Roanoke, Rocky Mountain, and West Gulf Divisions:

1. You are hereby notified that an election for a new A.R.R.L. Director, for a term of one year, is about to be held in each of the above Divisions, in accordance with the new A.R.R.L. Constitution and By-Laws, which are published in the membership edition of this issue of QST for your information. Your attention is invited to Sec. 1 of Article IV of the Constitution, providing for the government of A.R.R.L. affairs by a Board of Directors; Sec. 2 of Article IV, defining their eligibility; By-Laws 12, 13, 14 and 15, providing for their nomination and election; and particularly By-Law 27, which especially for this election stipulates dates differing from those specified in the other By-Laws cited.

2. The election will take place during the month of April, on ballots which will be mailed from Headquarters in the first week of April. The ballots for each Division will contain the names of all eligible candidates nominated for the position by A.R.R.L. members residing in that Division. There will be one Director elected from each Division.

3. Nominating petitions are hereby solicited. Ten or more A.R.R.L. members living in any Division have the privilege of nominating any member of the League in their Division as a candidate for Director. The following form for nomination is suggested:

Executive Committee, A.R.R.L. Headquarters, Hartford, Conn.

Gentlemen:

We, the undersigned members of the A.R.R.L. residing in the Division, hereby nominate as a candidate for Director from this Division, for the election of April, 1924. 

(Signatures)

The signers must be League members in good standing. The nominee must be a League member in good standing, and must be without commercial radio connections. His complete name and address should be given. All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the first day of April, 1924. There is no limit on the number of petitions that may be filed.


5. This is your opportunity to put the man of your choice in office as the representative of your Division. Members are urged to take the initiative and file nominating petitions immediately.

For the Board:

K. B. WARNER, Secretary.

Hartford, Conn., Jan. 2, 1924.

To All A.R.R.L. Members Residing in the Atlantic, Dakota, Delta, East Gulf (including Porto Rico), Midwest, and Pacific (including Hawaii) Divisions:

1. You are hereby notified that an election for a new A.R.R.L. Director, for a term of two years, is about to be held in each of the above Divisions, in accordance with the new A.R.R.L. Constitution and By-Laws, which are published in the membership edition of this issue of QST
for your information. Your attention is invited to Sec. 1 of Article IV of the Constitution, providing for the government of A.R.R.L. affairs by a Board of Directors; Sec. 2 of Article IV, defining their eligibility; By-Laws 12, 13, 14 and 15, providing for their nomination and election; and particularly By-Law 27, which especially for this election stipulates dates differing from those specified in the other By-Laws cited.

2. The election will take place during the month of April, on ballots which will be mailed from Headquarters in the first week of April. The ballots for each Division will list the names of all eligible candidates nominated for the position by A.R.R.L. members residing in that Division. There will be one Director elected from each Division.

3. Nominating petitions are hereby solicited. Ten or more A.R.R.L. members living in any Division have the privilege of nominating any member of the League in their Division as a candidate for Director. The following form for nomination is suggested:

(Place and date)

Executive Committee,
A.R.R.L. Headquarters,
Hartford, Conn.

Gentlemen:

We, the undersigned members of the A.R.R.L. residing in the __________ Division, hereby nominate ___________ of ___________________________ as a candidate for Director from this Division, for the election of April, 1924.

(Signatures)

The signers must be League members in good standing. The nominee must be a League member in good standing, and must be without commercial radio connections. His complete name and address should be given. All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the first day of April, 1924. There is no limit on the number of petitions that may be filed.


5. This is your opportunity to put the man of your choice in office as the representative of your Division. Members are urged to take the initiative and file nominating petitions immediately.

For the Board:

K. B. WARNER, Secretary.
Hartford, Conn., Jan. 2, 1924.

To All A.R.R.L. Members Residing in the Dominion of Canada, Newfoundland, and Labrador:

1. You are hereby notified that an election is about to be held for a new A.R.R.L. Canadian General Manager, in accordance with the new A.R.R.L. Constitution and By-Laws, which are published in the membership edition of this issue of QST for your information. Your attention is invited to By-Law 26, defining the policy of the League in Canada; Sec. 1 of Article IV of the Constitution, providing for the government of A.R.R.L. affairs by a Board of Directors, of which the Canadian General Manager is a member; Sec. 2 of Article IV, defining the eligibility of Directors; By-Laws 23 and 24, specifying the duties and authority of the Canadian General Manager; By-Laws 20, 21 and 22, providing for his nomination and election; and particularly By-Law 27, which especially for this election stipulates dates differing from those specified in the other By-Laws cited.

2. The election will take place during the month of April, on ballots which will be mailed from Headquarters in the first week of April. The ballot will list the names of all eligible candidates nominated for the position by League members residing in Canada, Newfoundland and Labrador.

3. Nominating petitions are hereby solicited. Ten or more A.R.R.L. members living in the Dominion of Canada, Newfoundland or Labrador, have the privilege of nominating any Canadian member of the League as a candidate for Canadian General Manager. The following form for nomination is suggested:

(Place and date)

Executive Committee,
A.R.R.L. Headquarters,
Hartford, Conn.

Gentlemen:

We, the undersigned members of the A.R.R.L. residing in the __________ Division, hereby nominate ___________ of ___________________________ as a candidate for A.R.R.L. Canadian General Manager, for the election of April, 1924.

(Signatures)

The signers must be League members in good standing. The nominee must be a Canadian member of the League in good standing, and must be without commercial
radio connection. His complete name and address should be given. All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the first day of April, 1924. There is no limit on the number of petitions that may be filed.

4. Mr. A. H. K. Russell, of 234 Westmount Drive, Toronto, Ont., is the present Canadian General Manager.

5. This is your opportunity to put the man of your choice in office as the Canadian member of the A.R.R.L. Board. Members are urged to take the initiative and file nominating petitions immediately.

For the Board:
K. B. WARNER, Secretary.
Hartford, Conn., Jan. 2, 1924.

Transpacific Test Report

While no official report has been received from Australia on the results of the recent Transpacific Tests in which A.R.R.L. cooperated with Radio Journal and the Southern California Radio Assn., Mr. H. Kinsley Love, 3BM, in charge of Australian arrangements, announces that 150 American and Canadian amateurs got across according to reports received at Melbourne, with probabilities that the total will reach 200. Stations as far east as 2ZBY were logged.

The tests were run under very poor conditions at the receiving end, July being their best period. During the whole of the tests there was not a single really good DX night. Whenever strays were at all weak they were incessant, so that only strong signals could be read thru them, and on the other nights there were strong splashes that choked the receiver frequently. Commercial spark stations caused added difficulties in the form of harmonics.

Many more calls would have been logged, the Australians say, if we had sent a bit slower, made our dots firmer, and paid attention to good spacing.

6KA was the strongest station of the lot. At 3BM, Mr. Love’s station, which acted as the observation station for the tests, 6KA’s messages to Australia were recorded on dictaphone records. KA was received on a loop by one station, and in another case was copied in the late afternoon before the sun went down, signals QSA on one-step radio and detector.

We will publish further information as soon as the official reports arrive in this country.

-K.B.W.

Help Wanted For A Book of American Amateur Stations

A SMALL “Stray” in a recent issue announced the desire of Mr. James A. Wilson, of 8CPY-SDKC, Kalamazoo, Mich., to undertake the publication of a profusely illustrated book of American amateur radio stations, on behalf of amateur radio. The little item caught the eye of many and the returns received by Mr. Wilson were most gratifying in the cooperation offered. Hundreds of letters attest the idea to be “just the thing”.

And so now we are pleased to solicit material for Mr. Wilson. He wants photographs of stations. Every amateur is invited to send to Mr. Wilson at once, in care of the Crescent Engraving Co., Kalamazoo, a real good photo of his station, also one of the owner and operator, together with a complete but brief description of the station and biographical notes on the owner-operator. The book will be primarily pictures, so good photographs are more important than text. The photographs will be returned as soon as they have served their purpose. Five-watt stations will get the same consideration as the big fellows with 250’s—everybody is wanted.

Mr. Wilson takes the gamble. He will do a good high-class job if there is a chance of putting it across. Whether or not it can be done depends purely upon the response you fellows make to this appeal for photographs and descriptions. If he gets them, he has the material to make a successful book; he can do nothing if nobody displays interest. Let’s show him—shoot your stuff.

-K.B.W.
**UlARY and C2CG Help in Emergency**

**Amateur Radio Again Serves In Terrific Storm**

Amateur Radio added a new feather to its cap of achievements and the public was given a new insight into the possibilities of amateur service when 1ARY and Canadian 2CG rendered invaluable service on Nov. 25th during a heavy storm which tied up communication out of Burlington, Vermont, especially to the north. When telephone and telegraph service went out after a hard struggle with the storm, amateur radio was given the SOS and immediately jumped at the opportunity to bridge the gap.

Shortly after 2 o'clock in the afternoon the telephone test man in Burlington called up the chief operator, R. P. Slayton, at the University of Vermont station, and informed him that all means of communication between this city and Montreal had been cut off. Radio seemed to be the only possibility left and the test man wanted to know if the U.V.M. station could assist. Mr. Slayton went immediately to the station, only to find that the storm had taken toll there too—the receiving aerial was down. With characteristic amateur ingenuity he connected the set to one side of the electric light circuit and 1ARY was ready.

Within ten minutes after the first call went out, Burlington was in first class communication with the Canadian metropolis, for C2CG, owned and operated by J. V. Argyle, Quebec Division Manager of the A.R.R.L. in Montreal, was on the job and answered! The first messages sent were between the telephone test men of the two cities. Information was checked and an attempt made to establish communication by wire. The first message, to Montreal, read:

**PLEASE TRY TO GET IN TOUCH WITH BURLINGTON VIA RICHFORD OR WHITE RIVER JUNCTION RUSH INFORMATION CONCERNING CONDITIONS OF WIRES VIA STATION DELIVERING YOU THIS MESSAGE.**

The following reply came back:

**WIRES OK ON CANADIAN SIDE BUT ST ALBANS REPORTS 14 POLES DOWN BETWEEN ST ALBANS AND BURLINGTON.**

The second message from Burlington read:

**MEET YOU AT 4:30 VIA RICHFORD OR SHERBROOKE YOU HAVE NEGATIVE BATTERY ON YOUR WIRE.**

In the meantime, rush telegraph messages were handled by radio, avoiding dangerous delays. By 5 o'clock telegraph communication had been re-established and the wires once more took over their work.

---

**The Fourth District-East Gulf Convention**

By Charles B. Transou, 4QF*

Well, the old Fourth District-East Gulf has bust loose, fellows. The first Annual Convention was a whooping success—"as good as the Chicago Convention" was all we could hear from those who had been fortunate enough to have attended the National Convention last September. December 27 saw all the gang down in Atlanta, and a good gang it was, too, with representatives from seven districts—the missing ones being the sixth and the seventh as would naturally be expected—and they all started with a whiz and a bang. They hadn't been in an hour before the Ansley Hotel sounded like a swarming bee hive. But soon things got under way.

* A.D.M. for Georgia and City Correspondent for Atlanta.

The first was a trip by special car to WVR, the station at Fort McPherson, one of the biggest army tubes set in the country—five K.W. with fifteen thousand volts rectified A.C., supplied by Kenotrons, on the plate, and an antenna current around twenty-six amperes. How'd you like to get hold of that for a few minutes, OM? Wouldn't we work old SAB blue in the face, though?

And the banquet that night on the Ansley Roof opened things up in good shape—introductions and short speeches by the notables at the Convention, just to get us all acquainted, and lots of entertainment thrown in; it was certainly a gala occasion.

Friday morning the gang turned out in a bunch for the first technical meeting,
and some good dope it was that we got, too. At this time we heard from Fred Schnell about the famous receiver at 1MO-1XW on which F8AB is being worked. We also had a talk by Mr. H. E. Bussey of the General Electric Company on the Super-Heterodyne, and a little talk by Mr. Hebert on the A.R.R.L. Friday afternoon everybody went for a trip to Stone Mountain—one of Atlanta's proudest possessions. Here the work on the famous Confederate Memorial which is being hewn from the sheer face of the great Rock was reviewed, and then followed a little "jaunt" to the top of the Mountain, a mile above the surrounding country. The inducement was a little slip of paper entitling the holder thereof to an "Esco" motor-generator set. Incidentally our good friend 5QF ran off with it—hi!

Friday night came another technical meeting and with it the best lectures which we have ever had the pleasure of hearing. This time we heard from Prof. C. M. Jan sky, Jr., of the University of Minnesota, on the possibilities of the vacuum tube and the future of Experimental Radio; and from Mr. John L. Reinartz on his justly famous short wave transmitter, used at 1MO-1XW and 1QP-1XAM, respectively first and second stations to work F8AB. It is considered quite an honor that we could enjoy the pleasure of having Mr. Reinartz here to explain his circuit in detail.

Saturday was the crowning day of the Convention. In the morning and early afternoon some minor prize contests were run off and that night all gathered at the Club Rooms of the Atlanta Radio Club for the initiation into the Royal Order of the World Hong. Though some had a hard time of it they all came out more than delighted at now being members of the widely famed fraternity of the amateurs of the American Radio Relay League. The rest of the prize contests were held and the prizes awarded, and right here a gang of the fellows became the proud owners of lots of apparatus. 3PB ran off with the Paragon outfit in the code contest and 4QF got the Graue CR-13 for the "Ten Best Suggestions for the Betterment of Amateur Radio", and so things rocked along until that huge pile of prizes had been reduced to nil. The final windup had come—the Convention had gone across with a BANG—and everybody resolved then and there that the Fourth District-East Gulf should have no equal in the country from now on.

Fellows, the Atlanta Radio Club pushed this thing and has got the ball rolling—now let's keep it going. Let some good snappy club in one of the larger cities put in bids for the next year's Convention and decide right now where it'll be. The good work is on foot—now let's keep it up. And we also might give a word of thanks to those in the Atlanta Radio Club who specially pushed the Convention and did their best to make it the success which it was. The Convention Committee was as follows:

Dr. M. M. Burns, 4DO, President, Atlanta Radio Club, General Chairman.
Harry F. Dobbs, 4DN-4ZA, Chairman, Ways and Means.
Henry L. Reid, 4KU, Chairman, Publicity.
Capt. Walter Van Nostrand, Jr., Chairman, Prizes.
Chas. B. Transou, 4QF, Chairman, Registration.
Walter E. Dobbins, 4AP, Chairman, Programme.

Convention Pictures may be had at $1.00 each by writing Walter F. Winn, care the Atlanta Journal, Atlanta, Ga.

A New Type of R. F. Transformer

By S. Kruse, Technical Editor

We do not know what form the radio-frequency transformer will finally take; fixed transformers and tuned transformers both have their advantages. The Ballantine "Variotransformer" combines some of the advantages of both types.—Tech. Ed.

In the amateur world the early form of the "Variotransformer" is well known, for few sending stations are without a copy of "Radio Telephony for Amateurs"—and fewer still should be. But for the few who do not have the book, and for the man not interested in transmission, it is interesting to follow an explanation of the underlying idea.

When a radio-amplifier uses a fixed transformer the wavelength range is also fixed. By using various tricks it has been possible to broaden out the range of such transformers; a few makers have done it in a really quite satisfactory manner. The effect of these tricks is usually to reduce the amplification; that is to say, a narrow high peak is replaced by a broad, low one. In no case is it possible to make the amplification over the entire range as high as the original peak.

This situation has driven amplifier-
makers to the use of tunable devices, whose peak can be shifted to suit, instead of attempting to broaden it out.

The Two Kinds of Tuned R.F.

The first form of tuned amplifier that one thinks of is that in which the transformer has two air-core windings, each tuned by a variable condenser. Naturally that is hard to handle and it has been simplified by taking out the primary condenser and coupling the windings so closely that they tune as one circuit and the secondary condenser can handle them both (See Fig. 1) Such devices amplify very well. Their tuning is quite sharp, which is an advantage when a single stage is used. When more stages are used it becomes rather hard to tune all of them together. More than two stages are not ordinarily used. One immediately thinks of introducing resistance to broaden the tuning, but that causes a drop in the signal strength.

The second of the usual methods is to put a variometer into the plate circuit of the first tube and feed the plate power (B-battery) to the tube thru this variometer. When a signal is coming in, this variometer is so adjusted that the radio-frequency current causes a considerable voltage-drop across the winding; it is then only necessary to feed this voltage to the grid of the next tube. Right there the trouble begins—the variometer is connected to the B battery, the windings carry the B-battery voltage, and a direct connection to the next grid will injure or destroy that next tube. It is necessary to put in a blocking condenser and a gridleak as in Fig. 2. This is not a good state of affairs, as it is not possible to control the bias of

grid circuits. The thing has been done quite simply: the variometer is wound with a 2-strand wire, the strands being insulated from each other (see Fig. 4). When the winding is complete one strand is connected into the plate circuit and becomes the primary; the other strand is connected into the grid circuit and becomes the secondary. We now have a transformer whose primary and secondary, and therefore the wavelength range, can be varied by turning the knob on the shaft of the variometer-rotor. This is the "variometer-transformer" or "Variotransformer".

The actual construction of the device is shown in the photograph and does not seem to need much comment. However, a great deal of time and patience was spent in determining the proper proportions and in arriving at a construction which will keep down the resistance and still permit a wide wavelength range.

Testing Radio Amplifiers

Before one starts to speak of amplifica-
It is well to explain how it is measured. The amplification of a radio (or audio) amplifier can be expressed as the output voltage divided by the input voltage—in other words, the voltage amplification is simply the number of times that the input voltage has been multiplied in going through the amplifier. Let us look at this another way: suppose that the tuner supplied to the detector a potential of one micro-volt (one millionth of a volt). Now if we put a r.f. amplifier ahead of the detector and find that we are supplying 5 micro-volts to the detector, it is evident that the voltage-amplification is 5.

The devices for measuring such amplifications must be very carefully handled—it is extremely easy to get false results. Ballantine and Hull therefore spent many months in devising an apparatus set-up that they were sure did really measure the r.f. voltage amplification, and nothing else. All manner of check-tests and precautions were taken and the results may be regarded as trustworthy, especially as both men concerned had put some years on this particular sort of work.

In Fig. 3 are shown curves for the Variotransformer and several commercial transformers with fixed windings. Curve 1 is an air-core transformer and, as stated above, it shows the tendency to amplify very strongly over a narrow range—and not at all otherwise. This particular transformer performs beautifully on 450 meters. Nos. 2, 4, 5 and 6 are normal iron-core transformers. No. 3 is a somewhat special type intended mainly for long-wave work and it can be seen that above 600 meters it performs better. The outstanding thing about the group of curves is the flat-topped curve of the "Ballantine 5." This curve gives the same high amplification over the entire broadcast band, and does not fall below 5 in the amateur band. None of the others approach this. Now it is not pretended that the curves show all commercial transformers, none the less it is true that no fixed transformer can show a flat-topped curve.

Handling the Variotransformer

The curves perhaps give the impression that the “variotransformer” is non-selective and will “let everything thru at once.” That is not correct, for it must be remembered that at any one setting the transformer gives a curve which (altho higher) is
of the general type of curve No. 4, Fig. 3. The curve shown therefore is the one made by the various peaks that can be obtained. Putting it in another way, if we turn the knob of the variotransformer we can cause the peak to slide along and draw the curve shown—but if we stop at any point we have a peak and will therefore not be bothered by waves much to either side, tho the tuning is not so sharp as to be bothersome.

The process of tuning a set with Variotransformers accordingly is to set the knobs of all of them at the same value—a bit below the desired wave,—then to tune in the desired station with the condenser, etc., of the input tuner; and, finally, if that seems necessary, to make more exact setting of the Variotransformers. Any tendency to oscillate can be avoided by keeping the settings a bit low (this makes the plate load capacitative instead of inductive) or by some permanent device such as described in the paper "Anti-Regenerative Amplification," QST for January, 1924.

"CQ Urgent de 7IP"

Amateur Radio Again Proves Itself Useful in Emergencies

By F. M. Curtis, 7SZ

Hub, that's a new one on me", muttered 7GI to himself, as he turned on the filaments of his two five-watters preparatory to answering 7IP's general inquiry, which was liberally sprinkled with the word "urgent". "Wonder who this bird is, any­way? Don't remember hearing his call before. Well, here is where we get acquainted.

7IP 7IP 7IP de 7GI 7GI 7GI QRA? QTC? K".

"7GI de 7IP GM OM QRA NEAH BAY WASH. QTC LONG MSG QSR? VY URGENT HD STORM HR ALL COMMUNICATION CUT OFF MUST GET IN TOUCH WITH MAINLAND 7GI de 7IP K".

"7IP de 7GI OK OM GA K".

"HR NRI FM A A MCCUE NEAH BAY WASH DEC 8 3AM TO P H MCCUE NORTHWESTERN FISHERIES CO 800 MARINE BLDG SEATTLE WASH. CANNERY COURT SOLDIER HOUSE AND CHINA HOUSE READY TO FALL STOP MESS HOUSE OR STOP CLOSE NIPPLE BETWEEN SHUT OFF VALVE AND FUEL TANK BROKE ALL—QRX BATTERY FAILING".

That was all. No longer was 7GI nodding with drowsiness. "Ed storm hr—all communication cut off" was enough to cause an attentive tenseness in him as he sympathized with 7IP in his helpless position out there on the storm-battered point. He tuned around in vain—the pleading chirp of Neah Bay was not heard. Minutes dragged by. After a space that seemed like hours, again the signals reached his ears:

"7GI 7GI de 7IP 7IP SORRI OM QRY? HW? K".

From his little shack in Spokane, 7GI again joined Neah Bay to the rest of the world. Traffic was resumed without wasting time:

"--ALL CRUDE OIL LOST STOP FIVE PILES GONE UNDER STOP BOILER STILL STANDING ALL MACHINERY MOVED OUT OF CANNERY INTO WAREHOUSE STOP SUGGEST YOU COME OR SEND SOMEONE TO LOOK THINGS OVER AFTER STORM ANSWER SIG A A MCCUE. HW? 7GI de 7IP K".

7GI had it, of course, and arrangements were made for the delivery of the message via Western Union to Seattle. 7GI received the answer from Seattle and forwarded it to 7IP. Several days later GI received the following letter from IP:

Neah Bay, Wash.,


Mr. Carlos S. Yerian, 7GI,
Spokane, Wash.

Dear Mr. Yerian:

I wonder if you realize how important that message to Mr. P. H. McCue was? Up until the night of our communication I had not done any amateur work since I disposed of my transmitter in Alaska four years ago. (By the way, I was the first ham in Alaska; my 1-kw. spark set was in
operation up there in 1916.) I gave up amateur work when I took charge here three and a half years ago, as it interfered with my work, but after the good work thru amateur radio the other night, I am back in the game for good. I am going to Seattle the first of January and while there I am going to build a 250-watt C.W. transmitter—so you see I am going into it right.

My dad, Mr. P. H. McCue, general manager and vice-president of the Booth Fisheries Co., is here now looking over the damages done to our cannery by the storm. He certainly appreciates the good work you did for us and he is all for amateur radio. He is writing you a letter to show his appreciation. Allow me to thank you again for the good work. I hope I may have the opportunity of meeting you some time.

Respectfully yours,

A. A. McCue,
Supt. & Mgr., Neah Bay Branch.

As 7GI folded up the letter and put it back in the envelope, he knew that amateur radio is indeed more than a mere plaything.

The Improved "S"-Tube Rectifier

By James L. Jenks, Jr.*

It is an interesting fact that, during the past fifteen years, the transmitting amateur has been constantly perplexed and harassed in mind as to how he may supply the necessary volts and amperes to his sending-equipment without breaking a bank or committing forgery. In the very early days dry-cells, an army of wet batteries, or even an occasional storage battery, furnished the energy for the famous "squeak box," at that time the very acme of transmitting perfection. A few years later the electrolytic interrupter made its appearance, and city mains supplied the necessary wherewithal for "half-kilowatt transformer coils" and such gentry. Next came the good old transformer and spark gap with its host of relatives in the form of blinking lights, annihilated fuses, uncanny telephone troubles, etc., ad infinitum. And now, with the little transmitting bottles here apparently to stay, the same old problem pops up again—"What shall we use for the necessary D.C.?") To some, a high voltage "B" battery or a motor generator may be the answer, although both have their drawbacks. To the great rank and file, however, the high voltage rectifier, capable of efficient filtering, is the most satisfactory solution.

In QST, August, 1922, a new rectifier known as the "S"-Tube was described. This device was of considerable interest for the following reasons:—

1—it would rectify comparatively high voltages without filament or other electron emitting device.

2—it was not determined by any one element within its construction, such as filament, etc. In other words, the life of the tube depended largely upon its treatment, and with care, the tube was known to average several thousand hours of service.

3—it was extremely simple to connect up and operate since it was merely necessary to insert a common porcelain lamp receptacle, and connect to the alternating current source. The tube was free from the inconvenience of separate filament lighting supply, sloppy chemicals, magnetic fields, etc.

The chief limitations of the tube, however, were in its voltage and current output. 50 M.A. at 750 volts D.C. was considered the maximum safe output of the old style tube. With the ever-increasing popularity of the 50-watt transmitting tubes, it soon became evident that the original "S"-Tube would not handle the job. Accordingly, late in the spring of 1923, an improved "S"-Tube was developed in the Amrad Research Laboratory, which is now marketed under the title of "S'-Tube, #4000." This new tube possesses the following advantages:

1—it's voltage and current output has

---*Laboratory Manager, Research Department, American Radio & Research Corporation.
been considerably increased; 100 M.A., D.C. at 1000 volts are now considered a safe operating output.

2—Owing to improved internal construction, temporary overloads can be much better withstood than with the old style of tube.

3—Improved methods of treating and design have lowered the starting voltage and internal losses.

The new tube operates very successfully both in series and in parallel, which means extended usefulness where extra high voltage or current is required.

A glance at Fig. 1, which is a cross-sectional cut of the tube, shows its extreme simplicity of construction. It consists essentially of a treated carbon cup and nozzle, supported on a thimble-shaped insulator of baked lava. An anode pin projects into the nozzle space, and is insulated from the cathode by means of the lava thimble. One reason for the tube's increased output is the fact that lava maintains its resistivity at very high temperatures. Glass, on the other hand becomes a fairly good conductor when heated above 300 degrees centigrade. The increased simplicity of construction has permitted making the over-all length of the tube considerably less, thereby increasing its mechanical strength. Fig. 2 shows the tube as it appears completely assembled and in a regulation lamp socket.

It has been found to be an excellent source of plate power for all types of tube transmitters, owing to the excellent wave form inherent in its principle of operation. Properly smoothed by filters and chokes, the "S"-Tubes will furnish direct current that can hardly be told from that furnished by a storage battery.

Fig. 3 shows an oscillogram of two "S"-Tubes rectifying 60-cycle A.C. with and without a filter. Note the almost perfect wave form, and absence of reverse current. Frequencies as high as 800,000 cycles have been successfully rectified with the new style tube.

Station "WGI" has been using "S"-Tubes with perfect success for charging a 500-volt Exide storage battery used in phone transmission. High voltage batteries of this sort may be charged direct with no complicated paralleling switch or similar device.

By properly filtering the output of one or two "S"-Tubes, a very satisfactory source of plate-potential for receiving sets may be provided, free from all hum or ripple. Such a plate-supply is clean, compact, always ready for use, and amply sufficient to operate a power amplifier where several hundred volts are required.

In conjunction with a high capacity condenser, such as the Mershon Electrolytic Condenser, very heavy currents are made available for short intervals of time. This type of power is useful for such work as time clocks, relay signals, etc. Two "S"-Tubes, charging four E.M. Condensers in parallel, and having a total capacity of about 120 mfd.s., will put several amperes through a magnet coil of the proper resistance; and solenoids have been made capable of lifting several pounds by this method.

Chart #1 shows a single "S"-Tube in the process of warming up. It will be noticed that, when the tube starts cold, the output is somewhat below normal, the voltage drop decreasing in the course of a few minutes as the elements become heated.

Chart #2 shows the remarkable voltage regulation of the "S"-Tube under varying load.

Chart #3 shows two "S"-Tubes in double half-wave rectification with the usual center-tapped secondary. The four curves

---

1—Refer to "Amateur Filter Problems" page 23 of QST for August, 1923. This issue can be supplied by the circulation department at the usual price.

2—Refer to p. 13, QST, April, 1923 for full details. It can be supplied by the circulation department at the usual price.
show output under four conditions, namely:
load with and without condenser, and no
load with and without condenser.
Chart #4 shows a similar series of
curves, but with two tubes in series on
each half of the secondary. It will be
noted that the so-called “bridge” connection
puts two tubes in series for each half-cycle,
as does the other connection shown. The
“bridge” connection incidentally is useful
where very high voltage is required, or
where no center tapped transformer is
available. (However the “bridge” connection
passes quite a large amount of 60 cycle
current. The “center tap” connection passes
nothing below 120 cycle hence is easier to
filter.—Tech. Ed.)

Chart #5 shows the “S”-Tube operation
in parallel. As the “S”-Tube is purely a
gas discharge device, it is necessary to put
balancing resistances of from 500 to 1,000
ohms in series with each tube in order to
evenly divide the load.

The reason for
this will be apparent if one tries to run
two-spark gaps in parallel. Invariably, the
shorter gap will take all the current unless
it is forced to divide by some form of
balancing resistance. Ward-Leonard 500-
ohm and 1000-ohm wire-wound resistance
units are excellent for balancing resistances
as are 110 volt tungsten lamps. Use lamps
that run cold or at a dull red heat. 25 and
50-watt lamps are also useful when charg­
ing “B” batteries.

From the above charts transformers may
be designed for any desired output of recti­

ified D.C. In normal operation the “S”-
Tube starts conduction at about 300 volts
A.C., and has an internal drop of approxi­
mately 150 volts.

The following hints on practical operation
may not prove amiss:

Allow the tubes to warm up a few
moments before expecting full output, as
moderate heat improves conduction.

If applied potentials are too high, the
tubes will usually glow or flash over ex­
ternally, warning the operator to lower the
voltage. With smoothing condensers, a tube
will sometimes flash over at no-load, but
be perfectly steady at full-load, as with
high leakage transformers the no-load volt­
age frequently rises very high. Unless flash-over is prolonged, a tube is rarely injured by this phenomena and, properly observed, it makes an excellent overload indicator.

Unlike thermionic rectifiers there is no limit to the current the "S"-Tube will pass, until breakdown occurs. This is an extremely useful feature since very heavy current may momentarily be drawn without permanent injury to the tube. Should a tube be accidentally overloaded for a prolonged period and cease to rectify, several hours' operation on low voltage and light load will frequently repair the injury. The reason for this is that overloading gives rise to impurities in the gas, which, upon aging, again disappear, leaving pure gas and renewed service.

In parallel or series operation care should be taken to see that the tubes are connected properly. The tube passes current when entering by way of the anode which is the center contact of the lamp base. The current leaves by way of the cathode, which is connected to the ferrule, or outside of the base. With a split secondary, it is convenient to connect the outside taps to the two anodes, or center terminals of the "S"-Tube, thus making the center tap of the transformer the negative lead, as shown in the diagrams.

In conclusion, it is safe to say that the improved "S"-Tube will find favor with all who wish for a cheap, efficient, fool-proof, high voltage rectifier, which requires absolutely no attention, or auxiliary equipment, has nothing to burn out, is durable, very long-lived, clean and compact, and which, when properly filtered, gives a tone that cannot be excelled.

**Automatic Radio Relaying**

*By Porter H. Quinby, 9DXY*

**WARNING—**This article is presented as the record of an interesting stunt, but NOT to encourage general copying of the stunt. Endless trouble would follow if the practice of auto-relaying were to become common, no one would know whom he was hearing, a wild mess would be the final result.

Remember also that it is a violation of the radio laws to sign a call that does not belong to you—no matter how the sending set is being keyed. Don't try to blame it on someone three states away from you.—Tech. Ed.

Automatic radio relaying devices are usually built around the idea of receiving a signal, amplifying it until it will operate a magnetic key, and then using this key to operate a sending set on a wave very much different from the receiving wave. Such stunts have been used often; perhaps A.R.R.L. members will best remember the twin operation of WWV and NSF during the Fading Tests of two years ago. At that time the signals of WWV were received at NSF, amplified until strong enough to operate a keying relay, and then caused to operate the key at NSF. Because the stations were close together and special tuners were used it was possible to crowd the two waves together; quite regular operation was gotten with WWV on 200 and NSF on 190. The stations were operated when tuned more nearly together than that but some interference followed. Such systems are good only when the received signal is very strong or the re-transmission wave is quite different from the received wave. That is the first novelty in the system tested at 9DXY, the re-transmission wave is the same as the received wave.

9DXY's Stunt

A sending set with a tuned grid circuit was used and operated as follows: First the switch was closed and normal voltage applied to the tubes, which at once began to oscillate. The variable grid-tuning condenser was then very slowly turned until
the tubes just stopped oscillating; and then slowly turned back again until the point was found where the tubes just failed to start oscillating. The set was then in a very unstable condition and a small voltage in the antenna system would cause it to "break over" and begin oscillating. Unreasonable as it may seem it is perfectly possible for a received signal to furnish this "trigger voltage" and to start the set going.

The next problem was to make the sending set stop oscillating when the received signal stopped coming in, and this at first sounded very difficult. However, it was really quite simple. It was perfectly plain that the tubes would stop if we removed the plate voltage, and that was the method used at 9DXY. It was only necessary to supply the tubes with 60-cycle alternating current. This sort of plate supply shut off 60 times per second, and each time the tubes stopped oscillating. Then they did not start again unless the distant operator still had his key down so that the "trigger voltage" was supplied for the next half-cycle. Putting it differently, the sending set continued to be triggered off at each half cycle as long as the distant operator held his key down. As soon as he let his key up the sending set at the relay point finished that particular half cycle and stopped. The same effect can be had by using rectified-but-not-filtered plate supply.

The Set at 9DXY

The circuit used at 9DXY was the familiar reversed-feedback with a tuned grid coil. Both series and parallel feed have been used with equal success and the latter is shown in the diagram. The only unusual thing about the set is that the diameter of the grid coil is only 4 inches, altho that of the helix is 7 inches. This grid coil may at first glance seem small but is the result of much experimenting and is found to be the most satisfactory size for obtaining full output over a band of wave lengths. With this coil in use we find it possible to QSY over a band of fifty meters by simply changing the antenna clip and the grid-tuning condenser. This takes less time than the telling, usually about 10 seconds, and the antenna current remains about the same; how different from the Hartley! It has been our experience that the controls are not interlocking but that the plate clip controls the load on the tubes and the grid condenser controls the feedback. Thus we have reduced the controls of our wave length to two—the antenna clip and the grid condenser. [Almost—but not quite. To secure best operation from such a set the nodal point cannot be allowed to wander around but must be kept at the point where the filament and grid circuits connect to the helix, as often explained in QST. In general this means that the counterpoise and antenna clips will be about the same number of turns away from the filament-grid clip. Result: it takes 15 seconds to change wave instead of 10.—Tech. Ed.]

The Stunt in Operation

Any strong incoming signal could be retransmitted as desired in the following manner: First we tuned in the distant station on our receiver, then by means of the antenna inductance clip we adjusted the transmitting set to the wave length of the received signal at which the receiver was set; this was done easily enough when listening and took less than 60 seconds. Then we put the grid circuit in the critical condition as explained above and at once the signals began to break thru, and with a little readjustment began to re-transmit themselves as clearly and as cleanly as tho the original operator were handling the key at 9DXY! Operation was equally successful on five, ten, fifty and a hundred watts. The phenomenon is not a peculiar characteristic of one individual set for we have built two and they worked in the same manner.

Automatic relaying is interfered with by heavy atmospherics and other stations on its own wave length in the same manner as a receiving set. But under favorable conditions signals have been re-transmitted from 52A, 8CWP, 3ZO, 4EB, Can. 4DY, and others equally distant, and have been copied up to 800 or 900 miles from our station. At one time we QSRD a message in this manner from Ohio to Denver on 10 watts and received a QSL immediately. We never did get done explaining to those fellows how it all happened. Hi!

The suggestion may be offered that our receiving set re-acts upon the transmitter in aiding this phenomenon but we found it made no difference whether the receiver was turned on or off. However, the re-
Motor and Generator Bearings

By E. W. Berry*

The greatest cause for dissatisfaction on the part of users of motor-generator sets does not arise from the inability of the manufacturer to produce a machine that fulfills the requirements, but rather from failure of the machine thru ignorance, neglect or wilful misuse. This statement is made after a careful survey of the work of the repair department of one of the largest makers of motor-generator sets for radio work. A large percentage of generator and motor breakdowns are either in the bearings or are the result of bearing trouble.

Bearings may be divided into three types: wick oiling, ring oiling and ball bearing. Without commenting on the disputed merits of each type we will consider them individually.

Figure 1 shows a typical wick-oiled bearing with its oil cup. The bearing, B, is mounted, tight fitting, in a housing, H, and is held in place by the nozzle, N, of the oil cup, C. The nozzle also serves as a guide for the wick, W, and as a mounting for the cup. The wick and the spring should be so adjusted that the wick bears firmly on the shaft. Do not loosen the nozzle or the bearing may become loose in the housing. The proper fitting of wick-oiled bearings without accurate bearing and lining reamers is a dangerous undertaking in so far as the machine is concerned. If new bearings must be installed be sure that they are provided with a small groove extending from the wick hole nearly to the ends of the bearing. This groove may be chiseled provided the burrs are carefully removed.

Figure 2 is a ring-oil bearing. The ring, R, hangs in the groove, G, riding on the shaft and turning thru the groove with its lower side immersed in an oil well. This revolving ring carries a steady flow of oil over the exposed surface of the shaft. The grooves convey the oil from here to the inner surface of the bearing. In placing a machine of this type into service three precautions should be taken. First, see that the ring rides on the shaft and turns with it. It may be held by an unremoved burr, or it may have slipped out of the groove and lodged on the bearing proper. Second, be sure that there is a good supply of oil in the well; a small amount of oil, thru which the ring does not run, is useless. Third, be sure that the oil well is free from burrs or grit that may be carried with the oil into the grooves.

Ball bearings should not be meddled with. They are accurately fitted and inspected before leaving the manufacturer. Provisions for oiling or greasing are made; use them. Removal of the end caps is only inviting grit to enter.

Keep the cup of wick-oiled bearings well filled. The manufacturer has originally filled it with the proper lubricant. Ask him where to buy the right oil or obtain it from him. In any case the oil or grease should be fluid enough to be absorbed by the wick. Ring-oiled bearings should have a fairly heavy oil, ball bearings a light grease, and vertical-shaft ball bearings a slightly heavier grease.

In mounting machines be sure that they are so arranged that the bearings will lubri-
cute properly. Wick-oiled and ring-oiled bearings must always be mounted with the shaft horizontal. This is to let the armature line itself up in a normal position in the magnetic field. In this position the armature should tend to hug neither bearing but to "float" between the two. On the other hand with ball bearings there should be no end play. The bearings are so designed that the armature is held in its proper position. This permits less care in mounting.

Use the proper lubricant and use it freely.

A tight bearing causes excessive heating and may result in burning the bearing and shaft.

A loose bearing is noisy, wears rough, and often allows the armature to rub against the stator; then the machine will fuse to start or does so with heavy vibration.

A ring-oiled bearing is designed to be mounted in one position only, with the oil well down and the shaft horizontal.

Ball bearings may be mounted in any desired position but the preference should be given to the position for which they were designed.

An improperly floated armature will cause inefficient operation. The shaft will hug one bearing, wearing away the fibre washers, whereupon the bearing, with metal against metal, becomes noisy and overheats.

Don't dismantle the machine until you know that by doing so you can repair the difficulty. Otherwise get into touch with the manufacturer. He would a great deal rather help prevent trouble than to repair the machine after the harm is done.

Rotten Problems
By The Old Man

Say, Son, send help, will you please.
The Radio Club dug up one last night that has not been equalled since the old spark days when we used to break up the furniture trying to agree where the ground began and the ground lead ended. It began when Final Authority explained in words of one syllable the "The poor gink to whom his remarks were addressed—."

"Law of the Conservation of Energy."
The poor gink to whom his remarks were addressed was trying to make out that his six amps in his antenna and his four amps in his plate transformer primary indicated that he was getting something for nothing from somebody. He got about as much out of Final's lecture on the Conservation of Energy as I would get out of a discussion of the "Background of Eternity". I don't know what the latter means and the poor gink didn't know what "conservation" meant. The lecture got just exactly nowhere with the muddle-plated one, but it did wake Radical up. I noticed his attention being drawn to the subject in hand, just about the time that Final got on to the matter of radiation resistance. I knew there would be some old time doings, so I stuck around and threw a monkey wrench into the works now and again, whenever the opportunity offered.

When Final had been led along by Radical to a point where the radiation resistance of the antenna represented actual energy sent out, the fire began to fly the way it did in the good old spark days. It sure did seem like old times. Radical asked Final what made the phone diaphragms at the distance receiving station move, and of course Final said it was the A battery energy triggered off by the feeble incoming current. Radical's questions had about ten words in them, and Final's explanations had about fifteen hundred. We waited while Final wandered around through the mazes of the vacuum tube...
detector and the vacuum tube amplifier. Radical after a long time got him down to the energy placed on the grid of the detector tube. All hands agreed, after about an hour and a half, that this energy was unconditionally a part of the energy that had been radiated from the transmitting antennae. This is just where Radical wanted to land Final. It took a long time to get down to brass tacks, but he finally got him down. Then he proceeded to swat him in the intelligence.

If the law of the conservation of energy held, then would Final please explain what became of the energy that left the earth and was radiated into outer space?

Final replied that energy can neither be created nor destroyed and that which escaped into outer space, could not have been destroyed and probably reappeared in the form of heat somewhere.

Radical touched a tender spot when he asked, "heated the air, I suppose—HOT AIR?"

Final didn't see the point at all. He rejected the hot air proposition altogether, and did not believe that the air had anything to do with it, but that it was an ether proposition. This got him in still deeper. Radical asked him if he meant that the "ether got hot."

Final had evidently never given consideration to heating up the ether, and he began to flounder. It was evident that the knock-out was drawing near.

"Then what does get hot?" asked Radical.

Final had a terrible time trying to put his finger on something in outer space which would get hot as a result of the hundreds of thousands of ergs of energy that were being squirted into outer space by the radio stations every month that rolled around. But he had said that the energy positively must reappear somewhere on account of the conservation business. It usually appears in the form of heat, and he positively must find something that got hot. He could not think of a blamed thing out in inter-stellar space that would get hot as a result of the hundreds of thousands of ergs of energy that were being squirted into outer space by the radio stations every month that rolled around. But he had said that the energy positively must reappear somewhere on account of the conservation business.

"Then what does get hot?" asked Radical.

Final hadn't anything better to suggest than "forever".

Everybody began to get up on their toes about this time and Radical expressed the views of the rest of us very eloquently when he replied "Gosh! Forever's a darned long time."

Final had to account for friction and various other losses which we electrical and mechanical tinkerers know so much about, but he simply ran clean out of ammunition and for once in his long radio club career sat down speechless.

There was a long pause when you could hear the watches all ticking around you. Radical finally broke it by exploding, "If all this conservation dope is OK, I'm still looking for somebody to tell me where the energy reappears that escapes into outer space. I'll be horned-swoggled if there was a soul in the room who could tell him. I've sat up half the night trying to figure it out myself, and I haven't got the answer yet. It's like the old timer, that Japanese school boy, who asked the one about the air condenser and what became of the charge on the dielectric when somebody blew out the air between the plates. This radio energy that we fellows radiate out from our antennas must escape into outer space in pretty big gobs. That which escapes from these 350-kilowatt trans-oceanic stations must be some respectable amount of energy. There is so darned much vacant space that this stuff must miss the target a good deal of the time. What becomes of it?"

Send us help, some of you wise guys. TOM.

NOTICE TO OUR NEWSSTAND READERS

As announced in our last issue, the Operating Department Report and the "Calls Heard" Department have been eliminated from the newsstand edition of QST because our non-member readers in general are not particularly interested in them. This results in a saving in expense which makes possible the publication of a larger and better QST.

These two departments are included in the edition supplied to members of the A.R.R.L. If you are interested in them, it is proof positive that you ought to be a member of the League. May we not direct you to the handy application blank appearing on page 88 of this issue?
The 25-cycle signals from Leon Deloy's station, F8AB, at 55 Boulevard Mont Boron, Nice, France, have been heard all over the United States and southern Canada during the past month. Amateurs everywhere are curious to know the details of this station's transmitter. F8AB was not only the first French amateur to work American amateur stations, but his signals are still the strongest amateur signals that have ever come across the Atlantic.

M. Deloy, when on his recent visit to America, spent a good deal of his time visiting amateur stations and getting information and ideas on the tube transmitters used by amateurs here. When he sailed for France he was confident that he could go home and build a transmitter that would reach this country—and it was not long before that was done and his signals were heard on this side.

The photograph shows the transmitter just as it was when it was first heard in this country. It is just an experimental layout and no attempt was made to make a finished job of it. The Hartley circuit is used with variable series condensers in both the antenna and counterpoise leads after the fashion described by 1QP on page 26 of the January QST. Two S.I.F. French 250-watt (input) tubes are used in parallel as oscillators, with high voltage 25-cycle alternating current applied directly to their plates.

Looking closer, the two series condensers can be seen at the extreme left in the wooden boxes. Next is the inductance, made of copper tubing and wound on a wooden frame. In front of the inductance is a 50-watt (input) French tube, the plate-to-filament resistance of which is utilized as a grid leak for the oscillator tubes, as suggested by Mr. T. Appleby. The boxes behind the transmitting tubes contain fixed condensers made of photo plates. To the right of these is the radio frequency choke coil: a single layer of cotton or silk covered wire on a cardboard tube. The high voltage current is supplied by the four transformers seen in the right-hand side of the picture. These have their primary windings connected in parallel and their secondary windings in series, the sending key being connected in series with the primary windings.

Passing to the outside of the station,
the antenna is an inverted L, the flat top of which is a four-wire cage on three-foot spreaders with an average height of 76 feet above the ground. The lead-in is about 46 feet long and consists of two wires running to the operating room on the top floor of the house. The counterpoise, nearly underneath the antenna, is a three-foot cage running from the operating room to a point six feet above the ground. It is slightly longer than the antenna.

A Grebe CR-13 receiver has been used lately in the transatlantic work, but an experimental super-heterodyne set and several other receivers are in the station and are used at times.

The normal antenna current at F8AB on a wavelength of 108 meters is in the vicinity of 3 amperes, but good communication has been carried on with American amateurs with as little as one ampere in the antenna!

Since the above was written, and since this photograph was taken, M. Deloy has rearranged his antenna system and although he is now getting less antenna current he comes in nearly twice as loud on this side as he did before. Details of what the changes were have not yet been received but will probably be published later.

G2KF, London, England

British amateur station 2KF was the first English amateur station to carry on reliable two-way communication with America. For that reason we are especially glad to get a peep at the inside of this pioneer station and have Mr. J. A. Partridge, the owner and operator, tell us about the apparatus and connections employed at his station.

(Concluded on page 56)
GETTING TOGETHER WITH THE B.C.L.'s
By H. Eugene Watkins, President,
Worcester County Radio Asso.

The Worcester County Radio Association pulled off a stunt recently in their "shack" on the roof of the Y.M.C.A. that can easily be copied by other radio clubs. It came about this way:

Worcester has hundreds of B.C.L.'s who have been blaming the local ham for all the sins in the decalogue and a few that have come in with radio. They organized as the Worcester Radio Club, and began holding their meetings in the City Club. They elected their officers: President, a dear little old man who is as "set" in his own opinions as any "down east Yankee." He is the owner of the "best radio receiver money can buy, sir." (A certain infamous single-circuited.) The Secretary is a young chap who holds down the job as Radio Editor on one of our local papers—who cannot read code and wonders who CQ is. And RO on all down the line.

So much for them. Now two week ago I was invited with two other members of our Club to come down to their meeting and explain why we existed at all; why we should not have our licenses taken away and allow the B.C.L.'s to have the air to themselves forever Amen. Well, we three threw a wrench into their aspirations and were able to convince them, partially perhaps, that we were pretty good fellows after all and we invited the whole bunch to attend our next meeting.

Here are the stunts we pulled off there and they opened the eyes of the B.C.L.'s quite a bit. We had an R.C. set with 1 stage amplifier and Radiola II (portable) set side by side on the table and one was attached to our receiving aerial and the other to the sending aerial. We were able to tune in WIP and KDKA separately and have music in one and a lecture in the other—this without the slightest interference one with the other. We showed them how to tune in without causing howling in the other set and how to stop the howling when it did occur from outside sources. Then we demonstrated the interference of X-Ray machines, violet ray, vacuum cleaners, trolley cars, buzzers, etc.

After the demonstrations we exhibited the two-reel motion picture "The Wizardry of Wireless" gotten up by the General Electric Co.

We had about 65 B.C.L.'s present and they all went home with better feelings toward the Hams and carrying with them a hearty invitation to join our club and learn the code.

AMATEUR RADIO STATIONS
(Continued from page 55)

Radio 2KF is situated at 22 Park Road, Collier Wood, Merton, London, S.W. 19. This is near Wimbledon, some miles southwest of London proper. Mr. Partridge is the sole owner and operator and all of the apparatus employed, with the obvious exception of such items as phones, tubes, and generator sets, is of his own construction. He commenced his radio activities in 1911 with the usual spark coil and crystal detector equipment and held an experimental permit prior to the outbreak of the war in 1914, when all amateur permits were cancelled by the P.M.G. Soon after demobilization in 1919 a new "ticket" was obtained and spark coil and crystal gadgets gave way to storage batteries and vacuum tubes. So 2KF is quite an old timer.

The actual site of the station is very favorable for short wave experimental work as the antenna and radio house are well in the clear. A three-wire invert-
Brother hams,—attention! Allow us to present to you the smiling visages and a brief history of the three hard working amateurs that do the illustrating of our QST. On the right is Carl D. Hoffman, 8UX and QST's cartoonist; in the center is Clyde E. Darr, 8ZZ, who makes QST's cover drawings, and on the left, Harry R. Hick, who draws the diagrams and other illustrations in QST.

The earliest ambition of 8UX was to be a newspaper cartoonist. However, he fell for radio some eight years ago and was soon in a close race with the other bugs of Akron, Ohio, for the biggest layout of apparatus. Those were the good old pre-war days, when his call was SADU. He started drawing for QST about the fourth issue that was published and has been at it ever since, putting over the funny side of radio with his clever pen.

During the period of the war he was in the Military Intelligence Service, Radio. Upon his return he attended the Cleveland School of Art for half a year, but forgot about his art career and started a radio store shortly afterwards. He recently sold out and is now with the Republic Electric Co., 1740 Chester Ave., Cleveland, Ohio, as assistant to the radio department manager.

Don Hoffman was one of the organizers of the Akron Radio Club. He is not a busy relay worker, preferring experimental and radio newspaper work. As editor of a fine radio column in Akron's largest daily paper, he puts forth the truth about the ham. "Occupational cartoons," started recently, has made such a hit that Don is swamped with suggestions in every mail. He figures that to use them all would require an art staff of ten men working for one year to draw them up.

Besides being an able cartoonist, 8UX has the distinction of starting the present system of using post cards for letting the other fellow know you heard his signals.
A letter from Mr. Hoffman in the August, 1919, QST on page 25 reads:

"Here's a little idea—run a suggestion that the fellows with long distance ham receiving sets make themselves up a form for postcards something like this (specimen cut shown) and send one each time a new long distance station is heard. In this way numerous relay possibilities will be discovered where some were careless and didn't notify stations heard formerly. Fellows receiving cards would keep them on file, etc. I used to do this and got a lot of thanks for it from the ones I wrote the cards to."

This letter was the beginning of the idea that has now developed to the point where every amateur station has its walls filled with these printed post cards.

Clyde E. Darr is so well known as the man behind the big noise at SZZ that he needs no introduction. Outside of making QST's cover drawings, his chief hobby seems to be drawing cartoons for convention crowds. It is estimated that he dashed off 860 cartoons at the Chicago convention last year without batting an eye.

He, too, was interested in radio prior to the world war when SAJD was his call. In the early days of broadcasting his station, SZZ, was the first to broadcast music to the Detroit public. He could not leave the amateur game, however, and at present his station is one of the best known and most consistent in the eighth district. Incidentally, fellows, he will tell anyone who sends him a stamped self-addressed envelope how he gets that queer "clank" on the tail end of his dots and dashes. His address is 137 Hill Ave., Highland Park, Detroit, Michigan.

Mr. Darr is a commercial illustrator when not pounding brass. He also is one of the Traffic Department's Ass't Division Managers in charge of Traffic Department affairs in Michigan and is a member of the A.R.R.L.'s Board of Direction.

Harry R. Hick is the man who draws the diagrams and many of the other illustrations that go towards making QST. He is a Hartford man who became interested in radio in 1912 and later put up a spark coil transmitter with the call 1E5S. When the first issue of QST appeared in 1914, shortly after the A.R.R.L. was formed, he was very much interested. Believing that QST would look much better with a few illustrations here and there he tried his hand at it, and has been illustrating QST ever since. His first work appeared in the fifth issue of QST for April, 1916, illustrating the story of the first Washington's Birthday Relay. This was the A.R.R.L.'s first big relay and caused more excitement in the amateur world than even our Transpacifies and Transatlantics do today.

ed-L antenna is supported by two 50-foot steel masts approximately 60 feet apart. A five-wire fan counterpoise, suspended 7 feet above the ground, is secured to the radio house at one end and extends outward to well beyond the free end of the antenna. Ground connection is made to buried copper plates, gauze and cables sunk to a depth of about three feet. Both the counterpoise and ground connections are used when transmitting.

As there are no company's power mains in the vicinity, all power for operating the station is supplied by a power plant consisting of a direct-coupled gas-engine driven D.C. generator having a maximum capacity of 3.5 K.W. and a set of 100-ampere-hour lead-acid storage cells. The generating set and batteries are located in an adjacent building.

The circuits employed both for transmission and reception are not out of the ordinary. The transmitting circuit is of the so-called reversed feedback type with series power supply and a separate antenna coil. When communication with America was first effected on Dec. 8th an old Mullard 0-150-watt tube was used (Concluded on page 52)
This Never Happened

Com’tl Op to Ham: “Copied your C.W. sigs off the coast of Chile on Nov. 6th, OM. How does that compare with your log?”

Ham to Com’tl Op: “Sorry, OM, you must be mistaken. I wasn’t on that night and am sure my sigs wouldn’t reach that far.”

Our idea of a hero is the ham who, upon receiving the w.k. “How is my modulation?” truthfully answers “Your modulation is rotten.”

Who will write some honest-to-goodness ham radio stories for QST? And by the way—just because “Rip” Bennett’s wonderful story “The Land of Blue Lightning” happened in a dream it isn’t necessary for everyone to follow the same idea. Let’s have some yarns in which the hero is awake.

A pipe cleaner is just the thing to use for brushing the dust from plates of your variable condensers. This is important in transmitting condensers as a little dust will cause a flashover.

Why not include the watt-input to the plates of your transmitting tubes on your station cards? Surely everyone knows that the watt input to the plates is equal to the plate voltage times the plate current divided by 1,000.

Appropriate wording for cards to be sent to several w.k. hams: “Dear OM: Your station heard here very QRM this date. You were calling-working ?? CQ (129 times) de (7 times) and signing (273 times). Good work, OM, congratulations! Will be glad to work you when you can spare the time. 73’s.”

Good connectors for the elements of an Edison storage B battery can be made by cutting the old battery cans into strips ½ inch wide and fastening the strips to the elements with the aid of silver solder and a small torch.

San Diego Radio Club Passes Resolution of Protest Against NPL

The San Diego Radio Club, acting for the 7,000 users of radio in that vicinity, adopted, at their Nov. 23rd meeting, a definite resolution of protest against the operation of Naval Radio Station NPL. It is claimed among other things that “notwithstanding the almost constant stream of complaints and requests filed with the proper authorities”, the use of the broadly tuned spark set, and the arc set that has long been noted for its harmonics, has been persistently continued, “causing a form of pernicious interference entirely preventable and the cause of great annoyance and discomfort to thousands of citizens within the range of said NPL.”

Copies of the resolution were sent the Secretary of the Navy, Congressmen and Senators representing the San Diego district, the Secretary of Commerce, the Radio Inspector for the 6th District, and the Press.

Amateurs in the Maritime Division held a miniature convention of the first order on November 23rd through the kindness of 1DT, who supplied the dinner and the meeting place. This was the first meeting of its kind in the division and it went over big. Great sorrow was manifest at the absence of the “Mighty IAR” but we guess Joe could not find his collar! During the dinner a shout went up when the D.M. was called to the telephone and was heard saying something about the “middle coil, dear.” The OW at home wanted to listen to broadcasts! After dinner, several contests and a general good time ensued. One of the competitions consisted of each victim being handed a clever verse about one of the local radio gang and being made to sing it to the tune of “Mr. Gallagher and Mr. Shean.” IEF’s face lit up like a fifty-watt tube. The meeting was considered a great success by all hands. A real convention where all the amateurs from New Brunswick, Prince Edward Island, Nova Scotia, and Newfoundland may meet at a central point is one of the big things that is being planned for the future.

Speaking of bets for brown derbies or walking sticks, C. P. Sweeney, ex-5KM, now aboard the U.S.C.G.C. Modoc, wants
to bet K.B.W. a suit of purple silk under­
wear on anything he's willing to bet on!

Another Distant Control Idea
Ralph E. Kepler of Cleveland suggests
the following simplification on the method of
distant control by one wire which was
described by IANA in the November 1922
QST on page 57. In Mr. Kepler's arrange­
ment A and B are both simple relays, no polarized relays being necessary.
Relay A controls the current to the fila­
ment of the transmitting tube or tubes
while relay B is the regular keying relay.
The spring on relay A is adjusted so the
relay will actuate on a feeble current
while a stronger pulse of current is re­
quired to actuate relay B. In operation,
switch S is first closed. This actuates relay
A with the weak spring, because of the
immediate small current flow thru the
resistance, thus heating the filaments. The
key is then operated in the usual way
and relay B is actuated. To shut down
the set open the switch S. The resistance
across the key may be anything from 6
to 30 ohms, depending somewhat on the
sensitivity of the relays employed, while
the whole circuit runs from a six-volt
battery.

Through the courtesy of Mr. R. Y.
Cadmus, Supervisor of Radio for the Third
District, the call 3DRC has been assigned
to the Third District Radio Convention's
station and will be reserved from year
to year for that station. FB.

Have You Lost a Friend?
A Good Suggestion from 7OE
There comes a time in the life of every
amateur when, because licenses do run out
and there are such things as Supervisors
of Radio, he must relinquish his station
call. Usually he does so with the hope
that it will not be reassigned to the "lid"
in the next block, and lets it go at that.
Inwardly, though, there is a deeper feeling
of sorrow for he feels as one who has lost
an old friend. Perhaps, in the time he has
had that call, his station has hung up many
DX transoceanic and transcontinental
records. Cards bearing this call adorn
the walls of stations throughout the world.
His station has carried on important storm
relief work, and hundreds of citizen radio
messages have been transmitted—prefixed
by this call. Yet, after working so hard
and losing so many hours of sleep to attain
glory for this combination of letters and
numerals, he must eventually bid it good­
bye. In these days of changing regulations
and readjustments of wave lengths an im­
ense number of changes are taking place
in the assignment of calls.
If you have been so unfortunate as to
have been parted from an old call, what
have you done to insure that the next holder
of your call will uphold its honor and
continue to add to its glory?
Stanley M. Mathes, ex-7OE, suggests
that those amateurs who have lost their
call letters or had them changed, should
write up the history of their old call, telling
everything from the joyous day when you first received a letter from the
Supervisor of Radio marked "Official Busi­
ness"; bearing the precious license and call
assignment, until the present time. Tell
of all the tests in which this call was
transmitted; of the many records it has
made; and how the station has always been
operated in accordance with the U.S.
Radio Laws. Then conclude the letter
with a few paragraphs of friendly advice
that you have gained from your many
years of experience in the amateur game
and forward the letter to the next holder
of your station call, requesting that he
keep the letter, add to it, and pass it on
when he relinquishes the call. Your Super­
vvisor of Radio can tell you who the next
holder of your call is.
In all probability, the person who gets
your call will be some poor lad, who with
more enthusiasm than apparatus has just
proved him. The combination of the
hearts of the amateurs of the district will
prove a mighty big inspiration to him. It
will become his constant endeavor to add
to its glory. Help the next holder of your
call and he will be eternally grateful.

Has anyone actually filtered a "sink" so
as to kid anyone into thinking it was D.C.?
This isn't an attempt to be funny—we
want to know.

"TT" in English radio parlance means
"tonic train." Amateur Wireless (London)
defines it as "CW chopped up into chunks
so that it does not require to be heter­
odyned." "I.C.W." is the American ham
term meaning the same thing.

The way to help QST is to help build
up the League—go and get some mem­
bers.
A circuit a day keeps the signals away.

About five guys have written in lately
all excited about the big discovery they
made by changing the value of the grid
leak resistance on their set and getting
more antenna current. Just because grid
leaks come already made up is no sign they are of the correct resistance for your particular set. Have you tried it on your set?

If your neighbor owns a radio transmitter he ought to belong to A.R.R.L.—if he owns a receiver there's still a good chance that he's interested in radio. In any case, get him.

If you haven't got what you need, make it and then tell us how you did it.

If a fellow says he hears you with 199 tubes, does that mean he used a super-het?

And does the high Mu in a tube cause the squeal?

A ham out in the ninth district called CQ on the buzzer in the trolley car and the motorman came right back. Hi!

The above diagram, which is self-explanatory, shows a useful addition to any receiver. During the winter months it will enable you to regulate the amount of smoke in the room without falling over backwards in your chair, a common failing.

If you cannot make a Modulascope work (described in the June, 1923, QST*) connect a plate of tinfoil or metal about one foot square to the lower end of the inductance secondary and place it just beneath the 'scope. This will provide a more intense electrostatic field, causing the spinner to work much better.

The easiest way of finding the nodal point on the antenna inductance of your transmitter is to use a wire, one end of which is grounded. Hold the key down and touch the other end to various points on the inductance. A point will be found where antenna ammeter and plate milliammeter are not affected at all when this wire is touched and taken away from a turn. This is the nodal point. Use care in doing this as the point is quite sharp; a quarter of an inch either way on a turn will sometimes make a big difference. After the nodal point is found it can be shifted to the proper location by following the information in the article "The Nodal Point Explained" in the September issue of QST*.

New Mexico State College Receives Gift of Radio Station

Through the efforts of Dean Goddard, the New Mexico College of Agriculture and Mechanic Arts is the recipient of the gift of a new radio station. The donors have requested that their names be withheld. This gift will include the equipment for constructing a 100 watt vacuum tube transmitter and the building to house it. The station will be utilized for experimental purposes and amateur relay work under the call of 5XD. It will be separate and entirely distinct from the present radio house and its equipment, which will then be used solely for broadcasting.

Plans for the new radio house call for a frame building 15 by 24 feet with a concrete floor. An operating room will occupy the east end of the building, while a club room for the College Radio Club will be at the west end. The center will contain a work shop and closets for the storage of equipment and batteries.

When completed, this new station will give the college radio experimental facilities which, combined with its present extensive equipment, will be unsurpassed by any college in the West, if, indeed, by any in the United States.

Old Faithful

Old two-oh-two, you're treated rough,
A martyr to the game.
Old faithful five, you know your stuff,
You've put the sparks to shame.

To thousand volts upon your 'node
And ten across your fil';
Two hundred mils your normal load
And all of that uphill.

There's one thing more, at any rate,
We've never tried before:
We're going to put upon your plate
Our one K.W. Thor.

—C. W. Hound, (5AMH).

The deepest heartfelt sympathy is extended to the wife of the man on the cover of the December QST by Mrs. A. L. Presley, wife of GAIX. So true to life it is, she says.

How many men in your radio club are not members of A.R.R.L.? Go get 'em.

(Continued on page 71)
SOLDER AND SOLDERING

By H. F. Mason, Department Editor

The first need in constructional work is that the amateur know how to use tools. He has undoubtedly had experience with the ordinary hammer-and-saw variety of tools ever since his boyhood days, but a soldering copper is a tool peculiar to electrical and radio work and should be skillfully handled for good results.

Soldering consists of joining two metals together by means of a softer metal which melts at a comparatively low heat and can be made to run in and around the other metals. When allowed to cool, a continuous and permanent metallic contact is thus formed. Corrosion and the consequent poor contacts would cause unlimited trouble in radio, electrical, and telephone work were it not possible to solder all current-carrying joints. Radio men can well take a tip from the large telephone companies, who carefully solder all of the millions of connections in their mammoth switchboards. The only connections that are not soldered are those that must be opened as a matter of routine, as in replacing worn-out batteries or cords.

Soldering Copper

When about to purchase a soldering outfit it will be found that there is quite a wide variety of sizes and shapes of soldering coppers to choose from. They are built for many different classes of service and range from the small ones used by jewellers in connection with blowpipe work to the large and heavy ones used by tinsmiths and plumbers. Sometimes a soldering copper is called a soldering bit or a soldering iron but it is the same thing. All but the very cheapest ones are made of solid copper.

Figure 1 shows some soldering coppers having ends of various shapes. Type A is a chisel point, common on small electric soldering coppers. This is perhaps the most useful type of point for radio and small electrical work. Fig. 1-B shows a soldering copper with a long pyramid shaped point while C is a similar copper with a short and blunt pyramid shaped point. The last, D, is a type of large copper, usually having a rather blunt pyramidal point, and is used extensively by tinsmiths and plumbers. These large coppers are rated in pounds.

There are several things to keep in mind when choosing soldering coppers. First, be sure that you get one the right size for the work you have to do. You can never do good work with a soldering copper too big and clumsy for the job. On the other hand one too small will not be able to transfer enough heat to the joint to make the solder run smoothly. Speaking further of the various kinds of points, the chisel type is to be preferred for radio work in general. The pyramid types of point are useful where all the heat is to be concentrated at one place as when a tinsmith solders a seam in tin roofing. A long slim point will lose its heat quickly while a short and stubby point will hold its heat for a considerably longer time. At the same time the copper must be of such a shape as to be convenient to handle in soldering joints that are not very accessible.

The amateur will find that for work on receivers, a good electric iron with a bit three eights of an inch in diameter, or if the copper is to be externally heated, at least two of them ½ inch or 3⁄8 inch square with fairly slim points will be as satisfactory as anything. The object of using two is so that one can be left on the fire while the other is being used, thus obviating the necessity of waiting for the copper to be reheated.

Methods of Heating

Soldering coppers other than the electric type should be heated in a clean and colorless flame such as that given by a good gas burner or gasoline torch. A red or white flame denotes imperfect combustion and a copper heated in it will become sooty and greasy. A pale blue flame is much better
and hotter. In emergencies the copper may be heated in a wood or coal fire, but extreme care should be taken not to get it too hot as will be explained later.

Electric soldering coppers are heated by a heating element consisting of a coil of fine resistance wire, insulated by mica and asbestos and connected to the electric light circuit. This coil encases the soldering bit which becomes hot in a short time after the current is turned on. The heating coil in turn is enclosed in an asbestos lined metal shell, which confines the heat mostly to the inner portions of the coil and soldering bit proper. A good electric copper is built so that both the bit and the heating element can be renewed, for sooner or later the element will burn out and the bit will wear away, necessitating replacement. It pays to get a good electric iron for cheap ones have a habit of going dead after being heated only once or twice.

A gasoline torch is almost a necessity for outside work on antennas as it permits the soldering copper to be heated on the spot, will cool too slowly to be of much value. A torch is also handy for inside work when large pieces of metal are to be heated and forms a very convenient medium for heating the soldering coppers. Next to a good electric soldering copper, then, a gasoline torch should be a part of the soldering equipment of every radio workshop. Torches are rated as half-pint, pint and quart; according to their capacities. Rules for operating gasoline torches are always furnished by the makers, so it will be needless to explain in detail how they are operated.

If an electric copper is not to be had, a gas connection and a small gas plate in the radio workshop will be excellent for heating the coppers. A metal hood should be placed over the stove to keep air currents from disturbing the flame. For very fine work a bunsen burner and blowpipe are employed but an amateur will find so little use for this method of soldering that it deserves no more here than mere mention.

**Solder**

Solder is usually simply an alloy of tin and lead and is graded by the proportions in which it contains these metals. For instance, “half-and-half” solder is composed of 50 percent tin and 50 percent lead, and melts at a temperature of 370 degrees Fahrenheit. The greater the percentage of lead, the higher will be the melting point. Solder containing 10 percent lead and 90 percent tin is the best all around solder for radio use, although “half-and-half” is perhaps the most common in other lines.

Solder can be obtained in one pound sticks or in the shape of wire solder. The latter is generally about ½ inch in diameter. The amateur will find this form most convenient for his needs as there is practically no waste when it is used. It can be cut from the spool a few feet at a time, coiling the piece around the hand and slowly uncoiling it again as it is used.

Some forms of wire solder have a hollow core that is filled with the soldering flux. This kind of solder can be fed to a heated joint and if the proportions are right the correct amount of flux will melt and be used at the same time as the solder. The objections to wire solder having the flux in its center are that the flux may be a paste containing acid, and second, that it is not possible to use a little solder without getting a supply of flux along with it. This excess flux is liable to run all over the work and not contribute to a good looking job. Rosin-core solder, which comes on five pound spools, is a form of wire solder used quite extensively, especially in telephone work where there are multitudes of small connections to be soldered. It is here that this kind of wire solder finds its real utility.

**Care of Soldering Coppers**

It is just as necessary that your soldering coppers be kept in good condition as it is for a carpenter to keep his saws and chisels sharp. Neat and quick work cannot be done with neglected tools. Keeping a soldering copper in condition consists of keeping the bit the correct shape and well tinned.

A copper is tinned when the flat or working surfaces of the bit are covered with an even coating of solder, which should be maintained at all times. This film of solder is put on by the process of cleaning the heated iron with a file; then rubbing the copper briskly to and fro on a chunk of sal-ammoniac, one surface at a time, and applying solder simultaneously. Heated copper oxidizes very quickly when exposed to the air and solder will not adhere to it unless every bit of oxide is removed. The action of the sal-ammoniac is to destroy the thin film of oxide and let the molten solder adhere to the hot copper before more oxide can form. If you cannot get a chunk of sal-ammoniac at your corner drug store, the iron can be tinned by dipping the clean, hot copper into soldering paste and then quickly rubbing solder over it. The paste
will destroy the oxide on the copper just as the sal-ammoniac did and the solder will flow on the clean copper just as water will wet a clean board but not a greasy one. The solder on the heated copper will now act as a ready means of carrying heat from the body of the copper to the work. This can be seen by touching a piece of cold solder first to the black, oxidized surface of the copper, then to the tinned tip; it will melt more quickly on the bright surface.

Once the copper is well tinned, care must be taken to preserve the bright and silver-like surface. Hot solder oxidizes just as copper does, but fortunately the solder is in a molten state on the heated copper and so the bright surface can be restored by merely brushing off the oxide with an old rag. This should be done after every heating when the coppers are heated in a flame and should be done every few minutes when using an electric iron. Another way to clean the copper is to dip it into a solution of sal-ammoniac and water, but this is not advisable for the copper is eaten away and the oxide is gradually destroyed if this practice is followed.

Excessive heat will always spoil a copper that is well tinned for the thin film of solder and also the copper beneath it will turn into a black oxide. When a copper has been "burned" in this manner it must be filed clean and re-tinned before any work can be done. Never allow a soldering copper even to approach a dull red heat and it will never become burned. The necessity for keeping the soldering copper clean cannot be over-emphasized for it is practically impossible to do good work with a dirty iron.

Soldering Flux

Two pieces of metal cannot be soldered together unless their surfaces are clean, and after they are cleaned they must be heated. When metal is heated, however, it quickly oxidizes and prevents the solder from sticking to it. In order to further

the union of the metals to destroy this film of oxide that has formed since the joint was cleaned, and to prevent the formation of additional oxide while the joint is being soldered, some sort of flux is necessary. Soldering flux may be in liquid paste, or dry form and almost invariably is some mixture consisting mostly of rosin or of acid.

The usual process in soldering a joint in a wire, for instance, is to clean the wires with sandpaper, twist them together; then apply a little of the flux to the joint. The heat from the iron or torch is then applied and, as the temperature of the joint becomes greater, solder is fed to the joint. It will then unite with the metal being soldered and firmly join them together. If no flux were used the surfaces would oxidize from the heat; the solder would act like a drop of water on a greasy board and not unite with the metals being soldered.

Rosin flux does not have the same power to destroy an oxide film as does an acid flux. Indeed, an acid flux not only destroys the oxide film but will eat away the metal. For this reason small copper wires should never be soldered with an acid flux, or any other joint for that matter where corrosion will prove injurious. This is despite the fact that it is easier to solder using an acid flux on account of its greater ability to cleanse the surfaces being soldered.

The only way to be on the safe side with regard to soldering flux is to regard all kinds of soldering flux as containing acid, regardless of manufacturers' claims or trade names, and for work in radio, use only rosin and alcohol, mixed to a paste by yourself or some good rosin-core wire solder. You can get ten cents worth of rosin at your drug store and mix it with wood alcohol which will make enough paste to last the whole A.R.R.L. for one season. A very satisfactory soldering paste will result and you need not worry about corrosion, for there will be none.

Soldering Receiver Connections

Now that a general outline of soldering and soldering methods has been given it will not be out of place to give some practical suggestions that will enable the amateur to more skillfully use his soldering tools and produce better results.

An important point in soldering connections is never to rely on solder for mechanical strength if it is possible to avoid it. Rather twist the wires together or fasten the parts together in some way first; then apply the solder to make the electrical connection sure. Figure 2, A and B, shows right and wrong methods of soldering a wire to a switch point or terminal post. Take a complete turn around the post before soldering to it and a joint

(Continued on page 65)
that is both mechanically and electrically good will result.

Use soldering flux sparingly. Put only a very little on the joint. When the joint is heated it will melt and run to all parts without trouble.

Good work cannot be done with a soldering copper that is not hot enough. The solder will not flow smoothly and the joint looks like Fig. 2 D instead of 2 C. In addition, the solder will not unite readily with the metal parts when a cold iron is used, causing a joint which is supposedly soldered to be only stuck together with rosin. The resistance of a joint which is not properly soldered is of course high and, if it occurs on a receiving set, frying noises are liable to occur in the phones. A well-soldered joint will require a good yank before it will come apart and will tear the solder in doing so. After a joint has been soldered, it must be kept absolutely motionless until the solder has set; otherwise the solder will crystallize and the joint will come apart. This emphasizes the necessity for fastening parts together before soldering.

Be careful in soldering to metal parts that are imbedded in moulded parts or set in panels, for some moulded compositions and hard rubber soften very readily when heated, and the heat transferred to it from the soldering iron, through the piece you are soldering to, may be enough to melt the composition in the vicinity and spoil the work. When soldering to terminals in hard rubber or moulded composition, be sure to have the parts clean and use a hot iron, so the job can be done very quickly, before the heat has a chance to get to the moulded parts. If you are using binding posts with black, moulded tops, it is well to remove these tops before soldering wires to the posts, for the same reason.

In reality a joint must be tinned before it is soldered, just as a soldering copper is tinned before the solder will stick to it. Ordinarily, pieces of metal are tinned and soldered at the same time but sometimes it is necessary that the surfaces to be soldered be tinned before they are put together. This makes the soldering much easier but the process is longer.

Wires that fasten to the binding posts on the front of the set and other wires that may have to be removed at some time or another should be soldered into copper lugs. If the wire is stranded lamp cord and no lugs are available, an improvised one can be made as shown in Fig. 3. It consists of baring the wire for about an inch, drawing it thoroughly with sandpaper and then tinning it after it is bent back upon itself in the shape of a loop. The solder will make the loop stiff.

Figure 4 shows how to bind the ends of lamp cord to prevent their fraying. The binding is, of course, done after the lug is put on and should be done with strong cotton or waxed thread. In Figure 4, A, B and C show progressive steps in binding the end of the wire. The start is at X and the end at Y. 4B is changed to 4C by pulling Y and laying it tight; then pulling upon X till the loop just disappears. The ends are then cut off.

Soldering Antenna Connections

On outside work a torch is handier than a soldering copper. If you do not believe this, try heating your soldering copper over the gas flame in the kitchen, then making a wild dash for the backyard or roof, as the case may be, and see if you can get at least one joint soldered before the iron gets cold. Using a gasoline torch, the heat can always be quickly applied to a joint and the solder caused to run evenly with no trouble whatever.

The details of antenna construction will be dealt with in a future article, so at present only a few pointers as regards soldering the joints in your antenna are given.

How many amateurs can make a good Western Union joint and solder it correctly? This is something fundamental, yet we know of many antennas that come down yearly because the joints in the wires are not properly made. Figure 5 shows a Western Union joint. The ends of the wires are scraped or cleaned with sandpaper before they are twisted together. Some soldering paste or other flux is then smeared on the center of the joint. The flame from a torch is applied to the center of the joint and just as soon as it gets to the temperature of melted solder, the solder is run into the joint. Do not get the joint any hotter than it must be for the solder to run smoothly, as the wire is weakened by heating. All joints in the antenna should be soldered, but put the solder only on the parts of the joint where the wire is double.

Aluminum wire cannot be soldered in the ordinary way and should not be attempted by the average amateur unless it is absolutely necessary. Then use Venice turpentine for flux; not too much heat, and a solder with a bit of mercury in it.

If your antenna is made of phosphor-bronze wire, do not solder the joints in the
usual way, but use McIntyre connectors. These are made of copper and look a great deal like the barrels of a miniature double-barrelled shot gun. They are made for 7-18 stranded wire or larger and can be bought from any large electrical supply house. The wires are inserted in the two tubes and the whole is twisted to form a very strong connection.

Most of us have had the experience of spending a couple of hours trying to solder a wire to a water-pipe filled with water. This is a waste of time for it is much easier to turn off the water where it enters the building and drain the pipe. You can then heat the pipe and solder to it without much difficulty, if a soldering paste or flux containing acid is used. Clean the pipe with a file and sandpaper and wrap the clean wire around it several times; making it thoroughly fast before soldering. It may even be desirable to tin the pipe and the wire before wrapping the wire around the pipe. If you cannot drain the pipe that is being soldered to, get a good ground clamp and put it on the pipe after both the pipe and clamp have been thoroughly cleaned.

Some Characteristics of Electrolytic Rectifiers

By E. J. Atkinson, ICEK

Perhaps one of the most satisfactory methods of rectifying the high-potential low-power outputs of plate transformers lies with the very much used Electrolytic Rectifier. It is equally true that when this particular unit is not properly designed it at once becomes one of the most unsatisfactory methods of obtaining rectification. Some time ago the writer made several tests with the object in mind of determining, for once and for all, the reasons behind some of the peculiar conditions encountered in practice with a device of this nature. The results of these tests furnished several important as well as basic facts that must be rigidly incorporated in the design of this device to obtain satisfactory operation.

The apparatus necessary for these tests was hooked up as shown in the figure. The rectifier cell was made up of a standard Myers Culture-Tube, 6" long by about 1" in diameter. A saturated solution of ordinary "20 Mule Team" Borax was used. An additional culture tube was filled with water and inserted in it was a Taylor thermometer calibrated in degrees Fahrenheit. This furnished the "idler" with which actual test readings were compared in obtaining the final temperature rise of the cell under test. This method prevents fluctuations of temperature due to outside causes from affecting the accuracy of the tests.

The elements of the cell were made up of aluminum and lead strips ½" x 5" and adjusted until 2 sq. in. of each element were offered to the solution. In this cell there was also a Taylor thermometer inserted, this one being a duplicate of the one used in the idler. The cell was connected with the necessary instruments and a direct current generator, and a 200-ohm rheostat used for a variable load.

Formation of the film was found to take place almost instantly in the cell when set up for the first tests. A few days after, however, it was found that our film was nearly 50% less effective than at first, but this alarming feature corrected itself in a few seconds to its original condition. Therefore, the long fussy operation of "forming" plates of rectifiers is unnecessary and a waste of time. When a new rectifier is put in circuit, a heavy charging current will flow for a few seconds only; the film will be fully formed before the transformer will have a chance to show any signs of distress. This first film will be, no doubt, the best that the cells will ever have. As the cells get old the lead elements take on an aluminum deposit which cuts down the over-all efficiency of the cell; therefore, we must clean up the cells every so often, depending upon the condition of the elements.
and the amount of sediment collecting in the bottom of the jars.

**Test 1—Heating With Normal Load**

<table>
<thead>
<tr>
<th>Time in Minutes</th>
<th>Temp. °F</th>
<th>Rise °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50 M.A.</td>
<td>72.0</td>
</tr>
<tr>
<td>1.5</td>
<td>&quot;</td>
<td>72.5</td>
</tr>
<tr>
<td>2.0</td>
<td>&quot;</td>
<td>77.0</td>
</tr>
<tr>
<td>2.5</td>
<td>&quot;</td>
<td>81.0</td>
</tr>
</tbody>
</table>

**Test 2—Heating on Overload**

<table>
<thead>
<tr>
<th>Time in Minutes</th>
<th>Temp. °F</th>
<th>Rise °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.200 M.A. 10 V.</td>
<td>72.0</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>73.5</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>74.8</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>77.0</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>81.0</td>
<td></td>
</tr>
</tbody>
</table>

Test No. 3 was made to determine the dielectric strength of the insulating film. The leads from the direct current generator were reversed so that the cell was connected reversed and therefore did not pass current.

**Test 3—Reverse-Voltage Breakdown**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>M.A.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.0</td>
<td>Film beginning to pass small reverse current.</td>
</tr>
<tr>
<td>20</td>
<td>0.0</td>
<td>Film now passing small reverse current.</td>
</tr>
<tr>
<td>30</td>
<td>0.5</td>
<td>Blue halo now evident.</td>
</tr>
<tr>
<td>40</td>
<td>0.6</td>
<td>Breaking down of film evident.</td>
</tr>
<tr>
<td>50</td>
<td>0.9</td>
<td>Complete rupture of film accompanied by scintillation of aluminum.</td>
</tr>
</tbody>
</table>

**Test 4—Reverse-Voltage Breakdown When Ammonia Is Added (5 Drops Commercial Strength Per Cell)**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>M.A.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0</td>
<td>Film beginning to pass small reverse current.</td>
</tr>
<tr>
<td>10</td>
<td>0.0</td>
<td>Film now passing small reverse current.</td>
</tr>
<tr>
<td>20</td>
<td>0.0</td>
<td>Breaking down of film now evident.</td>
</tr>
<tr>
<td>30</td>
<td>0.0</td>
<td>Complete rupture of film.</td>
</tr>
</tbody>
</table>

From Tests No. 1 and No. 2 we find that a current density of 100 milliamperes per square inch of aluminum sheet* can be used for intermittent duty but the density must not be run above 50 milliamperes per square inch for continuous operation. Putting it differently, a strip of aluminum one inch wide and immersed to a depth of one inch will pass 50 milliamperes continuously, but will NOT behave well if loaded above this current density.

Tests No. 3 and No. 4 show a very sharp dividing line between safe operating voltage-per-cell and over-voltage. The blue glow appears at about 5 to 10 volts-per-cell below the point where the film begins to suffer. Scintillation, or sparking, is positive evidence that an over-voltage is being applied and that more cells are needed. The sparking is due to the partial rupture of the insulating film. We find, on reviewing the tests above, that the voltage-per-cell should never, under any circumstances, exceed 50 volts per cell—and even that can be used only with the best of materials.

Any single cell that shows sparking of the aluminum should be examined and if the rest of the rectifier is operating well the sparking cell should be washed out and reassembled with new aluminum and new solution. However the trouble may be due to the fact that the sparking cell is the only one in good order and the sparking is caused by the brave attempt of this single good cell to do the work of the whole string. Therefore if all the rest of the cells are dark it may be well to short circuit, or remove, the sparking cell to see if the rest of the string is working.—Tech. Ed.] Tests show that the addition of a small amount of ammonia tends to give additional strength to the insulating film. Compare the results of tests 3 and 4.

**Summary and Design Rules**

In each string of rectifier jars allow one jar per 30 volts when borax solution is used. Remember this is in each string of jars; if you have a transformer with 1500 volts on each side of the center tap you must allow 1500/30 or 50 jars in each of the two strings, a total of 100 jars. The size of the aluminum is found by allowing a square inch for each 50 milliamperes to be drawn; do not exceed this.

*There is an entirely needless confusion about this business of the area of the aluminum electrode. A piece of aluminum sheet 5 inches by 10 inches represents 50 square inches of sheet aluminum—it decidedly does not represent 100 square inches. The size of a sheet of metal is determined by the area of one side; what would you think of a tinner that tried to sell you a "square yard" of tin that measured 18 by 36 inches?—Tech. Ed.
A Boost for Coupled C.W.

Riverbank, Calif.

Dear Eddy:

Just a few lines to let you know I have tried out the coupled C.W. circuit shown on page 8 of the October QST and it’s FB. I wound the coils in a hurry from whatever I had handy, which happened to be some No. 14 and No. 18 D.C.C. wire and some cardboard tubes of a size near that given in 3BWT's article. Hooked 'er up to a 5-watter with 400 volts of storage battery on the plate at about 60 or 80 mills with an old 43 plate condenser for tuning and no series condenser in the antenna circuit.

After using it about a week I found that I could change my wave from 150 to 200 meters in a few seconds with the antenna current and plate current remaining the same throughout. Suppose I am on 150 meters and hear a bird on 160 who evidently can not tune down to my wave. I just clip in two or three more turns in the antenna coil and swing the .001 tuning condenser around until the antenna and plate current come to the proper readings. Then set the homemade wavemeter near the inductance and swing the condenser until the flashlight bulb flares up; then sit the meter on top of my Reinartz cabinet and swing the knob of the secondary condenser until a click is heard. I now have my wave on the receiver and with a little experience it can be quickly shifted to any point. The plate and grid taps need no changing for waves between 150 and 200 meters. How’s at?

If the fellow I am working says “QRM, pse QSY lower wave,” it just takes a moment for me to cut a few turns out of the inductance in the antenna circuit and a swing of the condenser will do the rest. I am sure tickled with that circuit.

Robt. H. Potts, GAME.

Let There Be Justice!

Shreveport, La.

Editor, QST:

The fact that nearly every radio magazine published nowadays carries some article on the “regulation of amateurs so as to decrease interference with broadcasting reception” seems to have planted a psychological seed in the minds of all B.C.L.’s so that they have an idea that the only source of interference to their reception comes from the amateur class. This isn’t fair to the amateurs, and such magazines should tell the whole truth about it.

As an instance, a short time ago a prominent man of my town called me and asked me to come over to his house and show him how to tune his new set which he had just installed. Of course, his expectancy was at a high pitch. I went over and tuned in WWJ. The program came in clear and loud, free from any QRM; but just as a speaker on the program was getting well warmed up, a ship station, KZP, began, called WSA, and drowned out Mr. Speaker. Immediately my friend exclaimed, "Just listen at those --- amateurs interfering" (And this man lives in Louisiana!—Editor.)

Now this man had never listened in on a set more than an hour in his life, yet he immediately laid the interference at the door of the poor amateur! He had, however, been absorbing the various radio magazines, and it is clear where he got his idea. He had been reading about the conduct, regulation and restriction of the amateur to such an extent as to blind him to the fact that WWJ is on 517 meters while the amateurs are below 220.

Of course, I explained the situation to him, and he apologized; but he could not understand why it was that the Government was so particular to regulate one class of interference and leave the other to run wild. That, of course, I could not answer.

I am a B.C.L. myself, but can read the code. When a telegraph station "slops" over into my program, I always try to catch his "sig." I have heard these ship stations anywhere from 250 to 600 meters. For instance it was almost impossible to hear Mr. Lloyd George from KDKA on 326 meters because of ship station interference. And when Mr. Woodrow Wilson spoke on the night of November 10th notwithstanding the shutting down of other B.C. Stations for the occasion, there was a constant interference from ship stations. Tonight I was listening to a church service on 448 meters when the following government and commercial stations were heard: "NKB de NAT," "KKN de NAT,"
"WCY de KEX," "WSA de KOBN," "WCY de KIT." These are only a few, but I cite their calls to show conclusively that the interference to broadcasting at present doesn't come from the amateurs but from other stations; and also to show a reason for a re-assessment of commercial and ship stations' wave lengths, or for the better policing of the present wave lengths in this class. This is particularly pertinent since the Department of Commerce has just asked that amateurs kindly observe a further quiet period during the earlier evening church services on Sunday.

Let there be justice!

Bradford Hearn.

Double Reception

Farnham, Quebec.

Editor, QST:
Did you ever hear of an actual attempt to receive western DX during the silent hours while the family are receiving the broadcasts in the other room on the same antenna? I have tried it using the Reinartz scheme of untuned antenna circuits by connecting the antenna coils in series. Results are fine so long as I do not try to tune to the same station with both sets. I can receive distant broadcast stations on the loud speaker; then go down on 200 meters with the other receiver and log amateur DX signals to beat the band, all on the same antenna. This stunt ought to keep peace in some radio families.

A. J. Lorimer

The Western Wireless Press Ass'n

Spokane, Wash.

Editor, QST:
A movement has been started in the northwest corner of the United States which, if fostered and talked up by the amateurs of the country, can develop into an institution of exceptional usefulness to the educational institutions of the nation. This movement has been styled the Western Wireless Press Association. It is an organization among high schools for the exchange of school news by radio and originated about two years ago at the North Central High School, Spokane, Washington.

Form letters on the subject was first sent to the news editors of the larger schools in Washington, Oregon, California, Idaho and Montana. The idea met with a hearty response among a number of high schools and that winter several of them printed a column of capable news items in their school papers gathered from other schools by radio.

However, about this time, broadcasting stations began to get in their work and

our old 1K.W. sawmill at the North Central school brought such storms of protests from listeners that we closed it down. The next fall we set about raising funds for a C.W. set. Other stations with whom we had handled school news were undergoing a similar change.

We have now finished the installation of a 100-watt C.W. set that was heard clear across the continent the first night we operated it. With the announcement of this fact in our school paper, requests came from schools in Washington, Idaho, Montana, and even one from the Central High School in Minneapolis, to revive the Western Wireless Press Association. Accordingly we are now preparing to start the work again. North Central, 7YL, has four capable operators working under a regular schedule from dark till 7:30 P.M. every evening except Sunday, and from 10:30 P.M. to 1:30 A.M. on Friday and Saturday nights. The operators will receive school credits for this work. Schedules are being arranged with other high schools and within a few weeks we expect to be going in full swing. In a city where there is a school that does not own a radio set there are usually several amateurs in the school or in the city who are willing to co-operate in this work. Only news items of general interest are transmitted.

The details of exchanging school news on a large scale have not been worked out as yet. In fact 7YL is very anxious to receive suggestions along this line.

This is an idea that can grow and grow. If you amateurs are members of a school or are interested in the schools of your city, go to the news editor of your school paper with this proposition and start it going in your vicinity. It is worth much more than much of the "Pse-QSL-card" stuff that is now being relayed.

A. L. Smith.

Radio Station Director, 7YL, North Central High School, Spokane, Washington.

Things in General

Ambridge, Penn.

Editor, QST:
You asked for some dope on the standard waves that are sent out by WWV, so here is a bucketful. In the first place the signal strength on 576 to 200 meters was about five times that on 600 meters.

There's one strike against the idea of slopping over 200 meters.

At the time the standard waves were being sent I was using a General Radio wave trap and filter to check with WWV and was very agreeably surprised to note that the wave meter was absolutely correct.
On the other hand I was very disagreeably surprised to note that the large number of amateurs who thought they did not need to calibrate their sets were operating on illegal waves from 201 up to 278 meters. What in the name of key-thumps is wrong with these guys, anyhow?

Another thing that makes a fellow froth at the mouth is to have some sap send out a CQ a mile long during the quiet hour. What in the name of key-thumps is wrong with these guys, anyhow?

Well, I feel much relieved, now that that's that. 73's.

—Harley L. Sairs, SLW

Loose-coupled Transmitters

Editor, *QST*:

Several nights ago I tried for about two hours to QSR sum msgs—and got exactly nowhere because of the interference. I decided that something must be done to reduce this QRM and that the right place for me to start was with my own set—so I decided to try loose coupling the transmitter.

The results have been excellent. Local interference is very slight, the wave is very sharp, no key thumps are reported, and it is easily possible to adjust the set so as to obtain larger antenna current and might even be possible to omit the inductance L3. Then the antenna inductance L4 could be coupled directly to the primary inductance L3. This is not a very important change, tho.

I don't know what my plate current is as I haven't any milliammeter at present but the plates never show any signs of heating, while with direct coupling it was difficult to keep them from staying red hot all the time.

The range of this set is better than before, the antenna current is about two amperes, and I have worked several 5's in daylight. This morning at 10:10 A.M. I worked 5ZA, the distance being 570 miles.

Have found a way of working this set as a radiophone with no equipment except a microphone and a single-pole switch.

The scheme is to start the set oscillating and after the set is in operation to close the switch S. The clip connected to this switch must be placed a little ways below the nodal point the proper position being one where the antenna current rises a little when the switch is closed. I always start the set with the switch open, otherwise it will not modulate well.

I would like to see more of the gang try inductively coupled sets as I believe they can get farther and at the same time cause very much less QRM.

Ed. Barricklow, 9CCV.

Help the Bustan

Editor, *QST*:

In view of the fact that the Bureau of Standards, Radio Laboratory, has been endeavoring to help the amateur by scientific research and the transmission of standard frequency signals, we feel that it is only just for us to recommend to our representative in Congress, to make a larger appropriation for this good work so that the Bureau may still help the amateur as well as radio in general. It is a well known fact that the appropriations of Congress are not now enough to carry on the work at the Bureau.

As you know, the Bureau has in the past calibrated receivers and wavemeters for the amateur at a nominal price. This service has been discontinued because Congress did not appropriate enough money to hire the personnel to carry on the work.

Furthermore, we believe it our duty, as radio amateurs, to recommend to our fellow members of the A.R.R.L. to stress the attention of their representatives on this most important situation. We believe that the Bureau will greatly appreciate our interest in their work and if Congress sees fit to
make larger appropriations, the Bureau will endeavor to help the amateur.

Hoping you will give this matter your most careful consideration and approval, we beg to remain, fraternally yours,

O. M. Lewis, 3ALB.
E. P. Kampf, 3CCK.

On Behalf of the Beginner
Phoenix, Ariz.

Editor, QST:
I have noted various articles for the hams but have seen very little in defense of the beginner. For the love of Pete, fellers, remember you were all beginners once and be a little patient with the amateur who is just starting out. I am an amateur. I'm glad to say—so much so that I haven't a license yet, but expect one as soon as the over-worked government clerks get to it. I have my set all ready and am "rarin' to go." I have heard several amateurs talking about hearing or working so-and-so and how slow he was and they were not going to monkey with him again. Now that is strictly unfair. I "think" I know the code and can pass the 10 per examination easily, but gee, we all get stage fright the first time we get a call and when a fellow starts out about 25 per, spacing his letters any way to get it done with, signs off so dad-blamed fast that it sounds like a gatling gun, he leaves the poor beginner wondering who the deuce it was. It's a grand and glorious feeling to hear a ham come back at you after you have answered his CQ but, if a guy sends QRS, be patient and remember you were a beginner once and the courtesy of the air is to be maintained.

H. D. Wilson

The Hot-Dog Ammeter
Brooklyn, N. Y.

Editor, QST:
The hot-dog ammeter, although much used on the Continent, is utterly unknown in this country. The reason for this appalling state of things is the policy of the ammeter trust to "Keep 'em ignorant of better things and they'll buy ours." The writer discovered the use of the hot dogs as delicate current measuring devices in this manner:

Last summer I took a trip to Scotland and after a month's stay in that marvellous country I became even more Scotch than the natives. This was accomplished by a continuous process of absorption. Then, on that momentous day, June thirty-first, while visiting the English station 1RUM, I first saw a hot-dog ammeter. The owner explained that he had conceived the idea one day as he stood with his nose flattened against the window of those small shops where they cook hot dogs over a gas flame while you wait.

The technical description of the Hot-Dog meter follows: The age and size depends on the use it is to be put to. I have found that for heavy currents a bologna or liverwurst is suitable. For delicate work the hot dog (canus frankfurtns delicatessen) is unparalleled.

Figure 1 shows a complete hot dog meter. Figure 2 is a calibration chart showing the reaction of this meter to various currents. The hot dog in this case was 7.863 mm. by 3.1729 mm.

In closing, it may be said that the normal operating period is six months, after which time they may be cooked and eaten. It will be found that they will have a Flight current taste.

H. E. Fairman.

STRAYS
(Continued from page 61)

If you expect to have that master oscillator really stay on one wave, do not use a mercury type variable condenser for tuning the master circuit. It may stand the voltage but the mercury will invariably flop around and the signals will swing when you pound the key. If you do not believe it, set up your wave meter near the antenna lead and watch it change when...
you hit the brass. The best air condenser made is none too good for tuning the master oscillator.

On a Card From Texas

"Say, OM, your signals have reached my ears several times, always QSA. Last night one of my neighbors shot at me for keeping him awake at two in the morning and he put a big hole in the wall and I would appreciate if you would send me one of your call cards to stop this hole up and still adorn my wall. Let me hear from your soon, OM."

Amateurs are cautioned against the use of silicate of soda (water glass) for waterproofing coils, as it will absorb moisture and raise the high frequency resistance of the coil. Celluloid dissolved in acetone is also hygroscopic. Dissolve the celluloid in amylacetate and you will have a really good dope for coils. A Southbridge, Mass., amateur suggests this as a cure for poor coils in receivers.

At the December 8th meeting of the A.R.R.L. Board of Direction, Mr. George L. Bidwell of Washington, D.C., was appointed member of the Board to fill an existing vacancy. Mr. Bidwell, who is vice-president of the Washington Radio Club, is chairman of the A.R.R.L. Railroad Emergency Relief Committee, a most important new branch of our activities. He is an able leader, a man of vision and of ideas, and a strong addition to the Board.

The Headquarters Staff wishes to thank heartily all of our members and friends for the numerous holiday greetings showered upon us.

Experimenter's Section

The report this month will be very brief—too busy attending to the correspondence of the section to talk much about it in QST.

Many additional men continue to enroll for experimental problems, interest being especially strong in receiving sets, antennas and radio amplification. The roll is now being catalogued and men wanting to know of others in their own neighborhood who are interested in the same sort of work may write the Technical Editor, indicating what they are doing, what equipment they have, and as much other detail as possible.

These letters positively will not be answered unless they are correctly addressed and relate to experimental work and nothing else. Please don't write about half a dozen other things in the same letter.

Additional Problems

Men are wanted to work on the following things—

Curing interference from leaky power lines.
Preventing harmonics from sending sets.
Preventing interference on twice the working wave.
Resistance and capacity of various sorts of coils.
Curing the keying click.
Screening X-ray and violet-ray outfits to cure interference.
Frequency multipliers (getting 500 cycles or better from 60).
Electrolytic Rectifiers (considerable data available on this),
3,000 meter and 10,000 meter R.F. Transformers for Super heterodynes (urgent!)

The General Idea

The general nature of the Experimenter's Section is given on page 35 of the January issue. Come on in!

S.K.

AMATEUR RADIO STATIONS

(Concluded from page 58)

in the transmitter. The transmitting inductances, seen on the wall to the right of the picture, are rather out of the ordinary and are constructed by winding wire in slots in six hard rubber strips mounted on a hard rubber slab. During the tests with American amateurs, slightly over two amperes were being put into the antenna on wave lengths in the vicinity of 100 meters. The high voltage supply for the plate of the transmitting tube is obtained from a 1,500-volt Mackie double-ended generator used in connection with the usual filter condenser and choke coil. The generator is belted to a \( \frac{1}{2} \) h.p. D.C. motor.

The receiver is the customary three-coil arrangement; primary, secondary and tickler, with tuning condenser across the secondary. It has a tuning range from 100 to 1100 meters, being equipped with dead-end switches. Two English type D.E. tubes are used, one as detector and the other as an audio amplifier. During last year's tests 56 American amateur stations were logged on this arrangement on a single morning.

Mr. Partridge explains that, under favorable conditions, American amateur stations transmitting on wave lengths slightly below 200 meters are received very well in England. On wave lengths from about 180 upwards, however, the "hash" and "mush" from arc stations generally render reception most difficult over there and of course the more tubes they employ the stronger the QRM is also.
"Knowing radio batteries as I do, I consider yours most remarkable"

—a statement made by one of the most prominent radio engineers.

The efficiency of your receiving set depends largely upon the quality of batteries used.

That is why engineers, manufacturers, amateurs and the public at large prefer Burgess Radio Batteries.

"ASK ANY RADIO ENGINEER"

BURGESS
RADIO BATTERIES
A Laboratory Product

BURGESS BATTERY COMPANY
ENGINEERS - DRY BATTERIES - MANUFACTURERS
FLASHLIGHT - RADIO - IGNITION - TELEPHONE
GENERAL SALES OFFICE: HARRIS TRUST BLDG., CHICAGO
LABORATORIES AND WORKS: MADISON, WISCONSIN
BRANCHES
NEW YORK · BOSTON · KANSAS CITY · MINNEAPOLIS
WASHINGTON · PITTSBURGH · ST. LOUIS · NEW ORLEANS
IN CANADA
PLANTS: NIAGARA FALLS AND WINNIPEG
BRANCHES: TORONTO · MONTREAL · ST. JOHN

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
"THE AIR IS FULL OF THINGS YOU SHOULDN'T MISS"

Eveready "Three"

4 1/2 volts, three distinct uses: Length, 4 in.; width, 1 1/4 in.; height, 3 in.; weight, 14 oz.
At all reliable radio dealers.

This "C" Battery is a Wonder Worker
For Quality Reproduction

You can make the loud speaker respond with a new fullness and naturalness of tone. You can save money by adding months to the life of your "B" Batteries. These things you can do by using the new Eveready "Three" as a "C" Battery.

You already have an "A" Battery for the filament and a "B" Battery for the plate. A "C" Battery is connected to the third element of your vacuum tube, the grid, affording a control that is marvelous in action on audio frequency amplifiers.

As a "C" Battery the Eveready "Three" prevents distortion and excessive flow of current from the "B" Battery, lengthening its life. It is a wonder worker that saves its small cost many times over. Connect it in your audio frequency amplifier and note the difference.

This triple-use battery can also be used as an "A" Battery in portable sets. Light and full of pep. Its third use is as a "B" Battery booster.

Use the Eveready "Three"—a tested product of the world's leading electro-chemical battery laboratory. It serves more radio uses and effects more economies than any radio battery heretofore developed.

If you have any battery problem, Radio Battery Information Headquarters will solve it for you. Write G. C. Furness, Manager, Radio Division, National Carbon Company, Inc. 124 Thompson Ave., Long Island City, New York.

NATIONAL CARBON COMPANY, INC.
Headquarters for Radio Battery Information
New York San Francisco
CANADIAN NATIONAL CARBON CO., Limited. Factory and Offices: Toronto, Ontario

EVEREADY
Radio Batteries
—they last longer
This new Ace Type 3B Armstrong Regenerative Radio Receiver is the height of perfection. It is equal to a combination of the Ace Type V and the Ace two-stage amplifier. For volume and distant reception it out-performs most sets costing a great deal more. The new Ace Type 3B has a filament switch which eliminates necessity of turning out rheostats when set is not in use. Sells for $50.00 but worth much more. Has genuine mahogany cabinet with engraved panel.

ACE TYPE 3C CONSOLETT E

This is the last addition to the Ace Family. Has beautiful solid mahogany, wax finished cabinet. Set consists of a regenerative tuner, detector and two stages of amplification with built-in loud speaker. Due to the particular method of winding Crosley coils it is exceptionally selective. Has sufficient room inside cabinet for dry batteries, making a complete self-contained long range receiving outfit. Phone jack for tuning with head phones; Crosley multistat; filament switch, engraved Formica panel. Uses all kinds of tubes. An efficient set at a remarkable price, $125.00—without tubes or batteries.

Your dealer can supply you. Ask for "Simplicity of Radio"—your copy is free.

DEALERS: Write on your letterhead for attractive sales proposition.

Determining Quality

A RADIO set or product is no better than the science and skill that creates it.

Those men in this Institution who are intrusted with the responsibility of producing up to the standards of Powel Crosley, Jr., are experts who have won national recognition in their chosen scientific field.

Honest Merchandise uses Truth in Advertising

Ace Type 3B and Ace Type 3C Consolette manufactured under Armstrong U.S. Patent No. 1,113,149

THE PRECISION EQUIPMENT CO.
21st VANDALIA AVE.
POWEL CROSLEY, JR., Pres.
CINCINNATI, OHIO
HOW far have we progressed from the days when the minstrels, singing their self-composed ballads to the accompaniment of harp or lute, or telling their stories illustrated with crude mimicry, wandered from castle to castle in old England furnishing to the nobility, practically the only entertainment available.

Today every American, no matter how far removed from the centers of activity has within his reach up-to-the minute news and amusements that would have delighted the hearts of the nobility of old. The air is filled with merriment waiting to be captured and brought to your very fireside.

Radio is the magic wand that attracts to you the desired entertainment, Crosley Radio Receivers are the instruments by which this entertainment may be clearly and distinctly converted into a true reproduction of the original voice thousands of miles away.

You can own and enjoy a Crosley Radio Receiver. Unique features and quantity production have enabled us to offer the greatest value in radio ever produced. Actual tests by hundreds of satisfied users in all parts of America have proven that in performance, Crosley Instruments are unsurpassed. And the prices are remarkably low.

Let a Crosley Radio Receiver Bring Perpetual Entertainment to Your Home.

For bringing in distant stations no set can excel it.

For Sale By Good Dealers Everywhere.

CROSLEY MANUFACTURING CO.
Powel Crosley, Jr., President
218 Alfred St. Cincinnati, O.

—The Largest Manufacturer of Radio Receivers in the World—
Radio Show

and

Convention

of the

Second District

The Fourth Annual Second District Radio Show and Convention, under the auspices of the Executive Radio Council, Inc., will be held in New York at the

Hotel Pennsylvania

(grand ballroom)

March 3-4-5-6-7, 1924

—See QST and Amateur Radio for Details—
A few of the noteworthy features

Over 50 of the best manufacturers; visit to the famous WJZ-WEAF studios; Amateur Club Booths and exhibit of apparatus; Initiation of the R.O.W.H!!! Contests, Lectures, Stunts, etc. Grand Banquet and Hamfest with everyone prominent in radio present.

General Admission—50 cts. (Inc. Magazine Program)
Banquet—Season Pass—Hamfest-Trips—$5.00

Make Your Reservations Early To
Executive Radio Council—120 Liberty St.
N. Y. C.
What's Inside

THE most important thing to know about an amplifier is "What's inside." Outwardly there is little vital difference. Inwardly there's all the difference in the world—the difference between clear, smooth reception and poor reception full of squeaks and squawks.

Many radioists unconsciously put the "squeaks and squawks" into their sets through the use of improper transformers. They have yet to learn that "RATIO" means absolutely nothing—that 10 to 1, 9 to 1, etc. do not spell maximum amplification.

The very next time you buy an amplifier insist on a Genuine JEFFERSON for these reasons:

1st— A JEFFERSON is scientifically designed.
2nd—The windings are carefully calculated to produce 100% amplification—they are not built up to a ratio.
3rd—The JEFFERSON line embraces a variety of amplifiers to meet every demand—six Audio and two Radio Frequency types.

And remember this—the first cost of an amplifier is unimportant. Results count—buy an amplifier for what it will do—the service it will render—the tone and volume it will produce. Receiving is fun when one doesn't have a lot of peaky distortion to struggle with. You eliminate distortion when you use JEFFERSON. Your set operates more quietly and clearly—the volume is greatly increased—distant stations are easily tuned in.

You are invited to write our Radio Engineering Department for amplification data. Attractive descriptive literature is also available. This service is gratis.

Jefferson Electric Mfg. Co.,
425 So. Green St., Chicago, Ill.

Jefferson
Super-sensitive
Amplifying Transformers
Generators — Motors — Dynamotors — Motor-Generators
Stand Supreme in Wireless Field

This Special 4 Unit Set made for Wis. Dept. of Markets—the largest Broadcasting Station in existence. A 10 H.P. Motor—two 1000 V., 2000 W. Generators to operate in series, producing 2000V. and 4000 W. and one 12 V. 2000 W. Filament current Generator.

SEND FOR BULLETIN 237A listing over 200 combinations. We design and develop Special Apparatus for Special Purposes.

BATTERY CHARGER
Many Sizes with or without panels

DYNAMOTOR
Sizes to fit all requirements.

SOLD BY PRINCIPAL DEALERS EVERYWHERE
ELECTRIC SPECIALTY COMPANY
225 South Street,
Stamford, Conn., U.S.A.

Pioneers in developing High Voltage Apparatus

Sexton Condensers
Double Knob Vernier
(Balanced Model)
FURNISHED WITH 3" BLACK BAKELITE DIAL AND VERNIER BUTTON
Incorporates the following features:
Ball Thrust Bearing between Vernier and Rotor Shaft,
Half Capacity Switch,
Fig-Tail Connections,
Genuine Bakelite End Plates,
Exact and Uniform Spacing of Plates.
Write for Circular "R."
The Hartford Instrument Co.
308 Pearl St., Hartford, Conn.
Radio Frequency Ammeters

HOT WIRE AMMETERS

All transmitting sets, and continuous wave sets in particular, require ammeters to obtain the best results. You cannot depend on the other fellow’s ear. The circuits from input to output must be adjusted by ammeters.

The hot wire ammeter is the universal meter for this service. It is adapted for direct current, low frequency alternating current and for radio frequency. It can be checked at any time on direct current and will be equally accurate on radio frequency. As this action depends on the fundamental PR law, it always measures actual effective amperes.

We recommend for this service our Type 127 hot wire ammeter. This meter employs a platinum expansion element and is rugged and reliable. The diameter is three inches and this meter is made in front-of-panel and flush-mounting models. It is supplied in a variety of convenient ranges. The price is also right.

PRICE $7.75

SEND FOR FREE RADIO BULLETIN 916-Q

GENERAL RADIO COMPANY
MASSACHUSETTS AVENUE AND WINDSOR STREET
Cambridge 39 Massachusetts

Do not confuse the products of the GENERAL RADIO CO. with those of other concerns using the words “General Radio.” The General Radio Co has been manufacturing radio and scientific instruments for many years. It has no affiliation with any other company.
You will marvel and be thrilled by the performance of

Federal
Radio Parts
Always
Ideal Gifts

Groups of Federal Radio Parts to make complete sets.

Federal Telephone and Telegraph Company
Factory: Buffalo, N. Y.
Boston New York
Brigdeburg, Canada
Philadelphia Chicago San Francisco Pittsburgh

Boston
New York
Philadelphia
Chicago
San Francisco

Pittsburgh

Bridgwater, Canada
London, England

Price $7.00
2000 OHMS

FANSTEEL
Balkite
PATENTS APPLIED FOR.

Battery Charger

Noiseless and Indestructible

A new charger for Radio "A" 6 volt batteries. Entirely noiseless. Has no moving parts to adjust or get out of order, and no bulbs to break. Cannot discharge, overcharge or short circuit the battery. Can be used while the radio set is in operation. Simple, positive and undefeated in action. Sent direct on receipt of price if your dealer cannot supply you.

Price $18 ( $18.50 West)
Dept. Q2 Fansteel Products Co., Inc.
North Chicago, Illinois

STANDARD
of
EXCELLENCE
for audio amplification
With all tubes
In all stages

AmerTran
TRAD MARK REG. U. S. PAT. OFF.

Improve your set with an AmerTran
Its flat-top, distortionless amplification curve assures faithful reproduction of speech and of music over the full musical scale.
In one stage audibility is increased 80 to 40 times in the flat part of the curve, depending on the tube constant—the amplification is approximately 6 times the tube constant. Send for Circular 1006.
Type AF-6; turn ratio 5:1. Price $7. Ask your Electrical Dealer; or, sent carriage charges collect.

American Transformer Co.
Designers and builders of radio transformers for over 22 years.
176 Emmet Street,
Newark, N. J.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
FULL voltage battery current all the time! That's what you want. Westinghouse Radio Storage Batteries will give it to you. No more operating with run-down batteries! No more sudden drops in battery voltage! No more throwing away worn-out batteries! Westinghouse Batteries last. They hold their charge. They can be easily recharged. There's a size and type for every radio need. Built by Westinghouse, you know it's RIGHT!

Westinghouse CRYSTAL CASE Batteries have one-piece clear glass cases, with solid glass cell partitions and high plate rests (deep sediment spaces). Perfectly insulated against current leakage. "A" Batteries. 2 volts, for low-voltage tubes, such as WD-11 and WD-12. 4 volts, for tubes like UV-199. 6 volts, for tubes UV-201A or C-301A. Also rubber-case types. "B" Batteries. 22 volts. Regular and quad­ruple-capacity types. "C" Batteries in 6-volt units.

WESTINGHOUSE UNION BATTERY CO., Swissvale, Pa.

MAIL COUPON
for interesting facts about batteries

WESTINGHOUSE
RADIO
"A," "B" and "C"
BATTERIES
HOMMELS STOCKS are ALWAYS COMPLETE waiting to serve you promptly.

AMATEURS — Tell us what you are interested in — send us the name of your dealer and we will see that you are supplied promptly.

Enormous stocks of high grade nationally advertised radio equipment are always carried by this organization to assure prompt shipments any time anywhere.

Hundreds of dealers throughout the country have found "Hommel Service" most dependable and satisfactory. A trial order will convince you of Hommel ability to serve you likewise.

Dealers — Let us send you the new Hommel Encyclopedia $1.60!

LUDWIG HOMMEL & CO
530-534 FERNANDO ST. PITTSBURGH, PENNA

WEIGHS ONLY 8 OZ.

SEND NO MONEY! Order Today by Postcard and Pay Postman on arrival

A $200,000.00 COMPANY stands squarely back of the guarantee on every Scientific Headset of the guarantee on every Scientific Headset.

THE PHONE IT TOOK A SOLID YEAR TO DESIGN $2.95

POST-PAID LOUD SPEAKER UNIT $1.95

We Guarantee The Scientific Headset to be the greatest value on the market. Try it for five days. If not satisfactory send it back and your money will be refunded immediately. Circular on request. Dealers wanted.

THE SCIENTIFIC ELECTRIC WORKS
98 Brookline Ave.  BOSTON, MASS.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Important Announcement About Radio Panels

ELECTRASOTE is the latest addition to the famous family of products whose names end in “Sote”. The unvarying high quality of these celebrated products has made THE PANTASOTE COMPANY, Inc., well known the world over. Listen to what the U. S. Bureau of Standards says about ELECTRASOTE for Radio Uses:

“Electrasote has an average phase difference of about 1.8 degrees. Since phase difference is a dependable property on which to base an opinion of a material for use in radio apparatus, it seems to us that in this respect Electrasote is as good or better than the average phenolic insulating materials for such uses.”

Here’s What You Get in ELECTRASOTE

1. HIGH QUALITY—Electrasote is as good as any other panel material regardless of price. High Surface and Volume Resistivity. Low Phase Difference. Absence of Abrasives. Cuts clean without dulling tools.

2. LOW PRICES—From 25 to 50% lower list prices than any other standard high quality Panel Material.

3. FINE FINISH—Each panel finished in a high gloss finish on one side and a very fine satin-grained finish on the other side, thereby filling the bill whatever the demand.

4. INDIVIDUAL PACKAGE—Every Electrasote Panel wrapped in a durable, attractive envelope.

ON SALE AT GOOD RADIO DEALERS

JOBBERS AND DEALERS: Write for our attractive proposition. Some territory still open.

Address all communications to

M. M. FLERON & SON, INC.
Exclusive Sales Agents for Electrasote Radio Panels
113 North Broad Street  -  -  Trenton, New Jersey
RADIO TEST SET

This radio test set has been designed to meet the demands coming to us from serious experimenters, manufacturers and dealers in radio equipment and supplies, for a complete radio testing outfit.

While the various ranges of readings permit making practically every test necessary in connection with radio receiving sets, it has been particularly designed for the taking of characteristic curves on vacuum tubes, the only extra equipment required being the batteries.

The several instruments, any of which may be used independently, include a 0-1.2 filament ammeter, a 0-6 filament voltmeter, a 0-120 plate voltmeter, a 0-10 plate milliammeter, and a 10-0-10 grid voltmeter.

Complete With Instructions

Price, $75.00

Send for Circular

ORDER FROM DEALER

JEWELL ELECTRICAL INSTRUMENT CO.
1650 WALNUT ST.
CHICAGO

Simple as A-B-C

Longer distance and clear signals are the pleasing results which you can be sure of when both the A and B batteries of your radio set are storage batteries. No other source of power for radio equals the storage battery.

The Valley Type ABC Battery Charger is so simple and so easily operated that it makes storage batteries the most convenient and inexpensive source of power for radio. Enjoy radio at its best. Use storage batteries and charge them with the Valley Type ABC Battery Charger.

The Valley Type ABC Battery Charger is made to charge:

- 2-volt Peanut Tube Batteries
- 6-volt A Batteries
- 6 and 12-volt Automobile Batteries
- 1 to 4 B Batteries

Bakelite panel, glass top. Harmonizes with any receiving set. And as simple as ABC to operate. Plugs in on the light socket like a lamp and connects to battery by means of regular battery clamps.

At all good radio shops.

VALLEY ELECTRIC CO.
3157 S. Kingshighway St. Louis, Mo.
ARE YOU HAVING TROUBLE GETTING SHORT WAVE SIGNALS?

The WC-5-SW shown above picks up signals on wave lengths from 90 to 380 meters sharp and clear. It is the most practical set for low wave specialists. Built by short wave experts the WC-5-SW eliminates the trouble which transmitting amateurs are having with ordinary receiving sets. If you are interested in getting better results it will be to your advantage to investigate the WC-5-SW. Enthusiastic operators from all parts of the country write us praising its efficiency.

WC-5-SW

Built especially for Transmitting Amateurs

The WC-5-SW is a 4 tube set. One stage of tuned Radio Frequency amplification is employed ahead of the detector to make it super-sensitive. Two stages of audio frequency are used to bring up the signal strength. Uses any type of tubes. Gives perfect control of audibility. Detector rectifies only. Uses antenna compensating condenser. Only two control adjustments. Pure negative biasing on all tubes, thus marked saving on B Battery current. Tuned Radio Frequency sharpest known and most selective principle ever adopted. Plate potential non-critical. Mono-block tube socket. No grid plate leads on audio amplifiers. Audio amplification absolutely necessary when using low efficiency receiving antenna, i.e., underground or indoor. Mahogany cabinet, piano rub finish. Rabbited-in panel, Split lid cover. The price is only $85.00.

Write for complete description and illustrated folder on this practical set for low wave specialists. All transmitting amateurs will be interested in this literature.

OTT RADIO, Inc.
224 Main Street
La Crosse, Wis.
Cover the Continent—
Every radio enthusiast is interested in long distance reception. No matter how loud and clear the nearby stations come in, the big thrill comes when you hear a station thousands of miles away.

Stromberg-Carlson
RADIO HEAD SETS
enable you to utilize every bit of energy that your set picks up. The layer wound and layer insulated construction increases their capacity and enables them to function properly under the high plate voltages now in use for loud speaker hook-ups.

STROMBERG-CARLSON TELEPHONE MFG. CO., ROCHESTER, N. Y.

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 national 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 of its purposes as set forth on page 6 of every issue. We would like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio, and incidentally you will have QST delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

American Radio Relay League,
Hartford, Conn.

Being genuinely interested in Amateur Radio, I hereby apply for membership in the American Radio Relay League, and enclose $2 in payment for 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 address.

Station call, if any.
Grade operator’s license, if any.
Radio Clubs of which a member.
Do you know a friend who is also interested in Amateur Radio, whose name you might give us so we may write to him too about the League?

Thanks.
YOUR SET WILL BE A MUSICAL INSTRUMENT WHEN YOU USE

THE THORDARSON SUPER AUDIO FREQUENCY AMPLIFYING TRANSFORMER

Heretofore, audio frequency amplifying transformer manufacturers have given too much attention to volume of amplification and have sacrificed the most important function of their transformers—that of perfectly reproducing the broadcasted programs. Consequently many listeners have complained about the musical qualities of radio reception.

No matter how good your phonograph, you could not expect to obtain good music from a poor record. Likewise, although your loud speaker be the best you cannot expect to enjoy radio reception if the signals you put into it have been distorted in the process of amplification.

The new THORDARSON SUPER Audio Frequency Transformer was designed to correct the shortcomings of amplifying transformers of the past and embraces the following cardinal features:

1. Perfect reproduction of voice and instrument.
2. Even amplification over the entire musical range. (You will be surprised to hear the amazing reproduction of the bass notes).
3. Increase in volume to the extent that tonal purity will permit.

This SUPER TRANSFORMER is the result of several months research work in the thoroughly equipped Thordarson laboratory and represents the culmination of twenty-eight years experience in manufacturing small transformers.

Such leading set manufacturers as the Colin B. Kennedy Company, Chicago Radio Laboratories Company (Zenith), and the Western Coil and Electric Company (Radiodyne) along with many others proclaim the merits of the THORDARSON SUPER TRANSFORMERS.

Install a pair of Thordarson Super Transformers now and your receiving set will be converted into a real musical instrument.

YOUR DEALER HAS THEM

THORDARSON ELECTRIC MFG. CO.
CHICAGO — ILLINOIS
SIGNAL
New Vernier
Variable Condenser

Positive contact between Vernier and Rotor plates. Special designed Vernier closest tuning.

Vernier but 2-1/100 of large dial.
Pigtail connection to soldering terminal.
Special bushing holding Vernier and shaft.

Ensures:
- Closest tuning obtainable.
- Positive contact.
- Clear signals.
- Less interference.

Ask your dealer to show you the new Signal Vernier Variable Condenser. Catalog on request.

SIGNAL Electric Mfg. Co.

Boston, Chicago, Minneapolis, Montreal, New York, Pittsburgh, St. Louis, San Francisco, Toronto, Philadelphia, Los Angeles.
You'll find our local address in your Telephone Directory.

ARE YOU A 1923 MAN?
IF YOU ARE—GET OUT OF THE RUT
Radio has improved with leaps and bounds since last year—to be a 1923 man is to be satisfied with last year's results—Broadcasting and CW will accomplish wonderful results this Fall and Winter and for you to share in these coming successes—both receiving and transmitting—you need a good set, made from the latest and most improved parts.

ROSE RADIO HAS IT!!
(and I don't mean maybe)

ROSE RADIO AND ELECTRICAL SUPPLIES
129 CAMP STREET,
NEW ORLEANS, LA.

NA-ALD
De Luxe Socket

The laminated phosphor bronze contacts of the Na-ald De Luxe Socket press firmly on both the ends and sides of tube prongs, keeping the surface clean and insuring clear reception.
Moulded of genuine Bakelite this socket expresses the very highest quality in appearance and workmanship.

ALDEN MANUFACTURING CO.
Largest makers of Radio Sockets and Dials in the world.
Springfield, Mass.
Dept. M 52 Willow St.

RADIO "B" BATTERIES
At Factory Prices
Greatest radio "B" battery on market. Full number of voltage taps: QUALITY GUARANTEED: LOWEST PRICES: brings in concerts LOUDER AND STRONGER; will work on any tube or loud speaker.
Order by number TODAY with check, money order or postman C. O. D.
No. 222B 22½ volt variable, regularly $2.25. $1.50
No. 222A 22½ volt variable, regularly 3.00. 1.85
No. 245A 45 volt, 8 taps, regularly 5.50. 3.25

AYRES BATTERY CORPORATION, Cincinnati, Ohio

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
RADIO FREQUENCY AMPLIFICATION
WITH
Ballantine Variotransformers
(Patents Pending)

Model 5 $9.60

Complete Unit $15.00

“TURN THE KNOB”
1. Continuous variation in wave length.
2. Self-contained and shielded.
3. Control of regeneration and tuning by single knob: no potentiometer.
4. Fits your set—either base or panel mounting.
5. Improved tone quality.

“Radio Frequency Amplification with the Ballantine Variotransformers”—a 25-page booklet—mailed free on request.

BOONTON RUBBER MFG. CO.
Pioneers in Bakelite Moulding
124 FANNY ROAD BOONTON, NEW JERSEY
CHELTEN QUALITY RADIO PRODUCTS

THE LATEST IN CONDENSERS

Accurately spaced heavy gauged plates mounted between Bakelite ends, a special Chelten 9 Plate Vernier, and many other improvements makes the Chelten RADIOSCOPE stand out as one of the most selective and satisfactory Variable Condensers money can buy. The 9 plate Vernier will surprise you with its unusual selectivity. You'll find stations you never imagined your set could receive. Made in 45 and 23 Plate type.

CHELTEN MIDGET VERNIER
Can be used as a Vernier with any variable condenser. Its 13 plates makes possible unusually fine graduation of capacity. Will increase the efficiency of all of the better circuits. Costs but $1.50.

CHELTEN MICROFARAD JR.
Specially designed as a Neutralizing Condenser of Low Capacity. Has 9 plates. A turn of the knob changes the adjustment without body capacity effect. Absolutely retains adjustment. Price but $1.75.

THE CHELTEN ELECTRIC COMPANY
4861 Stenton Avenue, Philadelphia

KEEP A RECORD OF THE STATIONS YOU RECEIVE
With a Moon Radio Log Book

The only book that gives you a complete, permanent record of your reception over a long period. A book bound in stiff, durable cover giving such valuable information as the Morse Code; latest list of broadcasting stations with new wave lengths and call letters; list of slogans of the various broadcasting stations; logs for over two hundred days and other valuable information for the amateur.

SEND NO MONEY
Just send your order in a letter or on a postal card and we will immediately send you a copy of the MOON RADIO LOG. You will pay your postman fifty cents, plus a few cents for insurance and C.O.D. fee. Present edition limited, so mail orders at once to

MOON RADIO CORPORATION
501 Steinway Ave.,
Long Island City, N.Y.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
MAGNAVOX instruments are never subject to those internal interferences which, at critical moments, are so apt to mar the performance of ordinary radio reproducers.

To measure the success which Magnavox engineers have accomplished in the design and manufacture of Magnavox products, remember that they have been sold in far larger quantities than any other radio units in the world.

Magnavox Reproducer
- R2 with 18-inch curvex horn: $60.00
- R3 with 14-inch curvex horn: $35.00
- M1 with 14-inch curvex horn: Requires no battery for the field: $35.00

Magnavox Combination Sets
- A1-R consisting of electro-dynamic Reproducer with 14-inch curvex horn and 1 stage of amplification: $59.00
- A2-R consisting of electro-dynamic Reproducer with 14-inch curvex horn and 2 stages of amplification: $85.00

Magnavox Power Amplifiers
- A1-1-stage: $27.50
- AC-2-C-2-stage: $55.00
- AC-3-C-3-stage: $75.00

Magnavox Products are for sale at Registered Magnavox Dealers everywhere. Write for new 28-page Magnavox Radio Catalogue.

THE MAGNAVOX CO., Oakland, California
New York Office: 370 Seventh Avenue
Perkins Electric, Limited, Toronto, Montreal, Winnipeg

Always mention QST when writing to advertisers
Like the motor meter on an automobile, the filament meter of your radio set is the signal that says: "Danger" or "All's well". Don't take a chance on burning out your tubes because you do not know the voltage conditions. Set the Sterling meter to work guarding your property and saving you worry and unnecessary costs. Unusually accurate and reliable. Magnetic type. Flush mounted type and require a hole in the panel only 2” in diameter. Price $4.00 & $5.00.

GENERAL ELECTRIC DOUBLE CURRENT GENERATORS

May Be Used as Dynamotors for C.W. Transmission

<table>
<thead>
<tr>
<th>Driving Voltage</th>
<th>Plate Voltage</th>
<th>Mills</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>550</td>
<td>130</td>
</tr>
<tr>
<td>8</td>
<td>400</td>
<td>90</td>
</tr>
</tbody>
</table>

Made for the United States Army Air Service. Equipped with a Dubilier Filter System. Using 2 1/2 MF. 1800 volts Mica Condensers. Ball Bearings Equipped. All new, in original cases. Price $29.75. Half Cash With Order—Remit by Money Order to Facilitate Immediate Shipment. We also have: CW-936 Sub Chaser Telephone Transmitting and Receiving Sets including:—Remote Control System, Power Amplifier, Loud Speakers, Tubes, Spare Microphone, etc. Can be tuned down to 150 meters. Absolutely new sets. Navy Long Wave Tuners Type CN-240, Tuning Range 1000-30000 meters. You will want one for long wave reception—SPECIAL PRICE $75.00.

EKSAF TRADING CO., 1515 Eastern Parkway, Brooklyn, N. Y.

PYREX LEAD-IN INSULATOR

$3.75 Complete

Prepaid to anywhere in U. S.
P. F. BECHBERGER & CO.
NORWALK, OHIO

FROST-RADIO Catalog and Instruction Book

This new booklet on the care and operation of FROST-FONES and FROST-RADIO is now ready. Contains 36 pages of valuable information on radio apparatus. Your copy mailed free on request.

Address Dept. 11F02
Herbert H. Frost, Inc.
154 West Lake Street
CHICAGO, ILLINOIS

A post card from you will bring this 40-page catalog.
ELECTRAD PRODUCTS

THEIR QUALITY ABSOLUTELY GUARANTEED

You are safe when you buy Electrad Products. They are absolutely guaranteed, electrically and mechanically, to be of the finest materials and workmanship.

Most good dealers carry them because they are fairly priced, and give their customers good service.

Double Your Distance with an ELECTRAD VARIOHM

The latest invention in grid leaks. A simple turn of the knob and you can get any resistance from \( \frac{1}{4} \) to 30 megohms. Eliminates circuit noises, is moisture proof and non-microphonic. Is equipped to take any standard condenser. Absolutely guaranteed.

ELECTRAD INDIRORIAL

Ideal for sharp tuning. Wonderful directional effects. Particularly effective where several local stations are broadcasting at once. Can be used also as ground. By using Indorarias for antenna and ground you can get any coupling you desire. Hang on wall, door or lay under rug.

ELECTRAD LEAD-IN

Fits under closed window. Can be bent to any shape. Covered with fireproof insulation which prevents grounding on wet window sills. No holes in window frame and takes the place of unsightly porcelain tubes. Fitted with Fahnestock Clips.

ELECTRAD GRID LEAKS

Absolutely uniform unvarying fixed resistance. A superior product of dependability, in all resistance from \( \frac{1}{4} \) to 10 megohms. Price 30 cents.

Dealers: Write for samples and details on our special group assortment.

ELECTRAD, Incorporated

Dept. "G", 428 Broadway, New York City
HEATH'S
Radiant Condensers

When you put Heath Radiant Condensers behind a panel, you can forget about them. They will always tune as perfectly as the day you mounted them. Absolute alignment is permanent, because the plates are protected against warping and buckling by the Heath process of stamping and tempering. Each plate is PERMANENTLY FLAT—

Vernier with a Hairline Adjustment

Separate vernier adjustment—reducing gear meshed into teeth cut in rim of vernier plate. Ordinary adjustment reduced to infinite fineness. Absolutely positive adjustment—without backlash.

Write for illustrated booklet and the name of the nearest Heath dealer.

LIST PRICES—VERNIER TYPE
13 Plate including 2½" dial and knob ... $3.50
25 Plate including 2½" dial and knob ... $5.60
35 Plate including 2½" dial and knob ... $6.50

HEATH RADIO & ELEC. MFG. CO.
207 First St., Newark, N. J.

NO LOOPS — NO ANTENNA

The RADIODYNE is operated by simply grounding to a water pipe or radiator, and throwing a few feet of wire on the floor. Uses any standard tubes—dry cell or storage battery. Extremely selective. Simple to operate—only two controls.

Stations within a radius of 2000 miles can be picked up on the loud speaker; any wavelength from 200 to 700 meters.

Price $150.00

For use in apartments, boats, automobiles, railroad trans, etc., the RADIODYNE is enjoyable where other receiving sets would not be practical.

When interference, strays, static, etc., make other types of reception utterly useless the RADIODYNE picks up broadcast programs clear and distinctly.

TO THE A.R.R.L.

We appreciate your efforts in boosting W.C. sets and are always pleased to furnish full information about them to members who have not yet had the opportunity to operate a Radiodyne. We want every member to know the merits of this efficient outfit.

Just drop us a line and we will see that your inquiry gets prompt attention.

Western Coil and Electrical Co.
305 Fifth St., Racine, Wis.

"The Voice of the Nation"

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
If you take radio seriously

You want to tune in distant stations, but there is another thing you want just as keenly—to get what you get clearly.

No matter how far or how near the station is, for greatest clearness and for all-round satisfaction, you must use storage batteries. Once you hook up to Exide Radio Batteries you will never be satisfied with anything less. They give uniform current, smoothly, quietly, over a long period of discharge. Like good little boys, they are seen and not heard.

For low-voltage tubes
The two newest members of the Exide family are midgets in size but giants in power. These sturdy little A batteries weigh only five and six pounds each. They furnish in full measure that uniform and unfailing power so essential to clarity and distant reception.

They were specially designed for WD-11 and UV-199 vacuum tubes, but can be used with any low-voltage tube. The two-volt Exide A Battery consists of a single cell. It will heat the filament of a WD-11 or other quarter-ampere tube for approximately 96 hours. The four-volt A battery, having two cells, will light the filament of a UV-199 tube for 200 hours.

For six-volt tubes
Like all Exide Storage Batteries, the Exide A Battery for six-volt tubes is dependable and long-lasting. It is made in four sizes—of 25, 50, 100, and 150 ampere-hour capacities.

On land, at sea and in the air
It is the experience back of Exide Batteries that makes the Exide give such exceptional service in radio. There is an Exide Battery for every purpose. Exides run trucks, start and light automobiles, operate drawbridges, propel under the sea a majority of the world's submarines, send your voice over the wire every time you use the telephone.

A majority of all government and commercial radio plants both on land and at sea are equipped with Exide Batteries. The Leviathan is Exide-equipped. The giant dirigible "Shenandoah" carries Exide Batteries for ignition, lights and radio.

It does not pay to get any but a known-to-be-reliable storage battery for radio. Exide Radio Batteries are sold by radio dealers and Exide Service Stations everywhere. Ask your dealer for booklets describing in detail the Exide Radio Batteries, or write us direct.

Exide Radio Batteries

THE ELECTRIC STORAGE BATTERY COMPANY, PHILADELPHIA
Manufactured in Canada by Exide Batteries of Canada, Limited, 133-157 Dufferin Street, Toronto

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
A tip for the
Set Building Industry
You fellows who build sets for the "friendship trade" have had a taste of the "service" problem. Customers are very fussy about results—particularly squawks and mushy tones. Not so? Well, DURHAM Variable Grid Leaks will help you out in this manner. They are instantly adjustable for all tubes—in any hook-up. With them you can get perfect control of oscillation. Naturally, you get full benefit of regeneration. Use Durhams on every job. Then, like ourselves, you can guarantee satisfaction.

Free folder gives more details.
Get yours from dealer or write
Satisfaction Guaranteed

Durham Variables—75c
No. 100—1.000 ohms to 0.1 megohms
No. 101—0.1 megohms to 5 megohms
No. 101A—5 megohms to 10 megohms
Manufactured by
DURHAM & CO.
1936 Market St. Philadelphia
Dealers—Among the 40,000 readers of QST are the very finest technicians of the amateur set builders. Their recommendation carries weight. Their business in your store carries profit.

MIDGET ANTENNAE
Not a loop—Just a tube—2 inches long ½ inch round—No lightning arrestor required
Long distance reception without the inconvenience of an outside aerial
Only $5.00 Complete
Write for exclusive agency proposition
BUYRIGHT COMPANY
2503 No. 60th Avenue, Omaha, Nebr.

DE LUXE DIALS
When phonographs were first made they were square boxes without ornamentation. Likewise the first dials, turned out in a laboratory, had hard straight lines for shape. Beauty is a later development. Na-aid dials have soft, graceful lines which makes them very pleasing to the eye. They lead in both beauty and quality. They have the right grip for delicate, exact tuning.

ALDEN MANUFACTURING CO.
Largest makers of Radio Sockets and Dials in the world
Springfield, Mass.

3 inch
No. 2052—4
35c, 3 for $1.00

TELEGRAPH INSTRUMENTS
Dandy Morse Learner's Outfit
One dry cell is all that is required to operate this instrument.
Made by the best Telegraph Instrument Makers in the World.
Other types carried in stock.
Send stamp for Telegraph Manual No. 48Q.
Instrument only.......................... $3.00
With dry battery.......................... 5.50
Special Price to Dealers
J. H. BUNNELL & CO. 32 Park Place, N. Y.
Announcing—

A New Radio Frequency Transformer

—in a combination unit, consisting of transformer, tube socket and rheostat.

Especially designed for use in tuned radio frequency circuits—the most practical method of amplifying high (radio) frequency impulses.

The trend toward radio frequency amplification is to be expected. Its advantages are many—long distance reception; the excellent results obtained with indoor aerials, and an entire absence of interference with neighboring receivers.

When incorporated in a tuned radio frequency circuit, this transformer amplifies efficiently at all wave lengths employed in present-day broadcasting.

All Eisemann units are matched one to the other, not only in their electrical co-relation but also in appearance, and, when assembled, present a harmonious whole.

Complete instructions for wiring are given, and the individual not deeply versed in Radio can build a receiver with assurance of results.

EISEMANN MAGNETO CORPORATION

WILLIAM N. SHAW, President

42 Thirty-Third Street

Brooklyn, N. Y.
An Easy Way
to tune out Interference

The FERBEND "Wave Trap"
Makes Every Night Silent Night

Get the station you want quickly. Listen in on the distant stations without annoying squawk-k-k-s or irritating whistles. Listen like this St. Louis user: "Heard Havana clearly with three St. Louis stations broadcasting. My receiver works like a new set. The 'Ferbend' is certainly a wonder."

YOU Can Obtain These Remarkable Results

You can obtain results as satisfactory as this St. Louis user. If you don't, it doesn't cost you a penny, for the "Wave Trap" is sold with a positive guarantee that it will tune out your powerful local stations. Don't wait. Order now at our risk.

SEND NO MONEY. You need not send a penny. Pay Postman $6.00 (plus postage). If you prefer, send $6.00 with order and Wave Trap is mailed postpaid. Money-back guarantee either way. You see, you take no risk, so order TODAY.

FERBEND

Wave Trap

For Sturdiness and Accuracy
Use Lombardi Condensers

A rugged condenser built on an entirely new principle, made to last a lifetime.

The tension is adjusted by tightening a thrust plug causing the proper tension between a hardened steel ball and a 45 degree tapered brass bushing.

Also makers of coils and sockets.

Literature and prices furnished upon request

67 MINERVA ST., DERBY, CONN.
Hear the Atlaa
Loud Speaker
Ask your dealer for
a demonstration.
Submit it to any
reasonable test. Get
the proof NOW.

Scores of letters, sent us by
enthusiastic owners of Atlas
Loud Speakers, reveal how
great is the difference between
ordinary loud speakers and
this real radio reproducer. It
is the difference between real
and artificial revival of the
music broadcasted. The ex­
clusive “double diaphragm”
feature responds equally true
over the entire range of music­
al cycles. There are no dis­
tortion points. This device is
adjustable to your set and par­
ticular receiving conditions.

Write for Illustrated Booklet
“D”.

Letters from Users
Requested

Make Your Own Loud Speaker with THE ATLAS UNIT, with phono­
graph attachment $13.50 (Unit without attachment $12.50)

Multiple Electric Products Co.Inc.
Makers of Multiple TIME-LAG Mono FUSES
11 Orange St., Newark, New Jersey

Sole Canadian Distributors: The Marconi Wireless Telegraph Company
of Canada, Limited, Montreal, Canada.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
You can pay more but you can't get better value

For 20 years Murdock radiophones have been the standard for efficient radio reception. Made with the precision of a delicately wrought instrument—they are unexcelled for sensitiveness, clarity and durability. The fact that over a million have been sold is proof of their superior service.

Why pay more

The great demand for Murdock phones has forced us to make them in large quantities, which means lowered cost to the consumer. Thus you can buy a Murdock for almost half what is asked for phones of equal value. Why pay more? Get a Murdock today and test it out. We guarantee complete satisfaction.

A Higher Price Is a Luxury—
Anything Less Is Poor Economy

Have you a new Murdock Multiple Plug?

At all dealers

WM. J. MURDOCK CO.
343 Washington Ave.
Chelsea, Mass.
Sales Offices Chicago and San Francisco.

MURDOCK
Radio

STANDARD APPARATUS SINCE 1904

The perfect radio switch—correctly designed and skillfully constructed. Installed on any panel in five minutes to add hours of convenience, and protect both tubes and batteries. At dealers everywhere—insist on the genuine—in the orange and blue box. If your dealer has not been stocked send 60c plus 10c for packing and you will be supplied direct.

THE CUTLER-HAMMER MFG. CO.
Member Radio Section
Associated Manufacturers of Electrical Supplies
Milwaukee, Wisconsin

RADIO SWITCH

Illinois

Socket Cushion

Protects Tubes

Cushion is moulded of pure gum rubber that absorbs all vibrations that would otherwise reach Tube. It is not a mere pad or washer. It is held to socket separately by 2 small screws and nuts and will fit any socket, round or square, for large or small Tubes.

Price, 35c. Each—3 for $1.00, Post Paid

Remit by Money Order or Check.

Dealers write for circulars and discounts.

ILLINOIS RADIO CO.
Springfield, Ill.
Keep Abreast of the Times
Use a Paragon Variometer in Your Receiving Set

Every man who owns a Radio Receiving Set naturally wants to get the best possible results that can be obtained with it. To do so he must keep abreast of the times and add parts where they will improve it.

Wavelength bands now in force involve radio currents of extremely high frequency. An inductance unit of exceptional electrical and mechanical excellence is needed to obtain the best results on these wavelengths. The PARAGON No. 60 Variometer, ribbed design, assures the greatest possible efficiency at high frequencies and makes it far easier to secure desired results on wavelengths of 150 to 200 meters.

The reduction of material in the support forms permits us to offer this essential radio part at an extremely popular price.

Use a PARAGON Variometer in your set. It will make it a better set and will increase your pleasure in listening in with it.

Illustrated Bulletins on Paragon Radio Products are yours for the asking

ADAMS-MORGAN CO., 4 Alvin Avenue, Upper Montclair, N.J.
"The most popular in this vicinity"


GUARANTEE
Your money back on any KIC-O Battery if not satisfied within 30 days.

Get a U. S. Government Commercial License

The radio profession pays well. Amateur experimenters are in great demand. Your present knowledge will shorten your course with us. Commercialize your amateur experience. Special amateur stations with wave power privileges demand extra first grade amateur licenses which require 20 words code speed and definite knowledge of tube circuits. There is a great shortage of commercial operators. Wages are rising; some companies are paying as high as $140.00 a month. Sail on American ships to all parts of the world. Positions guaranteed. Through our favorable connections with operating companies as well as our continued success in training operators we are now supplying about 90% of the ship operators sailing from Boston.

G. R. Entwistle, Radio Director
Mass. Radio & Telegraph School, Inc.
Tel.—Beach 7168 Boston, Mass.

THE LITTLE WONDER
The smallest, yet most efficient Transformer ever made. Maximum reproduction value, minimum distortion, 100% shielded.

$3.50

PREMIER
"HEGEHOG"
Trade Mark
Audio Transformer
Mounts anywhere—save space in assembly. We guarantee it unconditionally. Try them in your next "hook up." Ratio 1 to 3, 1 to 4, 1 to 5, $3.50; 1 to 10, $4.50. Ask your dealer. Write for bulletin No. 92.

Premier Electric Company
3811 Ravenswood Ave. Chicago

104

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Look for this stamp on every genuine RADION Panel. Beware of substitutes and imitations.

18 Stock Sizes Radion Panels

<table>
<thead>
<tr>
<th>Size</th>
<th>6x10 1/4</th>
<th>6x14</th>
<th>6x21</th>
</tr>
</thead>
<tbody>
<tr>
<td>7x9</td>
<td>7x9</td>
<td>7x10</td>
<td>7x12</td>
</tr>
<tr>
<td>7x14</td>
<td>7x14</td>
<td>7x18</td>
<td>7x21</td>
</tr>
<tr>
<td>7x24</td>
<td>7x24</td>
<td>7x26</td>
<td>7x26</td>
</tr>
<tr>
<td>9x14</td>
<td>10x12</td>
<td>12x14</td>
<td></td>
</tr>
<tr>
<td>12x21</td>
<td>14x18</td>
<td>20x24</td>
<td></td>
</tr>
</tbody>
</table>

Mahoganite Has the Beauty of Polished Mahogany

Mahoganite Radio Panels have a satin-like finish comparable to that which age and a skilled cabinet maker give to mahogany. Radion Dials and Knobs are also made in Mahoganite, to match.

The best radio shops everywhere carry RADION Panels and Parts in stock.

RADION

The Supreme Insulation PANELS

AMERICAN HARD RUBBER CO. 11 Mercer St., N. Y.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
For Transmission or Reception!

"FRESHMAN SELECTIVE"

MERCURY VARIABLE CONDENSER

$5

It has been conceded by the Foremost Radio Engineers that a Variable Condenser with Mercury plates is the most efficient for fine adjustment and selective tuning. Our engineers, after exhaustive experiments and research work, have developed a Variable Condenser with Mercury plates separated by heavy Mica dielectric. It is the ONLY VARIABLE CONDENSER the plates of which actually vary in area—AN ENGINEERING FEAT NEVER ACCOMPLISHED BEFORE.

No Leakage
Absolutely quiet
No plate vibration
Will stand 5000 volts
Compact and attractive
Plates cannot collect dirt
Cannot become short circuited

.0005 m.f. (equivalent to 17 plate) ALL $5
.0005 m.f. (equivalent to 23 plate)
.001 m.f. (equivalent to 45 plate)

All Molded Parts and Dial of the Finest Bakelite

At your dealer, otherwise send purchase price and you will be supplied postpaid.

Chas. Freshman Co., Inc.
Radio Condenser Products
106 SEVENTH AVE. NEW YORK

RIGGS RECTIFIER

$12.50

Prepaid Anywhere in the U. S.

MONEY BACK GUARANTEE
We guarantee the Type B-3 to please you. If it does not, return it and we will return your money.

THE RIGGS MFG. CO.
Factories—Everett, Wash.

Audiophone
REG. U. S. PAT. OFFICE
LOUD SPEAKER
A REAL REPRODUCER OF THE ORIGINAL BROADCASTING

It is easy to listen to the reproductions made by the Audiophone because they are so perfect. The speech, the songs, and instrumental music are not blurred or disguised by mechanical distortions. You will get all the fine shading and every inflection. In fact, the very personality of the artist seems to be present as you listen.

Made in three models—
Senior Audiophone.................. Price $32.50
Baby Audiophone.................. Price 12.50
Junior Audiophone.................. Price 22.50

Write for copy of Bulletin AX-3012

THE BRISTOL COMPANY
WATERBURY, CONN.
After Extensive Tests and Comparisons
We Offer The
Branston-Quality-Guaranteed Audio Transformer

You can now get rid of noisy or otherwise unsatisfactory transformers and, with perfect confidence, replace them with this fully-tested-and-proved Branston Audio Frequency Transformer. The results will delight you and your "audiences."

You can now make up new sets, with the certainty that you have the maximum-possible amplification and best tone quality without distortion.

If your dealer has not yet secured his supply, send check or money order for as many as you need, at $6.50 each, or order parcel post C.O.D. Mention your dealer's name, please.

Use Branston "Broadcast Coils" for
closer selectivity

Very fine adjustment, close selectivity and clearer reception for all wave lengths between 250 and 600 meters. Wound on Formica Tubes 5" diameter. Equipped with standard coil plugs. Fit any Honeycomb coil mounting. Furnished only in sets of three, Primary, Secondary, Tickler. In attractive carton, per set, at dealer's or by mail, $5.00.

Protect Against Lightning and Static
Use Branston Vacuum Tube Protectors in Place of the Grounding Switch

Approved by Underwriters' Laboratories and Hydro-Electric Power Commission of Ontario.

Scientifically constructed. Always ready to carry away a lightning flash before it can enter the building. Drains static from the aerial, relieving interference. Signals are more audible.

It operates automatically—Requires no attention. Can be installed and forgotten. Designed for outdoor mounting. Petticoat insulator prevents leakage in wet weather. Vacuum tube entirely enclosed and protected from breakage, moisture, dirt, insects. Not affected by snow, sleet, or rain. Price, at dealer's or by mail ........ $3.00

Send 30c Stamp for New Honeycomb Coil Hookups.

Compiled by experts and includes five good Honeycomb Coil "Hookups" and complete catalog of famous Branston Radio Apparatus. Write today. Give us name of your radio dealer. If he cannot supply you, write

CHAS. A. BRANSTON, INC.
Manufacturers of Branston Violet Ray High Frequency Generators.
823 MAIN STREET, BUFFALO, N. Y.
In Canada—Chas. A. Branston, Ltd., Toronto

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
“USE A Hoyt”

1. TO TEST YOUR B BATTERY—Use the Hoyt Pocket Meter—Range 0-50 volts, special red markings at 22 ½ and 45 volts on the dial—Price $2.50.

2. TO TEST THE CONSUMPTION OF YOUR TUBES—Use Hoyt Peep-Hole Ammeters and Voltmeters—Specially designed to fit in the peep-hole on the panel—Price $3.00.

We can supply you with any kind of meters for Radio Work.

Write—BURTON-ROGERS CO.
Sales Department For
HOYT ELECTRICAL INSTRUMENTS
26 Brighton Avenue, Boston, Mass.

The ‘Phones They Are All Talking About

"THOSE imported phones that give such wonderful mellow tone.”
N & K Model D phones, 4000 ohms, are made of nickedled brass—not stamped aluminum. Have extra large sound chamber, 2 ½ in. diaphragm. Result—broader range, greater comfort, exclusion of outside sounds. Sanitary, leather covered head bands. Price $8.50. Write for folder.

TH. GOLD-SCHMIDT CORP.
Dept. Q2
15 William Street
New York, N. Y.

U. S. TOOL CONDENSERS

Infinitesimally small dielectric losses in U.S Tool Condensers. The end plates of Laminated Condensite-Celoron are non-porous, proof against all capacity leaks and non-warping. One of the details that make it well worth your while to insist upon U.S. Tool Condensers.

Write for booklet
U. S. TOOL COMPANY, INC.
112 Mechanic St., Newark, N. J.
Another Acme Radio Frequency Transformer

The Acme 30KC for Long Wave R.F. Circuits

We have found in our laboratory that we can run these transformers with the grid return to the negative side of the filament in fact, we can run them as high as six volts negative. We have also found that it is not necessary to shield the transformer, and that they operate satisfactorily in cascade as high as four stages without interstage oscillation. This new Acme 30 KC Transformer is a worthy member of the Acme Transformer family. The Acme A-2 Audio Amplifying Transformer and the Acme R-2 Radio Frequency Transformer have made the name Acme synonymous with “the best transformer” in the mind of radio amateurs. We brought out the Acme 30 KC Transformer because we found that a real need existed for a transformer of this kind for long wave and R.F. circuits. Send 10 cents for our booklet “Amplification without Distortion”.

ACME APPARATUS COMPANY
Dept. 35 Cambridge, Mass.

ACME ~ for amplification

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
How to Improve Your Set

Hook a Samson HW-A1 Transformer to your set and notice the difference. You get 40% to 100% greater amplification—more volume from one tube than from two tubes with some transformers and more than from three tubes with others. You get practically no distortion at any range.

The Samson now sells for $5. It costs two or three times as much to make as any other transformer. The Helical Wound primary and secondary coils alone cost more than most transformers cost complete. But your $5 gets the most satisfactory audio frequency transformer that the most experienced radio engineers have been able to design.

Insist on a Samson HW-A1 Audio Frequency Transformer. If your dealer hasn't it or won't get it for you, we'll send it pre-paid on receipt of NEW LOW PRICE $5.00.

Write for Results of Tests proving the superiority of the Samson. Ask for Chart No. 112.

SAMSON ELECTRIC CO.
Manufacturers Since 1882
Factory Canton, Mass.

Sales Offices: Boston, New York, Chicago, Philadelphia, Pittsburgh, Buffalo, Cleveland, Detroit, Indianapolis, Minneapolis, St. Louis, San Francisco, Los Angeles, Seattle, Portland, Atlanta, Montreal and Toronto.

All transformers except the Samson are wound spirally fashion from end to end; the adjacent turns of wire are 500 to 1000 turns apart. The Samson is Helical Wound—wire in layers one on top of the other with the adjacent turns but forty turns apart. This method of winding, patented by and exclusive with Samson Electric Co., reduces distributed capacity to an absolute minimum, accounts for greater amplification and the ability to transform the signals without distortion at any range.

110 ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Gilfillan and Bakelite

All the molded insulation of these Gilfillan radio parts is 100% Bakelite.

In the words of the manufacturer, BAKE-LITE "insures positive insulation and absolute permanency." And that's the story in a nutshell.

Nothing else equals Bakelite in the combination of all its desirable properties such as insulation resistance, mechanical strength, permanence of color and indifference to all weather conditions.

The outstanding merit of Bakelite is its durability—its freedom from deterioration.

Every day, radio men are finding new applications for this "Material of a Thousand Uses," for parts made of molded or laminated Bakelite possess properties that successfully meet the most exacting demands of radio work.

Write for a copy of our Radio Booklet C.

Send for our Radio Map

Enclose 10c to cover mailing cost and we will send you a large Radio Map which lists the call letters, wave length, and location of every broadcasting station in the world. Address Map Department.

BAKELITE CORPORATION

247 Park Avenue, New York, N. Y.

Chicago Office: 636 West 22d Street
Clear as a Silver Bell

O-T SILVERTONE TUBES

(Registered)

will increase the signal strength of your set from 20 to 50 per cent—and even to a greater degree when used as a NEUTRODYNE detector.

Three Models

O. T. 1A—2 to 4 volts, Battery Draw .16 amps. Price, $6.00
O. T. 9—2 to 4 volts, Battery Draw .06 amps. Price, $6.50
O. T. Power Tube—5 volts, Battery Draw .25 to .35 amps. Price, $7.50

At your dealer or direct by mail.

Write for complete literature.

Manufactured by DeForest Tel. & Tel. Co.

Exclusively for the

O. & T. Electric Corporation

1819 Broadway, New York

High class representatives wanted.

White Variometers
For Pure Inductance

These instruments are made to meet the requirements of the most critical radio engineer or amateur set builder.
They are marvels of efficiency.

(At your dealer or post-paid direct.)

Price $5.50

Manufactured by

THE WHITE MFG. CO.

2290 Alden Street, St. Paul, Minn.

Radio CALL CARDS Printed

TO ORDER

Use Individual Cards. A.R.R.L. Emblem added if requested by member.
MONEY REFUNDED if not satisfied.
Red call, black printing. 100—$1.75; 200—$2.75, postpaid. Blue, green or brown call, personal letterheads & envelopes 1¢ extra per card.

Personal LETTERHEADS & ENVELOPES

Showing your station, name and address. Good quality, clear white smooth surface hand paper. Letterheads 8½ x 5½. Envelopes 6 inches long. 100 each—$2.25; 500 each—$3.25; 300 each—$4.25; 600 each—$5.25 PREPAID.

Broadcasting Market Reports: 100—$1.00; 200—$1.75.

Send order with check or money order today—NOW.

RADIO PRINTERS, Dept. 12

Mendota, Ill.

Catal og

E19-112 PAGES FREE

LATEST REFLEX AND NEUTRODYNE CIRCUITS
EVERYTHING IN RADIO
One of the largest complete stocks in the world. 40 diagrams of latest Hookups.
DEALERS ALL OVER THE U.S.
Making big profits handling our supplies. 24-hour service. Goods shipped same day order received.

American RADIO Mfg. Co.

WHOLESALE RADIO DISTRIBUTORS
Dept. "T" 107 E. 13th St. Kansas City, Mo.

112

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Stop the Leaks with this Good Coto Air Condenser

This high grade condenser often increases signal strength as much as an added stage of Audio Amplification. It takes full advantage of all the energy from the antenna. It avoids the insulation losses that cripple a radio set. The economy is obvious.

Coto Condensers have low losses because of single bearing construction and hard rubber insulation (the best for radio use). The plates are of copper, soldered together and SILVER PLATED. Strong, handsome and compact, with VERNIER adjustment free from backlash. Moderately priced.

Type 3505 $5
Type 3510 $6

The Complete Answer to your demand for a real good Variable Condenser. Complete with handsome dial and vernier knob.

Other Coto specialties are Cotogrip Tube Sockets, Moulded Variometers and Variocouplers both with GUARANTEED range of 200 to 600 meters covering the broadcasting wave lengths, Tapped Radio Frequency Transformers Type 5000-A, Audio Frequency Transformers (Type 4000, $5) and Honeycomb wound Coils.

If your Dealer cannot Supply you, write us at once giving his name and address and a list of the Coto Radio Parts that you need. You’ll get them.

COTO-COIL CO.
87 Willard Ave.,
 Providence,  Rhode Island

BRANCH OFFICES
Los Angeles, 329 Union League Bldg.
Minneapolis, Geo. F. Darling, 705 Plymouth
Bldg.
Atlanta, C. P. Atkinson, Atlanta Trust Co-
Bldg.

CANADIAN DISTRIBUTORS
Perkins Electric Co., Ltd.
Montreal, Toronto, Winnipeg

Type 4500
The 3 to 1 Ratio Transformer
for All Stages

You can now settle all arguments as to desirable Transformer Ratios in different stages. The question has been needlessly complicated. As usual the simple answer is most economical and best in performance. Use Coto Specials in all stages and you will be delighted with the ample volume and freedom from distortion. Hundreds of buyers praise them. For reflex circuits they are simply great. Once you have tried them, you will recommend Coto Specials to all your radio friends. Price $2.50.
Tuska 220 Tuner
The Favorite of Amateurs

No tuner has ever been placed on the market that has been so popular with novices or experienced amateurs as the TUSKA 220 TUNER. Made by a house that has enjoyed the confidence of the radio world it is an expert and conscientious production.

The Type 220 is a complete regenerative tuning system. It has two distinct circuits; one with a range of from 150 to 385 meters, the other from 375 to 800 meters. The tuning units are: a primary series condenser, a secondary tuning condenser, plate variometer for regeneration, coupling switch and wave change switch. Designed to cover its full wave lengths range with maximum efficiency. There are no dead end or capacity losses because of the wave change switch.

The apparatus is mounted in a fine mahogany cabinet 20x6x7 inches; the panel is Formica, machine engraved; high grade knobs and dials.

Due to a big merchandising deal Stern & Co., Inc., are able to offer TUSKA 220 TUNERS at a price that places them within the range of every pocketbook. SHIPPED, (WHILE THEY LAST) BY PARCEL POST OR EXPRESS, INSURED, PREPAID TO ANY POINT IN THE UNITED STATES, ON RECEIPT OF POST-OFFICE OR EXPRESS MONEY ORDER OR CERTIFIED CHECK FOR $21.50

WASHINGTON RADIO LABORATORIES
5320 Illinois Ave.,
Washington, D. C.

Guaranteed Head-Set

"RED-HEADS" are guaranteed radio phones. You run no risk when you buy them. Money back if, after 7 days' trial, you're not satisfied that they're the best receivers on the market at the price. Why not act right now and get a pair? It'll mean getting the maximum from broadcasting from the day you put them into use.

The NEWMAN-STERN COMPANY
Dept. 0 $ Newman-Stern Bldg. Cleveland

"WARRANTED"

Audio Transformer
MTD. $2.00 UNMTD. $1.45
10 Days Money Back Guarantee
Dealers Write
C. C. ENDLY
22 Sturges Ave.
MANSFIELD, O.
If the soldering tabs are not needed simply swing them out of the way as here shown.

**MICADON TYPE 601**

**NOW HAS SWINGING SOLDERING TABS**

As a fixed condenser—the standard of radio—the Dubilier Micadon could not be electrically improved.

And as we improved it mechanically by providing it with swinging soldering tabs.

These facilitate mounting. The hot soldering iron need not touch the Micadon directly. Hence the capacity is not affected by heat.

If Dubilier Micadons are to be mounted with screws simply swing the soldering tabs out of the way and use the eyelets.

Price 35 cents up, depending on style and capacity. At all good dealers.

Dubilier Condenser and Radio Corporation
48-50 West Fourth St., New York
An Absolute Guarantee
with every instrument
made them famous!

SHAMROCK
(For Selective Tuning)
180°

Vario-Coupler
list price, $3.50 each

DOUBBLE DUTY
PIG-TAIL
Variometer

SHAMROCK MFG. CO.
316 Market St. — Newark N.J.

IT'S THE UNIT PLUS
It's the unit plus the design and construction of the projector that makes the Kellogg Reproducer so clear and loud.

The Special Kellogg unit of 2500 ohms resistance brings head set clarity to the reproducer, and is projected with maximum volume without distortion. The special acoustical fibre and design account for the wonderful tonal quality.

The No. 550 is small in size and projects in almost a straight line. Each $12.00.

The No. 551 makes its appeal to those who are fond of soft, mellow music, that comes in as clear as a bell. Each $18.00.

The No. 552 projects in volume, without distortion, speech or music for the large room, or for dancing. Each $25.

If your dealer does not handle Kellogg radio equipment, communicate direct with us.

Kellogg Switchboard & Supply Co.
1066 W. Adams St., Chicago

FREE!

Book of tested hook-ups for getting new thrills out of your present outfit. Also, circuit diagrams and Bulletin featuring Power Amplification. Send 4¢ in stamps to cover postage.

All-American Audio Frequency Transformers come in three ratios. $4.50 to $4.75. The best — no need to pay more.

Why experiment? Over 500,000 radio enthusiasts have already proved "All-Americans" best. Largest selling transformers. Standard on the better sets. A type for every purpose. All the better dealers sell "All-American."

Rauland Manufacturing Co.,
200 N. Jefferson St., CHICAGO.
Pioneers in the Industry
To operate Radio Receiving or Transmission Apparatus successfully, requires the use of accurate electrical measuring instruments.

Radio Frequency Ammeter
2-in. Dials, 2-in. Scales

Direct-Current Ammeter,
For Radio Application.

Direct-Current Voltmeter,
For Radio Application.

Westinghouse Radio Instruments

are small, yet accurate, sturdy and reliable. They are exact miniature replica of the larger high-grade Westinghouse instruments.

Direct-current Ammeters and Voltmeters should be used to regulate the current passing through the filament circuit of the detector or amplifier tubes, used in receiving or transmission sets.

Radio Frequency Ammeters should be used in connection with the transmitter apparatus. The effectiveness and character of transmission depends upon the current flowing through the antenna circuit.

Folder 4471-B gives full particulars

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
Newark Works, Newark, N. J.

Atlanta, Ga., in new bldg., 426 Marietta St.
Boston, Mass., 10 High St.
Chicago, Ills., 111 W. Washington St.
Cincinnati, O., Third & Elm Sts.
Denver, Colo., 910 Fifteenth St.
Detroit, Mich., 1535 Sixth St.

Los Angeles, Calif., Seventh & Spring Sts.
New York, N. Y., 1105 Broadway
Philadelphia, Pa., 1325-29 Chestnut St.
Pittsburgh, Pa., 306 Wood St.
St. Louis, Mo., 717 South 12th St.
San Francisco, Calif., Montgomery St.


ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

117
FLERON RADIO SPECIALTIES

The Porcelain Sockets

The Vernier Adjuster
The best adjuster on the market. Spring holds head away from dial when not in use. With slight adjustment spring can be made to hold head against dial if desired. Patented. 65c.

The Phono Adapter
Fits through the hole of the receiver cap and then slides on the phonograph tone arm. Fits Victor, Columbia, and others. Works perfectly. Only 35c. each.

The Porcelain Insulators
Lowest power loss in the antenna. Dielectric absorption reduced to minimum because of very low phase difference of Fleron Porcelain. Very tough body. Solid Black Glaze. Seven sizes, 20c. to $1.00. Each insulator in a separate carton.

The Stand-Off Insulator
Fills the much-needed requirement for a good strong looking and practical stand off insulator. Meets every requirement of the Board of Fire Underwriters. $1.25 each.

For Sale by all Good Jobbers and Dealers

M. M. FLERON & SON, Inc., 111 N. Broad St., Trenton, N. J.

WE REPAIR THE FOLLOWING RADIO TUBES and Guarantee Them

<table>
<thead>
<tr>
<th>Tube</th>
<th>WD-11</th>
<th>WD-12</th>
<th>UV-200</th>
<th>UV-201</th>
<th>C-300</th>
<th>C-301</th>
<th>DV-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>$3.50</td>
<td>3.50</td>
<td>2.75</td>
<td>3.00</td>
<td>2.75</td>
<td>3.00</td>
<td>3.50</td>
</tr>
</tbody>
</table>

Genuine Western Electric VT-2 Tubes $7.45

Send 10c for copy of new 12 page RADIO CATALOG

REMLER Apparatus Radiates Quality
REMLER RADIO MFG. CO.

Genuine Western Electric VT-2 Tubes $7.45

Send 10c for copy of new 12 page RADIO CATALOG

CHICAGO SALVAGE STOCK STORE
509 S. State St., Dept. 9-6 Chicago, Ill.

118 ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS
All-Purpose VOLTMETER

Weston
Model 489
Double Range, Portable


Write today for complete information. If your dealer cannot supply you, we will fill your order direct.

WESTON ELECTRICAL INSTRUMENT CO., 158 Weston Ave., Newark, N. J.

Standard - The World Over

A LONG AND SKINNY INSULATOR 18 INCHES BETWEEN WIRE HOLES

Highly vitrified high tension white glazed porcelain, strength 1500 lbs.

In Lots of Six or More
ONE DOLLAR EACH

9DNH SURE FIRE RADIO LABORATORY Express C.O.D.
MACOMB, ILL.

2650 MILES

ON ONE TUBE. Broadcasting from Atlantic Coast, Mexico, Canada, Cuba and Hawaii, heard in California, by users of the CROSS COUNTRY CIRCUIT. Atlantic Coast users hear California. Range due to simplicity of set and operation by one tuning control. Easy and cheap to build by any novice. Dry cell tubes may be used. Complete understandable instructions, full size panel layout, assembly photo, etc. Postpaid, 25 cents; stamps accepted.

Box Q-117 VESCO RADIO SHOP Oakland, Calif.

RADIO MASTS

Fabricated steel masts, the self-supporting kind. The most beautiful masts to be found. The best job for supporting antenna properly. Each mast equipped with cable and mast-head pulley. No guys, no platforms, no necessity for climbing up. Patents pending. Write for prices and describe your antenna.

WHITTLESEY ENGINEERING CO.
Cleveland, Ohio

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
EXPERIMENTAL WIRELESS

The new British paper
Full of first class
Experimental articles
by the best writers

Strikes a new note among British wireless papers; it is of experimental interest from cover to cover. The contributors include the best transmitters and experimenters in Great Britain, and in other European Countries. Every U.S.A. experimenter should read it. Correspondence invited from members of the A.R.R.L., Inc.

Monthly, Single copies 30 cents
Per Year $3.50

Percival Marshall & Co.
66 Farringdon St., LONDON, Eng.

RUSONITE

Entire Surface Sensitivity
The Recognized Standard Crystal Rectifier
Used all Over The World
Hundreds of Thousands of Satisfied Users,
Rusonite Has Revolutionized Crystal Radio Reception.
"THE PERFECT SYNTHETIC CRYSTAL"
Guaranteed
Price mounted 50c
RUSONITE CATHWHISKER 14K. GOLD
Supersensitive; will not oxidize
12 Price 25c
Order from your dealer or direct from
Rusonite Products Corporation
13 Park Row, New York, N. Y.

RADIO UNITS INC
1311 First Ave.,
Maywood, Ill.
Radio Fans

Here is a Winner
Armstrong
Regenerative Set
Receiving
Radius
600 Miles
$23.25

Order Direct From
This Advertisement.

Here is a money saving Radio Outfit that will bring the news of the world—concerts, lectures and stock reports—into your home. Sold complete with head set, tube, batteries, aerial and ground wires, for only $23.25! Connections simple and plainly marked. Easy to tune. Order NOW! Shipping weight, 12 pounds. Shipped from CHICAGO or PHILADELPHIA store.

57Q9366 ........................................ $23.25

Save on All Radio Supplies.

Save money on your radio supplies, and get guaranteed quality! Our big FREE Book shows hundreds of bargains in complete sets and parts. Many new hookups, complete list of broadcasting stations. Contains "How to Build an Aerial." Mail coupon!

Sears, Roebuck and Co.
Chicago - Philadelphia

Mail coupon today to
store nearest you for Free Radio Catalog.

Send me FREE Radio Catalog No. 62Q92.

Name ............................................

P. O. ..............................................

State .............................................

Rural Route ....................................

Street and No. .................................

Sears, Roebuck and Co.
The World's Biggest Mail Order House

Ad 9992—5½x5¼ Inches.

An Amateur Radio Reference Library!

That's what you get in Bound Volume VI of QST, combining in compact form the issues of August 1922 to July 1923 inclusive.

Two equal volumes for convenience, handsome red binding with gold imprint, uniform with previous editions. Postpaid for only $5.00.

A FEW SETS DON'T GET LEFT

QST, 1045 Main St., Hartford, Ct.
SIX CENTS PER WORD PER INSERTION IN ADVANCE. NAME AND ADDRESS MUST BE COUNTED. EACH DIAN 3GG ON 10 WATTS REPORTS WORKED 8ML, 4837 ROCKWOOD ROAD, CLEVELAND, OHIO. INCLUDING SOLUTION, DRILLED AND CUT IN CITY CELL OF INITIAL COUNTS AS ONE WORD. COPY MUST BE RECEIVED BY THE 1ST OF MONTH FOR SUCCEEDING MONTH'S ISSUE. NOTE NEW CLOSING DATE.

LEAP YEAR! SNAP UP THIS PROPOSAL. HOOK UP TO AN EDISON B FOR LIFE. 100 VOLT BATTERY; ASSEMBLED FUMED OAK COVERED CABINET, TEST TUBES IN PLACE, 4" LEAKAGE PATH, LARGE WATER DRAIN BASKETS WIRED, PERFORATED HARD RUBBER SEPARATORS, RUBBER BANDS, SOLUTION, (NOT LYE), WHITE SEALING OIL, CLEANED AND TESTED AVAILABLE 30.00. WITH A COLLOID CHARGER $2.00. TUNGAR HVOLTAGE CHARGERS AND PARTS, INSTRUCTION SHEET 50¢, REVEALED GLASS TEST TUBES 7¢, 3¢, 1¢, FLAT BOTTOM 9¢, 75¢, PUREST DRAWN SOLID (NOT PLATED) NO. 20 NICKEL WIRE FOR CONNECTORS 1½¢ FT. PLAIN, 1½¢ PER HARD RUBBER SEPARATORS, PERFORATED. 1¢ PREPAID. GENUINE EDISON SOLUTION $1.50 SLB. CAN. DRY SOLUTION. $0.50 PER 500 GMS. 4¢ PER 10000 CTN. 5¢ PER 50000 CTN. EATON BATTERY, 500 WATT 500 VOLT MOTOR GENERATOR SETS 10 $48. Radio Frequency Transformers, all makes. State your wants. Don Not Trade. 2 New 450 WATT 500 VOLTS" TUBE TRANSFORMERS $40.00. NVY KNOB FOR THE OLD KEY $3.50 SAVES A BURN IF THE KEY GOES HOT. STILL HAVE TWO EMERSON 5 WATT 500 VOLT MOTOR GENERATOR SETS TO SELL AT $75.00. THE PEPPIEST MACHINE ON THE MARKET, AND NOT TO BE HAD WHEN THEY ARE GONE. BETTER TALK FAST. TRY US ON YOUR NEXT ORDER. SUGGESTED SERVICE IN THE PURCHASE OF THE ONLY HAM STORE IN THE FIFTH DISTRICT FT. WORTH RADIO SUPPLY CO., 104 EAST 10TH ST., FT. WORTH, TEXAS.


HONEYCOMB REGENERATIVE set. Det. 2 stage in one cabinet and 18 honeycomb coils to cover all wavelengths $85.00. Geo. Fox, 328 L Street, Salt Lake City, Utah.

FOR SALE: Complete phone and C.W. Set, all Radio Corp. apparatus. Never used, $150.00. Also complete receiving set with 2 Marconi A-P Amp. and Detectors, Meyers. Robbins-Meyers $35. 2B20, Paul Rizzo, 571 39th St., Brooklyn, N. Y.

FOR SALE: Motor Generator, 500 volts, 150 WATT, $48. Radio Frequency Transformers, all makes. State your wants. Don Not Trade. 2 New 450 WATT 500 VOLTS" TUBE TRANSFORMERS $40.00. NVY KNOB FOR THE OLD KEY $3.50 SAVES A BURN IF THE KEY GOES HOT. STILL HAVE TWO EMERSON 5 WATT 500 VOLT MOTOR GENERATOR SETS TO SELL AT $75.00. THE PEPPIEST MACHINE ON THE MARKET, AND NOT TO BE HAD WHEN THEY ARE GONE. BETTER TALK FAST. TRY US ON YOUR NEXT ORDER. SUGGESTED SERVICE IN THE PURCHASE OF THE ONLY HAM STORE IN THE FIFTH DISTRICT FT. WORTH RADIO SUPPLY CO., 104 EAST 10TH ST., FT. WORTH, TEXAS.


HONEYCOMB REGENERATIVE set. Det. 2 stage in one cabinet and 18 honeycomb coils to cover all wavelengths $85.00. Geo. Fox, 328 L Street, Salt Lake City, Utah.

FOR SALE: Complete phone and C.W. Set, all Radio Corp. apparatus. Never used, $150.00. Also complete receiving set with 2 Marconi A-P Amp. and Detectors, Meyers. Robbins-Meyers $35. 2B20, Paul Rizzo, 571 39th St., Brooklyn, N. Y.

FOR SALE: Motor Generator, 500 volts, 150 WATT, $48. Radio Frequency Transformers, all makes. State your wants. Don Not Trade. 2 New 450 WATT 500 VOLTS" TUBE TRANSFORMERS $40.00. NVY KNOB FOR THE OLD KEY $3.50 SAVES A BURN IF THE KEY GOES HOT. STILL HAVE TWO EMERSON 5 WATT 500 VOLT MOTOR GENERATOR SETS TO SELL AT $75.00. THE PEPPIEST MACHINE ON THE MARKET, AND NOT TO BE HAD WHEN THEY ARE GONE. BETTER TALK FAST. TRY US ON YOUR NEXT ORDER. SUGGESTED SERVICE IN THE PURCHASE OF THE ONLY HAM STORE IN THE FIFTH DISTRICT FT. WORTH RADIO SUPPLY CO., 104 EAST 10TH ST., FT. WORTH, TEXAS.


HONEYCOMB REGENERATIVE set. Det. 2 stage in one cabinet and 18 honeycomb coils to cover all wavelengths $85.00. Geo. Fox, 328 L Street, Salt Lake City, Utah.

FOR SALE: Complete phone and C.W. Set, all Radio Corp. apparatus. Never used, $150.00. Also complete receiving set with 2 Marconi A-P Amp. and Detectors, Meyers. Robbins-Meyers $35. 2B20, Paul Rizzo, 571 39th St., Brooklyn, N. Y.

FOR SALE: Motor Generator, 500 volts, 150 WATT, $48. Radio Frequency Transformers, all makes. State your wants. Don Not Trade. 2 New 450 WATT 500 VOLTS" TUBE TRANSFORMERS $40.00. NVY KNOB FOR THE OLD KEY $3.50 SAVES A BURN IF THE KEY GOES HOT. STILL HAVE TWO EMERSON 5 WATT 500 VOLT MOTOR GENERATOR SETS TO SELL AT $75.00. THE PEPPIEST MACHINE ON THE MARKET, AND NOT TO BE HAD WHEN THEY ARE GONE. BETTER TALK FAST. TRY US ON YOUR NEXT ORDER. SUGGESTED SERVICE IN THE PURCHASE OF THE ONLY HAM STORE IN THE FIFTH DISTRICT FT. WORTH RADIO SUPPLY CO., 104 EAST 10TH ST., FT. WORTH, TEXAS.


HONEYCOMB REGENERATIVE set. Det. 2 stage in one cabinet and 18 honeycomb coils to cover all wavelengths $85.00. Geo. Fox, 328 L Street, Salt Lake City, Utah.

FOR SALE: Complete phone and C.W. Set, all Radio Corp. apparatus. Never used, $150.00. Also complete receiving set with 2 Marconi A-P Amp. and Detectors, Meyers. Robbins-Meyers $35. 2B20, Paul Rizzo, 571 39th St., Brooklyn, N. Y.

FOR SALE: Motor Generator, 500 volts, 150 WATT, $48. Radio Frequency Transformers, all makes. State your wants. Don Not Trade. 2 New 450 WATT 500 VOLTS" TUBE TRANSFORMERS $40.00. NVY KNOB FOR THE OLD KEY $3.50 SAVES A BURN IF THE KEY GOES HOT. STILL HAVE TWO EMERSON 5 WATT 500 VOLT MOTOR GENERATOR SETS TO SELL AT $75.00. THE PEPPIEST MACHINE ON THE MARKET, AND NOT TO BE HAD WHEN THEY ARE GONE. BETTER TALK FAST. TRY US ON YOUR NEXT ORDER. SUGGESTED SERVICE IN THE PURCHASE OF THE ONLY HAM STORE IN THE FIFTH DISTRICT FT. WORTH RADIO SUPPLY CO., 104 EAST 10TH ST., FT. WORTH, TEXAS.


HONEYCOMB REGENERATIVE set. Det. 2 stage in one cabinet and 18 honeycomb coils to cover all wavelengths $85.00. Geo. Fox, 328 L Street, Salt Lake City, Utah.

FOR SALE: Complete phone and C.W. Set, all Radio Corp. apparatus. Never used, $150.00. Also complete receiving set with 2 Marconi A-P Amp. and Detectors, Meyers. Robbins-Meyers $35. 2B20, Paul Rizzo, 571 39th St., Brooklyn, N. Y.

FOR SALE: Motor Generator, 500 volts, 150 WATT, $48. Radio Frequency Transformers, all makes. State your wants. Don Not Trade. 2 New 450 WATT 500 VOLTS" TUBE TRANSFORMERS $40.00. NVY KNOB FOR THE OLD KEY $3.50 SAVES A BURN IF THE KEY GOES HOT. STILL HAVE TWO EMERSON 5 WATT 500 VOLT MOTOR GENERATOR SETS TO SELL AT $75.00. THE PEPPIEST MACHINE ON THE MARKET, AND NOT TO BE HAD WHEN THEY ARE GONE. BETTER TALK FAST. TRY US ON YOUR NEXT ORDER. SUGGESTED SERVICE IN THE PURCHASE OF THE ONLY HAM STORE IN THE FIFTH DISTRICT FT. WORTH RADIO SUPPLY CO., 104 EAST 10TH ST., FT. WORTH, TEXAS.
type, thirty dollars. Advance Synchronous rectifier, thirty dollars. 2CLA.

OLD TIMERS: Please sell me the first eight issues of QST at your price. Kepler, 2039 W. 52nd St., Cleveland.

HAVE TROUBLE making D.C.? Have formula, diagrams and instructions, sure fire method for perfect chemical rectifier. All sent for $2.00. Robert C. Klimesh, 9BDJ, Spatlville, Iowa.


TYPE 106C TUNER—Modified so that tube or crystal detector can be used. Perfect condition. Made as good as new. Satisfaction guaranteed or money refunded. Radio Receiver, $35.00. Advance Synchronous rectifier, $5.00. RCA Chopper Wheel and Motor. Entire set giving more efficient—$5.00. Have two.

FOR SALE OR TRADE: Fine Oliver typewriter $20. CW set parts wanted. Write 2CQE.

A PROVEN SUCCESS. Edison element storage "B" batteries are dependable. Batteries are enclosed in cabinets with lid and handles. 22 volt $3.25; 48 volt $6.50; 72 volt $9.50; 100 volt $12.25. "B" battery with battery switch from 6 volt A battery charger at the following prices: 24 volt $5.25; 48 volt $9.75; 72 volt $14.50; 100 volt $18.75. Prices include electrolyte and are shipped prepaid. Type A elements wired 6E per pair. %” containers 31⁄2”. Separators %”. Complete chemical rectifier $2.00. For $1.50 a "B" battery. J. Zied, 530 Callowhill St., Phila., Pa.

FOR SALE: 3 Coto coil Radio Transformers, Cost $5.50, sell $3.50; 2 Eola Radio Transformers, cost $4.00, sell $3.00. Like new. Prepaid on 3 or all. Geo. Schulz, Calumet, Mich.

FOR SALE: Reintz fifteen dollars. A. W. Gavett, Leeds Center, Maine.

TRADE CORONA Typewriter for standard make tuner, (not single circuit). Maxwell, Box 1057, Norfolk, Va.

OMNIGRAPH WITH KEY, buzzer, coil, phone, 15 code-word dials, $20; Filament trans. mounted, $5; Amplifiers, unmounted, $5; pair will carry 4 tubes with their Kenotrons. Switchboard, slate, 40x40, A1 condition. $5. T. DeVore, Oneida St., Baldwinsville, N. Y.

DID YOU SEE June QST's endorsement of Cardwell Transformers? Essential for efficient 100 meter work. Now obtainable from us at: 23 Plate, $5.00; 17 Plate, $4.75; 11 Plate, $4.25; ALSO Brandes Superior Headsets at $4.95! Other standard instruments at substantial discounts. Write for quotations. Herbert Isaacson, 515 80th St., Brooklyn, N. Y.

FOR SALE: 3 Cutocoil Radio Transformers, cost $6.00, sell $3.50; Meyers Choke Coils, cost $3.50, sell $.25. Postage 10c each. Prepaid on 3 or more. Geo. Schulz, Calumet, Mich.

Didja read my ads in past QSTs? Kepler.


THE ONLY GENUINE PEANUT Tube R215A designed by Western Electric Co. for Army aeroplanes. Manufactured by Northern Electric Co. in Canada, which company is closely associated with the Western Electric. Filament 3⁄4 amp at 1.1 volts. Plate voltage as detector, 22 volts; as amplifier, 46 volts. Steady and a splendid amplifier. Smallest, sturdiest, and most economical of vacuum tubes. $5.10 postpaid, insured. Sockets $1.00 each. J. G. Shaw, 14 Madison Ave., Hamilton, Ont., Canada.

FOR SALE: Bargains. Reinartz recr in mahogany cabinet. 1900 mi. on 200 meters. $25.00 with new transformer tube, $30.00, B batt $35.00. Regenerative tuner, both coils, complete except A batt, $32.00. Crystal sets, hrd. 6 stations over 300 miles, complete $55.00. 4WD11, new $4.35. Robert Altman, 490 Anthony, Glen Ellyn, Illinois.

COMBINATION A & B BATTERY CHARGER COMPLETE WITH TUBE $16.00. CHARGES 6 AND 12 VOLT A BATTERY, AND UP TO 100 VOLT B BATTERY. A REAL CHARGER, GANG. 8ML, CLEVELAND, OHIO.


VARIABLE CONDENSERS at real prices 23 plate Vernier $2.80; 43 plate Vernier $5.75 including dial. Can you beat it? Send order to R. C. Condenser Co., Suite 535 Monadnock Bldg., Chicago, Ill.

HAMS WHO DESIRE SPEED—a moment's attention. Brother Ham whose limit was 15 words doubled his speed in One Evening. Send your Call and ask for the facts as told by himself. Dodge Radio Shortcut, Dept. SC, Mamaroneck, N. Y.
SELL: Regenerative tuner $35.00; 2 pair fones, and miscellaneous parts. What do you want? Clifford Fohr, DeKalb, Illinois.

FREE—A $4.00 23 plate variable condenser given free with each vacuum tube purchased. All standard apparatus 15% off list. Write us your needs. Address—Radio, 3023 Boulevards, Indianapolis, Ind.

LOOK-A HERE! RCA Radiola Two portable receiver, with large DX dial to 500 cycle range. $2 each; two Crocodile radio frequency transformers, $2 each; motor-generator, 500 cycle generator, 90 volts, $20; 125 volts, $40; motor; one-amp. Plug-in-ammeter, $40; Amrad commercial quenched gap, 13 sections, $6; 1/4 KW 500 cycle transformer, 12,000 volt secondary with midtap, $15; UV174 radio frequency transformer, $3.50; 0-25 amperes, $3; 0-50 amperes, $4; 0-100 amperes, $4.50; 0-200 amperes, $8.50. Send for samples. 580-1500 volts, $8.50.

FOR SALE OR TRADE: 1 KW Spark Transmitter, with large DX dial to 500 cycle range. $2 each; two Crocodile radio frequency transformers, $2 each; motor-generator, 500 cycle generator, 90 volts, $20; 125 volts, $40; motor; one-amp. Plug-in-ammeter, $40; Amrad commercial quenched gap, 13 sections, $6; 1/4 KW 500 cycle transformer, 12,000 volt secondary with midtap, $15; UV174 radio frequency transformer, $3.50; 0-25 amperes, $3; 0-50 amperes, $4; 0-100 amperes, $4.50; 0-200 amperes, $8.50. Send for samples. 580-1500 volts, $8.50.

GET THAT RADIO SET NOW. Also anything that you need to complete that receiver. Radiodelectric, 729 Linderman Ct., Kenosha, Wisc.

SELL: Acme 200 Watt transformer, guaranteed good as new. $14. 9TW.


ALL BARGAINS: Navy 5 watt fone sets. Original cases. Complete with dynamotor, transmitter for CW, ICW, microphone, key, 2 tubes, antenna wire, spares $75. Very compact and operates from 12 volts. 1/4 KW 500 cycle quenched gap transmitters for local work and high voltage for the tubes. $75. General Electric 250 volt, 143 ampere dynamotors, with fone set for 12 volt supply $18. 1/4 to 1/2 to 2 KW 500 cycle self excited generators $25.00, with motors $55.00. Special new flameproof keys with "breaker," $1.50. General Electric 5 watt Pilotrons sealed $6.00. In lots $5.00 each. Radiation meters, Bakelite constructed inductances $7.50, Antenna Wire, Western Electric, 3000 volt Dubiliers .62 and .062 $3.25. 53 ft. section mast weighs 20 lbs. $22.50. 0-5 amp. General Radio panel hotwire ammeters, $1.50, guaranteed new. George Eaton, 1915 South Twelfth, Philadelphia.


RADIO BARGAINS: Any $6.50 tube $7.75; Burgess 2156 batteries $2.50; Erla Reflex transformers and parts; 23 plate condensers $4.50; Brandes Refex transformers and parts; Complete line of accessories at bargain prices; everything guaranteed perfect. Edward Bromley, Jr., White water, Wis.

PROTECT YOUR APPARATUS with small fuse wire in dangerous places. Eighth, quarter, half, three-quarter, one-ampere and larger sizes, three feet for two bits, 92CF.

MASTER RADIO CODE in 15 minutes. Ten word spelling practice hours. Our students make these world records. Previous Failures will try all known methods give thanks to us for License. To hesitate kills speed. To master Code our way kills hesitation; gives speed. Constructed in a way that instructs only $2.00. Information free. Dodge Radio Shortcut, Dept. SC, Mame­roneck, N. Y.

10" PORCELAIN INSULATORS (QST No. 6) only $2.50.

EXPERIMENTAL KIT—A 150 volt, 75 watt, 1/2 KW, 23 plate variable condenser, 0-1.5 meters, $5.50; General Radio thermocouple ammeter 0-1.5, $8.50; General Radio variable air condenser, 20-1000 mfd., $2.75; Weston thermocouple ammeter, 0-1000 meters, $2.75; E. Leavenworth, North High School, Milwaukee, Wis.

SELL: New UV204s $80; 12,000 V .002 mfd. condensers $8.50; 1 KW NE-1500, $100; National IP-500 $150; WE 50 watts $30. Edward Page, Baldwinsville, N. Y. 8AQO-8XAV.


FOR SALE: 1 KW Spark Transmitter, with large DX dial to 500 cycle range. $2 each; two Crocodile radio frequency transformers, $2 each; motor-generator, 500 cycle generator, 90 volts, $20; 125 volts, $40; motor; one-amp. Plug-in-ammeter, $40; Amrad commercial quenched gap, 13 sections, $6; 1/4 KW 500 cycle transformer, 12,000 volt secondary with midtap, $15; UV174 radio frequency transformer, $3.50; 0-25 amperes, $3; 0-50 amperes, $4; 0-100 amperes, $4.50; 0-200 amperes, $8.50. Send for samples. 580-1500 volts, $8.50.
FIFTY ASSORTED FLAT HEAD solid brass machine screw heads, 12 sizes from 1/4" to 3/4", with 1/4" to 1/2" head size, $1.00 per set.

*NEW RADIOGRAM BLANKS*—Used with one hand operate our automatic call system. 2500 cards, $3.00; 5000 cards, $5.50; 10,000 cards, $10.00.

CARD COUNTERS—HINDS & EDGAR, 9 North 4th Ave., Ill. A wonderful battery at an equally wonderful price. The Nimrod Battery Shop, 57 Washington Ave., Chelsea, Mass.


TWO BARE BONE WIRE WEDGES, $1.50 each. SEE PAGE 53 FOR MORE.

NEW RADIOGRAM BLANKS—Used with one hand operate our automatic call system. 2500 cards, $3.00; 5000 cards, $5.50; 10,000 cards, $10.00.

WANTED: All A.R.R.L. members to know that we have a complete stock of radios and will handle mail orders with special attention.

HAMS: Get our samples and prices on printed Call Cards, Letterheads and Envelopes. Hinds & Edgar, 9 North 4th Ave., Ill. Dealers write. C. C. Endly, 22 Sturges Ave., Mansfield, Ohio.

EDISON STORAGE: "B" Battery Elements, Large size, full capacity. 3¢ per pair, in lots of 100. Kindly send postcard for 5½ lb. per 100 pair. Gilman's Battery Shop, 57 Washington Ave., Cleveland, Ohio.

"WARRANTED" C.W. TRANSFORMERS new and ten day's money back guarantee, 500 watt plate transformers taps 500, 1000, 1500, 3000 volts unmounted $13.00. 200 watt, high voltage 250, 500, 700 volts, filament transformer 3, 4, 6, 8, 10, 12 volts-unmounted, $10.00. 50 watt high voltage 375 filament voltages 8, 10, unmounted $7.00. Transformer 150 volt, 1400, 1600, 2000 volts unmounted, $7.00. High voltage, no. 10, 12, 15, 20 volts, 500, 700, 1000 volts. Henry, unmounted, $3.00. Order direct from this ad. Dealers write. C. C. Endly, 22 Sturges Ave., Mansfield, Ohio.

$110.00 SIX volt 150 ampere chrome nickel Edison storage "A" batteries at $22.50 each. Also 6 volt 225 ampere at $29.50, 300 ampere at $36.50, 500 ampere at $40.50. Every battery guaranteed perfect. A wonderful battery at an equally wonderful price. Edison (general) chrome nickel storage battery plate (large size type A) at 4¢ per pair, 4½¢ in lots under 100 pairs. Complete sets for making rechargeable battery. Complete sets for making rechargeable battery include genuine chrome nickel plates, heavy glass vials, special wire, perforated rubber separators, chemical electrolyte and complete simple instructions for assembling and charging. 100 volt unit of parts $9.35, 150 volt $13.90. Address B. Q. Smith, Largest and pioneer dealer of above parts, 31 Washington Ave., Danbury, Conn.

NEW RADIOGRAM BLANKS—Used with one hand only. Efficiently arranged. Blue Paper. 30¢ per hundred. Van Wert Printing Company, Van Wert, Ohio.

FISCHER RADIO TABLE. Solid mahogany, compacts, for batteries, spare equipment and radio magazines. Site works with sliding doors $15.00. C. D. A. G. Fischer, 55 John St., N. Y. C.

FOR SALE: Three Grebe CR-8 and RORK amplifiers $85.00 each at set at Radio 9ZY.

TELEGRAPHY—Morse and Wireless—taught at ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
YOUR CALL
IN SOLID GOLD
on the neatest little 50 watt tube pin you ever saw!

1AW-1ZE-2CFB-
3VO-4GL-8AA-
9ZG-CaM-4DY-

Most of the DX operators are wearing theirs

WHY NOT YOU?
Just slip a M.O. or check for $2.00 in an envelope with your call on and drop it in the mail box. You will receive your pin promptly.

R. C. BALLARD, 9FZ
1202 W. Oregon St., Urbana, Ill.

QUALITY APPARATUS
Selected by Cockaday for use in his new
IMPROVED FOUR CIRCUIT TUNER
As described in detail in the January issue of Popular Radio

Variable and Vernier Condensers
Precision—made for exceptionally accurate tuning

Rheostats and Potentiometers
With Knob or Dial—Suitable for either table or panel mounting
Write for complete literature.

AMSCO PRODUCTS, INC.
Broome and Lafayette Sts., Chicago, Ill.

RADIO PANELS
Cut exactly to size and a guaranteed 12 hour shipment. 1/4" thick, .015" per square inch. 24" thick, .012" per square inch. 24" thick, .015" per square inch. Made of the highest grade black fibre. This material possesses electrical strength of 200 volts per mil, is inexpensive, unbreakable, easy to work and takes a fine finish. We pay postage.

RADIO INSTRUMENT & PANEL CO., 564 W. Monroe St., Chicago, Ill.
FOR YOUR CONVIENCE—

QST'S INDEX OF ADVERTISERS
IN THIS ISSUE

Acme Apparatus Co., The ......... 109
Adams-Morgan Co., The ........... 103
Allen Mfg. Co., The ............... 96-98
American Hard Rubber Co. ....... 105
American Radio Mfg. Co. ........ 112
American Transformer Co., The ... 82
Amsco Products, Inc. ............. 126
A.R.K.L. Apparatus Co., The .... 80
Ayres Battery Corp. .............. 90
Bakelite Corporation .............. 111
Ballard, K. C. ..................... 126
Becherger & Co., T. F. .......... 34
Boonton Rubber Mfg. Co. ........ 91
Bosco & Co., Chas. A. ....... 107
Bristol Co., The ................. 106
Bunell & Co., J. H. .......... 78
Burton-Rogers Co. ............... 108
Byrkit Co. .......................... 98
*Cabinet Condenser & Radio Corp. 115
Durham & Co. ..................... 96
Eisenman Magnetico Corp. ....... 99
Ekta Trading Corp. ............... 94
Electro, Inc. ...................... 96
Electric Specialties Co. .......... 39
Electric Storage Battery Co., The 97
Emily, C. D. ........................ 129
"Experimental Wireless" ......... 129
Feinstein Products Co., Inc. ..... 82
Federal Tel. & Tel. Co. .......... 82
Ferber Electric Co. ............... 100
Fischer Co., G. H. ............... 119
Filer & Son, Inc., M. M. .... 88-118
France Mfg. Co., The ............ 92
Fresman Co., Inc., Charles .... 106
Frost, H. B. ...................... 24
General Radio Co. ............... 51
Gieren Schmidt Corp., Th. .... 108
Grebe & Co., A. H. ............. 4
HAM AIDS ........................ 122-126
H & H Radio Co. ................. 118
Harford Instrument Co., The .... 30
Heath Radio & Elec. Mfg. Co. .... 96
Hemmed Co., Ludwig .......... 24
Hygrade Electric Novelty Co. .... 126
Illinois Radio Co. ............... 102
Inter-State Signal Co. ........... 102
Jefferson Elec. Mfg. Co. ........ 79
Jewell Electric Instrument Co. ... 38
Kellogg Switchboard & Supply Co. 116
Kimley Electric Co. ............. 104
Lombardi Radio Mfg. Co. ....... 100
Magnavox Co., Inc. ............. 98
Marie Engineering Co. ........... 119
Mass. Radio & Telegraph School ... 104
Moon Radio Corp. ............... 92
Multiple Electric Products Co., Inc. 104
Murdock, William J. .......... 102
Murphy, F. M. J. ............... 120
Myers Co., Ltd., F. B. .......... 119
National Carbon Co., Inc. .... 74-78
National Elec. Supply Co. ...... 104
Newman-Stern Co., The ....... 114
O & T Electric Corp. ............ 112
Ott Radio, Inc. .................. 57
Precision Equipment Co., The .... 76
Premier Elec. Co. .............. 104
QST Round Vol. VI. ............ 121
Radin Corp. of America ........ 1
Radio Instrument & Panel Co. ... 125
Radio Printers .................. 112
Radio Tube Exchange ............ 121
Radio Vitas, Inc. ............... 120
RAULAND MFG. CO. ........ 118
Remier Radio Mfg. Co. .......... 118
Riggs Mfg. Co., The ........... 108
Roller-Smith Co. ............ 100
Rose Radio & Elec. Supplies ... 30
Rusonite Products Corp. ...... 129
Samson Elec. Co. ............... 119
Scientific Elec. Works ........... 84
Sears, Roebuck & Co. ........... 121
Second District Convention .... 78
Shamrock Mfg. Co. ............. 116
Sterling Mfg. Co., The ....... 94
Stromberg-Carlson Telephone Mfg. Co. 88
Sure Fire Radio Laboratory .... 119
Thorodarson Elec. Mfg. Co. ..... 39
U. S. Tool Co. .................. 108
Valley Elec. Co. ................. 86
Vesco Radio Shop .............. 119
Washington Radio Lab. ....... 114
Western Coil & Electrical Co. ... 96
Westinghouse Elec. & Mfg. Co. ... 117
Westinghouse Union Battery Co. ... 119
Weston Electrical Instrument Co. ... 119
White Mfg. Co., The ........... 118
Whittlesey Eng. Corp. ....... 119

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
What Is Meant by a "Carbon Pile" Rheostat?

More than 20 years ago, the Allen-Bradley Co. developed a successful compression rheostat for big power circuits. It was made of flat carbon discs and the electric current flowing through the column was regulated by applying or removing pressure on the discs. The idea of the carbon pile was not new, even then, but successful commercial rheostats were unknown.

Graphite discs, however, soon replaced the carbon discs and to this day all Allen-Bradley rheostats are graphite disc rheostats, although many prominent engineers still speak of them as carbon piles.

The Bradleystat Won First Place in the Radio Broadcast long distance contest. The first prize winner used a Bradleystat and the greatest mileage record was made with a Bradleystat.

More Bradleystats were used in this contest than the next four types combined. Bradleystat supremacy has become an actual fact through sheer force of superior performance.

The Universal Bradleystat is sometimes called a carbon-pile rheostat. It is, however, a graphite disc rheostat. The discs are produced in an electric furnace under the most terrific temperatures known on earth. Carbon discs, carbon powder, metallic powder or other materials have long since been abandoned in favor of the reliable and noiseless graphite discs.

Your radio set needs a Universal Bradleystat for long-distance range, loud reception and noiseless control. By all means, avoid substitutes. Insist on the Universal Bradleystat.

Just Mail This Coupon!

Allen-Bradley Co.,
277 Greenfield Ave., Milwaukee, Wis.

Please send me your latest bulletin on the Universal Bradleystat and why it improves radio reception.

Name ____________________________

Address ____________________________

Retail Price $1.85

In Canada $2.50

Postage 10¢ Extra
"Effective Resistance" has been reduced almost to the vanishing point in the Connecticut Variable Condenser. That means to you a stronger signal—therefore an increased range. You can therefore get signals from stations you've been missing. The scale is graduated over 360 degrees (twice that of the rotary), which means clearer readings throughout, with the special advantage of securing readings at both the low and high extremes of the scale.

These two cardinal advantages enable the average operator to secure results hitherto possible only for the expert.

A simple booklet explains and illustrates this Variable Condenser thoroughly—send a postal for your copy.

Mention your Dealer's Name
"Either Buy, Beg, Borrow Or Steal It---"

This is what the Senior Operator on the S.S. Manitou, WFW and 9LM Chicago, had to say about the Amrad Wavemeter in a communication to the editor of QST on page 47 of the September issue.

And hundreds of other operators feel the same way.

The Amrad Wavemeter is direct reading—a feature insuring simplicity of operation. There are no scales, curves or charts to consult; no calculations to make. Simply turn the knob and read the actual wavelength in meters directly from the scale.

The Amrad Wavemeter is exceptionally accurate—guaranteed within 2% on any reading. Heretofore, the comparatively high cost of an accurate wavemeter has limited its use to a fortunate few. In consequence many amateur stations have been operating on illegal wavelength, i.e. in excess of the 200 meter maximum set by the law. With the enforcement of the Federal law, wavelength must no longer be a matter of guesswork. The necessity of a reliable, accurate wavemeter as an essential part of every transmitting equipment is now acknowledged by leading amateurs, wireless clubs and radio inspectors everywhere.

The price of the Amrad Wavemeter is $8.50

Most live dealers carry the Amrad Wavemeter in stock. Complete operating directions accompany each instrument.
The Traffic Department

F. H. Schnell, Traffic Manager
1045 Main St., Hartford, Conn.

Now that the Transatlantic Tests are almost over, we might be able to get back to our regular duties and tend to the affairs of the Traffic Department.

The new Official Relay Station Certificates have been distributed and the division managers are issuing them as fast as they can. So far, also an order of D.S. there are a few requirements which may be of interest. The primary one is that you be a member of the A.R.R.L. It costs only two dollars per year and in addition you receive twelve numbers of QST, the League's Official Organ. The wave-length of your transmitter shall comply with the law; you shall observe quiet hours; your station shall be operated in accordance with the law of your country and you shall lend your best efforts toward promoting interest in amateur radio. For violation of some of the requirements, certificates will be cancelled. Further details accompany the application which you can get from your D.M., A.D.M. or D.S.

Reports for the past month show that the many stations are as active as ever at this time of the year. There is nothing new or startling in any division—just the usual showing of good work holds forth, therefore, the division reports follow.

Cancellations and Corrections in and Additions to Traffic Department Directory

Printed in October, 1923, and January, 1924, Issues of QST

Cancellations

WISCONSIN—A.D.M.—C. N. Crapo, 1175 2nd St., Milwaukee.

ILLINOIS—Dist. No. 1: O.R.S.—9BIL.
Dist. No. 5: O.R.S.—9AJX. Dist. No. 6: O.R.S.—8ABE.

SO. INDIANA—Dist. No. 3: C.M. RICHMOND—M. S. Moore, 213 W. 20th St., Indianapolis.

KANSAS—A.D.M.—L. J. Simmons, 218 S. Sedgwick St., Wichita.


WEST VIRGINIA—Dist. No. 5: O.R.S.—9ABQ.

LOUISIANA—Dist. No. 2: O.R.S.—SABA. 5ZAC.

GEORGIA—A.D.M.—G. L. Rhoades, St. Albans.


No. 3: Counties—Delete Southwestern half of DeSoto, and Northern half of Lee counties. Dist. No. 4: Counties—Delete Southern half of Lee County.

Corrections

NEW JERSEY—Dist. No. 8: C.M. CAMDEN—W. L. Wamnia, address changed to 450 Benson St.


O. W. Libbe, address changed to 154 S. Adams St. Dist. No. 5: O.R.S.—9DYU, 9ALP, 9DIS, 9BRK.


COLORADO—A.D.M.—F. H. Schnell, 604 Interstate Trust Bldg.


Additions


OHIO—Dist. No. 2: O.R.S.—8WG, 8AJX, 8DQ.

NO. 1A: O.R.S.—9AUX, 9UB. Dist. No. 4: D.S.—Hood Brothers, 1844-84th St., Indianapolis.

MINNESOTA—Dist. No. 2: O.R.S.—9ANJ, 9CPO.

Dist. No. 3: O.R.S.—9BIIS.

ARKANSAS—Dist. No. 2: O.R.S.—5ADW. LOUISIANA Dist. No. 2: 5AIA, 5ABA.

MISSISSIPPI—Dist. No. 2: O.R.S.—5AGV.


RHODE ISLAND—Dist. No. 4: O.R.S.—1IO.

MASSACHUSETTS—Dist. No. 1: O.R.S.—1IOQ.

1KA. Dist. No. 2: 5C. ATLEBOROUGH—E. G. Holbrook, 58 Pearl St. O.R.S.—1AJA, 1IV, 1OC. 1EG.


Dist. No. 5: D.S.—J. Fitzgerald, 145 Rockwell St., Norwich. (New London County.)

MAINE—Dist. No. 2: O.R.S.—1BNL, 1APF.

NEW HAMPSHIRE—Dist. No. 1: O.R.S.—1BY.

Dist. No. 2: O.R.S.—1AZT. Dist. No. 6: O.R.S.—1BTF.


NORTH CAROLINA—Dist. No. 3: O.R.S.—4KR, 4SF.

Dist. No. 4: O.R.S.—5AB.

VIRGINIA—Dist. No. 1: O.R.S.—4RJ.

WEST VIRGINIA—Dist. No. 1: O.R.S.—5WZ.

Dist. No. 5: D.S.—Melven T. Spence, 305 Reynolds St., Charleston.

GEORGIA—A.D.M.—C. C. Transou, 309 Greenwood Ave., Atlanta.

FLORIDA—Dist. No. 2: O.R.S.—6D.

ALABAMA—Dist. No. 1: O.R.S.—5AHM, 5ZAS, 5MT.


Personnel for S.C. not complete as yet.
ATLANTIC DIVISION

Chas. H. Steward, Mgr.

Brooklyn stations come thru with quite heavy traffic. The month showed 3BH, WRH, with 166 messages was the leader. Most active stations were 3CH, 2JR, 2BO, 3BWR, 2PP, 3ATZ, and 2BEW, of which 2BEW is the station in the new location. BROW was represented by 3CTR, 2CXY, 2PP, 3SM, 2BH1, 2BEN, 2ERQ, 2CUC, 2CWR, and 2BRX. Northern Manitoba reports came from 2BNL, 2BBK, 2XWA, 2KR, and EDL. While Rg Noord Horn was represented by 2CAI, 2CZQ, 2TS, and 2AMO. 2BJO reports 60 messages. 2BXW, 4BQLH, 4AVJ, and 4TRL have reports from four stations. The above stations are reliable traffic stations and will handle traffic thru their stations with the best possible delay.

With F. H. Ostman off the job, since he is away from his station very often, it may be necessary to make a new appointment to fill the job. Reports for several months have been very slim and we want more activity reported in this section.

DISTRICT OF COLUMBIA—The active stations handling traffic for the month were 3AB, 3AL, 3BVR, 3HS, and 2FZ. 3AB is 800 watt odd quite often and was included during the months 3LR and 3ZW are reported back on the air very soon. We welcome them.

DELAWARE—3APF off the air and 3SSS doesn’t seem to reach out. Amateur activity is at a standstill. 3ADN threatens to open up with four 5s, which may help traffic to some extent.

MARYLAND—There was much increase in stations. 3AIJ and 2CB are reaching out from Fm along with 3URC, 3WF has a new 100-watt set which is getting out, too. 3APT promises to open up with 100-watt shortly and 3PH and 3LG are installing 100-watters, 3PK with 100 watts also reaches out good. 3DJ, 3CRF, 3AEP, and 3CD are 10-waters getting out. 3BUK, our “YL” has a schedule with 15KP, 3SF is owned by 3HP, and 3IF. 3CW uses four 2s. 3MP came back on the job last month. 3APF is improving on his DX. 3SSR keeps the messages moving down his way. 3SMO is increasing his power. 3SPF and 3E8G are doing good work.

PENNSYLVANIA—3BTLL has heard 9D1T of BAN and is looking up a 250. 3BN1 reaches Langford FR, 3Y0 has erected new steel towers and looks for better DX. 3DHV was formerly 3AIJ, 3AIJ trying to boost his power, 3AFA is using a “refilled” water. 3RQ is reaching out all districts but 6 and 7. 3SCC gets out good with 80 watts. 3AUW continues to push traffic thru much of the area. 3Z0 is still as reliable as ever. Philadelphia is very inactive as reporting came from only 3HD, 3KD, 3PS, and 3AWA.

This is about the smallest report ever turned in from the Atlantic Division and some whole sections are missing. What’s the done, gents? We want activity reports and we want them on time. Let’s have them next month and put some zip into them...P.D.Q.—T.M.

CENTRAL DIVISION

H. G. Mathews, Mgr.

It would be a distinct step forward if all our O.R.B. would take it upon themselves to make an effort to secure messages relating to business or personal to friend, friends. In order to make this worth anything it must give real service on the delivery of such messages.

WISCONSIN—Dist. No. 1: 9CVI is maintaining a schedule Tuesdays, Thursdays, and Saturdays from 7 A.M. 2RLY is doing good work with one 50-watt. He has been heard in San Diego, Cuba and works noes and severe regularity. 9DK is moving his station to a new location. 9ADP is putting in phone for short distance work. 3APZ is rebuilding his station to use 5 tubes for D.O. supply. 9DMM turns in a great total with his C.W.

Dist. No. 2: 9DTP continues to feed the list but is being crowded by 9EAR. 9DZY is using 50 watts and getting out 9DQ and 9DVR will be on shortly with 50 watts each. 9DVR the old spark hook, has at last changed over to 110-volt line. 9WV is on 70 watts and won’t be long now. 9FQ reports traffic on the increase, 9CWZ is SOL. A fleet storm took both the DX and 9DZ is off the air. 9ZA has been rebuilt to accommodate four fifties.

Dist. No. 3: 9CJI is on with more power. 9ASB is on with 10 watts. 9BCH is quiet to get married, he says for good, bunch any “hi”! 9CGR is in a new set at Oaklawn. 9EMD will be going over to 9FVZ now. 9ZI is clearing up, and all roads are open in operation in Wisconsin. Message delivery is excellent.

DISTRICT No. 1: 9MM reports the DX with 10 watts and 500 watts M. 9AOK is on 5 watts, working over 1000 miles consistently, with 0.9 ampepere in the antenna. 9BZ with 15 watts is also doing good DX. 9DZK has not been working regularly the last month. 9BRC was reported QSA in all areas when he raised the plate voltages of his 20-watt set to 1000. 9AZN has some serious hookups to find one that will be satisfactory.

NORTHERN INDIANA—Dist. No. 2: 9MR reports the DX in the Midwest and using 5 watts. handled 90 messages but says there doesn’t seem to be much traffic down his way any more. 9DVK blew his 50-watt tube and is off until he gets another. 9BRC reports quite a bit of trouble in raising stations. He is going to put in C.W. after a while. 9CJ is doing well; fitted his four 10-watters and had a fine DX for C.W. 9FVZ is doing good work with his 550 watt. 9GGO is going over the plate voltages and reports quite some tube trouble. 9FP is doing good work on both C.W. and C.W. 9BHI has a good 50-set now. 9FRT are being quite active again. 9AKD gets out in fine shape. 9AKD reports all districts coming through in fine shape. 9AX worked 84 stations in 51 states and 7 districts but very little traffic of any kind. Prof. Achaz is out gleaning for DXing messages and has held a meeting of his local ops to that end.

SOUTHERN INDIANA—Dist. No. 3: Only one report received—From 9BRR. 9CIG has finally had the old mill and is going out west.

Dist. No. 4: 9UR, 9BJR and 9FPP are the only stations reporting in this district.

SOUTHERN IOWA—Dist. No. 6: 9WIS reports 57 stations and all districts on 10 watts. 9AWU’s antenna came down due to the efforts of a woodpecker at the top of the mast and 9AWU is starting to work again on schedule. 9ARB has moved to Calif.

Dist. No. 2: 9BJT reports the 250 not perking out. 9DXX reports messages scarce. 9JKC is on early mornings and places his traffic where it belongs. 9GI please communicate with the D.S. Things are slow at 9WX. 9AHQ has fine line to intended O.R.S. 9CFT is drilling through, OK. 9AMK has junked spark, but is on with 500 cycle C.W. working both coasts, 9CA rises to inquire what is the specie benefit to amateur radio to junk spark for high power C.W. Sex if 2BK’s C.W. doesn’t cause more QRM in Illinois than 9CJS spark, he’ll eat it and take the W.L.C. for dessert. Not much activity from 9AHF but the MO kite kicks west in fine shape. 9ARM has changed to C.W. from DK at the top of the mast and is getting west in good shape. 9BUK is working x100s but sex messages are hard to get. 9BPA will be high on the list. 9DRI are inactive. 9CCM is back on the air with 20 watts. 9CON is on with a new chemical rectifier which is working very well, thanks to the key at 9CXX. Two boys are now away at school. (Anymore in the family to fill in at the key?) 9DQ reports 50 watts, operating at 9CA in his spare time. 9DYN brothers have a Grebe 13 also a new transmitter to work foreign stations. 9JUN is with school, 9AFE is reaching out with a C.W. (BUT he still keeps the spark.) A new chemical rectifier and a Grebe
February, 1924

Q S T

III

12 have been added. 9AHO doing FB with his C.W.

Dist. No. 2: 93IN, of all C.W. districts, is leading the district with a 200-watt set RAC 500-ex, and is doing a great deal of DX and is adding more power. The 500-cycle is consistent in audibility at 9AIH—A.D.M.) 9BYX is now QSO with 7ADB. 9GMN is using 8 watts in his station and is using 5 watts and also adding more power. The district data 101 makes per station.

Dist. No. 4: 9DKH is installing a new 200-watt transformer. 9HZ (one spark) has a 50-watt which he says works DX fine business, and is adding more power. 9DGQ is putting in a station at Grand Haven as a 50-watt. E.A.N. is doing work of first class, 9BYX, using 30 watts and experience 9BYX's work is adding more power. 100. We would like to hear from 8BFQ. 9ANL, formerly an op at 87Y, is with us now with two 5-watt sets and doing DX work.

Dist. No. 4: 9ANL is also 8ZAB. 8AIB FB on 50 watts. 8CWK putting in a 50-watt now and will be using 200 watts. 9AWK and 9BQG have added 40 watts, 9AWF putting in a station at Allendale. 8CQ having 50 watts now and better DX. The Radio Inspector made a visit to Detroit and all the following obtained 5th grade amateur licenses. 9QFT, 9BLU, 9CLJ, 9BHZ.

Dist. No. 5: 9DZG is the only transmitter in E. St. Louis in commission as NAMS obtained the shack. A and has been QSO Denver, Colo.--and has been doing work of first class, 9BYX, using 15 watts and experience 9BYX's work.
honors in Minneapolis with 911. 9DGH has put in a 50-watt. 9GR has been heard in France and England, and has worked WNP. 9BLY is back on the air, handling a good share of the Paris traffic. 9CTO had better get down off his wave on top of the bunch or someone is liable to sit on him. The St. Paul bunch are still pounding away of five- and fifties.

NORTH DAKOTA—Dist. No. 1: Our California weather has had a severe effect on the message total this month. The A.D.M. has moved his station, 9AJE, from Fargo to Devils Lake and expects to be among us again in a few days. One of our best operators, 9SAN has found it necessary to dismantle his station and dispose of the apparatus. We regret the loss of his able assistance very much, as he did his share in handling traffic. 9EBT has been experiencing some hard luck by having the last of his 5 watters go west and as a result has been off the air during the month. 9ADZ has his 10 wats in operation so we look for old time results this month from him. 9DLI got his station going the 15th after an absence from the air for two months. 9AMP is rapidly developing into a real ham and we probably be holding his own with the old timers before spring.

Dist. No. 2: 9DRK has blown his third fifty and is using a 5-watt tube. His message total includes 6 messages from WNP and 9 to him. 9AFM is doing wonderful with his 5-watter but doesn't have much time to handle traffic as he has to attend school. He is also putting high voltage on his 5-watt tube and 9BMT and 9DQG are working on their stations and will soon be on the air. Expect report from 9ACK next month. DescLacs will soon have a station on the air with self-rectified or spark coil C.W.

SOUTH DAKOTA—Dist. No. 1: 9BG is apparently doing the best work in this district. Dr. W. W. Rodgers, M.Y., of Memphis brought his report to Head quarters of March 31. 9BCT, using a 5-watt tube was reported QSA by 6XAD. 9BCC is building a shack and expects to have it completed by the time of the South Dakota convention. 9AQE is on the air quite often. Dist. No. 2: The following stations have been operating for the past months: 9CJS. 9Jawl, 9DWN, 9BRI, 9AVZ, 9CGA, 9AYL, 9PF and 9TI. 9CJS is high in traffic handled and 9AVZ is first in DX work and has started an upgrade WNP. 9BRI puts the QTC through to Paros island coast easily, so QSR thru him.

DELTA DIVISION

W. W. Rodgers, Mgr.

The falling off of the number of rubber-stamp messages has sent our traffic figures to new low levels. It seems that we are too anxious to shake off the old before we have taken on the new. Outside of nothing doing, everything else is OK.

TENNESSEE—No. D.St. reported this month. (What in thunder is wrong, gang?—D.M.) C.M. Welford of Memphis brought his report to Headquarters of March 31. Memphians are anxious to have a station there for a long time. 5K1 is one of them and works 500 miles early on 15 wats. 5SY, another new fellows is getting out well on 50 wats, but reports no traffic. 5NT is stirring up things with a fifty, 5VT, with 19 wats, is doing good. 5XDN is back! He has 5 wats on a one wire antenna and CP gets all over the map on it. (Guess he is a real chugger.) 9CTO is here with us again. 5EK is the most consistent. His phone on the phone of the Memphis phone, phone to phone. 9OM is on occasionally but doesn't get much traffic. 5NZ is on with 100 wats 5AHJ struts his stuff with 5 wats. 5PF and 5PV are hot on the traffic trail. 5D2H was confined to the official League broadcasts and a few other long ones. 5KA says he knows of a guy with a 600-watt Navajo who has about a 5-watter. (Hope you make it OM—D.M.) No record of what is going on outside of Memphis.

LOUISIANA—Dist. No. 2: C.M. Freitag of New Orleans reported directly to national headquarters in an effort to insure his report reaching the proper parties before the time was up. 5AHJ broke through QRM to handle a nice message and got away with 72 messages. 9RH is confined to his bed, but manages to get on the air occasionally. 5AA, 5USA, 5AT and other active stations in New Orleans. 5LR, a new one, has opened up with 10 wats, and is doing good DX, in spite of a punk antenna. 5YW is on the air with 100 watts doing good DX. 5AVG is now 5BZ with 50 wats. 5ABC is troubled with power and school QRM. 5AT cut from 20 to 15 watts with the help of a new bunch of traffic. 5KC is still getting into the 6th district with 4 real amperes. 5KC handled 70 messages. 5ATZ handled 7a, and 5YW handled 67.

ARKANSAS—The A.D.M. reports nothing doing. No report received from D.S. Daly or C.M. Shnitz of Ft. Smith. 9X40 is on the air but nothing else. 5XAR and 5DQ are getting out well, but handled no traffic. A new station is in the air, but has not furnished any information.

MISSISSIPPI—Dist. No. 2: D.S. Henriques & Janin reported directly to headquarters and have a fine new 50-watter. This month reports going the west coast consistently and handled considerable traffic. He was high man this month. 5APV, a new one in 1924, has 60 watts with 50 volts and a B battery. (Welcome, OM—D.S.) 5AVG has started, but all we have had from him was a Christmas card. 9OM.

Dist. No. 1: 5AIR is the only active one here. He has handled a tidy sum of messages this month. 4ASZ gets out well, but we are glad to have him with us. 5YE managed to knock off a few this month.

EAST GULF DIVISION

H. L. Reid, Mgr.

FLORIDA—December was the best month in the history of the DX district, 5ST. The states have taken up permanent residence in Florida and have good stations in operation.

Dist. No. 1: Jacksonville heads the list with 5 bona-fide traffic stations: 4FS, 4IU, 4IZ, 4ER and 4PK, and they have handled 64% of the entire state. This is due largely to 4FS, who handled 220. His 50 wats have been doubled and he promised still better work next month. He will be back on the air with new equipment very shortly. 4HZ handled 42 in four days in 4IU and 4ER maintain daylight schedule daily with St. Augustine and other points and much traffic is handled in this way. 4JU has a new O.R.S., 4EZ is starting up again and promises a good report next month. 41F and 4EM are making a reputation for consistency. Their DX is FB, but they handled their traffic in short jumps, maintaining daylight schedules with Jacksonville stations. Collect college work and publicity duties to handle 57. 4MS reports his gang will be QRY with small C.W. sets soon.

Dist. No. 2: 4IZ is back on the job after a period of absence he has been appointed D.S. to succeed 4EM. 4IZ is doing splendid work through schedules with Florida stations. He has just been appointed C.M. of Tampa. 4PK has started again with 100-watter and handled 15 messages in a few days, then had the misfortune of having his transmitter stolen. He will be back on the air with new equipment very shortly. 4HZ handled 42 in four days in 4IU and 4ER maintain daylight schedule daily with St. Augustine and other points and much traffic is handled in this way. 4JU has a new O.R.S., 4EZ is starting up again and promises a good report next month. 41F and 4EM are making a reputation for consistency. Their DX is FB, but they handled their traffic in short jumps, maintaining daylight schedules with Jacksonville stations. Collect college work and publicity duties to handle 57. 4MS reports his gang will be QRY with small C.W. sets soon.

Dist. No. 3: 4PD is back on the job after a period of absence he has been appointed D.S. to succeed 4EM. 4IZ is doing splendid work through schedules with Florida stations. He has just been appointed C.M. of Tampa. 4PK has started again with 100-watter and handled 15 messages in a few days, then had the misfortune of having his transmitter stolen. He will be back on the air with new equipment very shortly. 4HZ handled 42 in four days in 4IU and 4ER maintain daylight schedule daily with St. Augustine and other points and much traffic is handled in this way. 4JU has a new O.R.S., 4EZ is starting up again and promises a good report next month. 41F and 4EM are making a reputation for consistency. Their DX is FB, but they handled their traffic in short jumps, maintaining daylight schedules with Jacksonville stations. Collect college work and publicity duties to handle 57. 4MS reports his gang will be QRY with small C.W. sets soon.
working a six the first thing. (FB) 4KE is working with 10 watts radiating 1.5 T.C. amps. (Pipe QSL his sign.)

ALABAMA—No report from Melfayne this month. O.C. D.M. has been a1,pointed to his sign.

PORTO RICO—A letter from 410 states that the fellows will be on in his territory soon and hopefuly at the same rate as usual.

GEORGIA—Due to the designation of the A.D.M. no report has been received this month. C. B. Branson, 4QF, has been appointed to succeed J. D. M. has been resigned desire of the D.M. that all the hams in Georgia get together and help put this state on the map. Mr. Branch at Middletown has also been appointed as D.S. of Dist. No. 2. All stations south of Atlantic please report to Mr. Brach. Due to heavy work on the gang have been busy and consequently traffic fell off considerably.

STOP!! LOOK!!! I've a pretty good ill' ole report this month. It could be better, but even at that it is the farnest it has been a1,pointed to 9EKF's sign. The news is that he is working a six the first thing. (FB) He is interested in parts. If you don't have your sign, get it. Here is the news.

February, 1924 QST

 touching together and helping put this state on the map. Mr. Branch at Middletown has also been appointed as D.S. of Dist. No. 2. All stations south of Atlantic please report to Mr. Brach. Due to heavy work on the gang have been busy and consequently traffic fell off considerably.

STOP!! LOOK!!! I've a pretty good ill' ole report this month. It could be better, but even at that it is the farnest it has been a1,pointed to 9EKF's sign. The news is that he is working a six the first thing. (FB) He is interested in parts. If you don't have your sign, get it. Here is the news.

WEST DIVISION

G. S. Turner, Mgr.

KANSAS—A new A.D.M. is working a6 the first thing. O.C. D.M. has been appointed. Please (F) his sign.

ATTENTION KANSAS GANG! Your A.D.M. is going strong on spark. (Can it, Paul.) Here is the news.

February, 1924 QST

working a six the first thing. (FB) He is interested in parts. If you don't have your sign, get it. Here is the news.

WEST DIVISION

G. S. Turner, Mgr.

KANSAS—A new A.D.M. is working a6 the first thing. O.C. D.M. has been appointed. Please (F) his sign.

ATTENTION KANSAS GANG! Your A.D.M. is going strong on spark. (Can it, Paul.) Here is the news.

February, 1924 QST

working a six the first thing. (FB) He is interested in parts. If you don't have your sign, get it. Here is the news.

WEST DIVISION

G. S. Turner, Mgr.

KANSAS—A new A.D.M. is working a6 the first thing. O.C. D.M. has been appointed. Please (F) his sign.

ATTENTION KANSAS GANG! Your A.D.M. is going strong on spark. (Can it, Paul.) Here is the news.
The reports received this month are certainly very encouraging to amateur radio. With all the good doings going on in our League, it is truly a great world to be living in—Mix at the North Pole—a new constitution for the League adopted—and our Atlanticists being carried on, certainly make a fellow feel good and glad he is one of such a wonderful organization. The Division manager is also quite enthused over his new station at Mattapoisett, which boasts of a 25-foot tower and the cards rolling in from all districts of the U.S. and Canada, as well as foreign ports.

THE NORTHWEST—Another enjoyable visit was experienced one Sunday night when Mr. Hilton dropped in to call on the O.M. Things were rather upset, but we are hoping for another visit when everybody was percolating. Maine reported a total of 56 messages handled, and taking all things into consideration, we are mighty proud of this report. The leaders in this state are as follows: 1AJL, 129; 1A; 144; and a unofficial station. 1AOU reports 139. 1FM also reports 79 messages which is FB for Portland. 1AQL plans to change to 50 watts very soon. 1AIFP is planning to be on shortly with 5 operators.

VERMONT—Old man Shayton has been busy drumming and utilization of the station has turned in the best report since it was organized. While only six stations reports with 164 messages, still this is a fine figure for a state so situated as is Vermont. They can only relay messages, and in these days when 5 watts sends to 600 miles, the fellows have to actually jump up and grab these messages as they go by. 1FM handled 14. 1AIO handled 7. 1AOG has 10 watts with storage B batteries for his place. He reports no generator hum. 1AJQ. 1AOG and 1AOG have regular schedules with each other.

NEW HAMPSHIRE—The report for this state for this month, there is a probability that they are slowed under pressure. The CQ for this state is 1AOU. We hope to hear from them this month making out the report. 1HBU, the A.D.M., sends in a very good report and this office wishes to commend him for such an effort. The A.D.M. is a new man. 1CTC handled 45. 1AQY reports 67 and using 10 watts. 1ER reports 91 and also thanks us for his good work. The M. has been keeping track of the O.R.S. that do not report and after three months of such failure he is going to recommend his resignation. The O.M. backs him up squarely in this and will certainly cancel this dead wood. This idea of having the O.R.S. certificate banking up in your shack and doing no work has passed by. Will other O.R.S. states do this? the M.A.R.S. of traffic handling has been recommended for O.B.S. Kansas handled a total of 1,501 messages during December.

The RCA report from the O.S. of District No. 2. 9HXT has been rather active and handling some traffic. A report was received directly from 9HXT and as such he states that he is in a handy location. However, he cannot work into eastern Nebraska for some freak reason, but has no trouble working farther east easily. His station is located 1,200 feet above sea level, and he is partially 200 feet high up and down the west coast. (Give him your traffic west). 9ATC is by far the star station in handling the O.S. as one should expect. He reported as QUICK as the lightning. He handles the O.R.S. by telephone and by telegraph. He is the dead wood that the A.R.R.L. have a problem handling. This idea of having his traffic for his race, he evaluated for his generator hum. Even if we have only three O.R.S. stations to a state, they will at least be good reliable ones, and his reports will show good scores. The A.R.R.L. Association did a good job of representing the A.R.R.L. at the recent Radio Show and from all accounts the O.R.S. handled the load of hundreds of messages and it is only regretted that they were not all reported. Messages were accepted for the U.S. and Canada and Canada station, W1RT, was wishing to report, but was out of traffic. ILT seems to be the chief hard luck man this month. He caught the poor Radio Corporation the worst of it by blowing four 50-watt and one 50-watter, 1BT and 1AAO spring a new one this month. They report that insurance companies refuse to allow them to have a transformer in the house. Quick, Watson, get the Ratty Switch! I suppose they all had that queer idea. The next move from 1ZK as an event. 1AO, a 150-watt lamp cord which he is acquainted with is carrying 1,290 D.C. volts in it! 1BMM reports that he has reports working a mill in daylight with spare coil. 1CW 1KA has his 100-watt transmitter on exhibition at the Boston Show and it certainly is a work of art. McLean also comes forth with a fine report. 1AJF has worked the west coast three times lately and is taking traffic reliably for the middle west, 1KC reports having a new 150-watt motor. This should send the signals farther than a mile. We wish to extend our sympathy to 1RO. M, who, on account of a death in his family, has dismantled his set. We hope it is only temporarily.

DIST. No. 7: Traffic is moving with speed of light, the honors going to 1QC and 1AOM. This of this district reports losing his mast in a recent gale. Following are some of the totals for the month of special interest, 1APA, 1YK, 1YK 294: 1AFA, 127; 1ADN 104; 1KC: 100; 1HGF 80. A total of 1,000 was reported for the Eastern Mass. and it is notable that no spar stations are reported as being in operation. Three more cheers for C.W.

Going back to Eastern Mass., we want to also mention that 1ZK handled 112, and 1CIT 282, while 1CJR hung up 101. These totals are very noteworthy.

RHODE ISLAND—1VBV, the A.D.M., for this area is considerably attired. The gang are finding a violation of the quiet hours by one of our best Rhode Island stations. To say that it has caused a great amount of alarm is an understatement. 1VOR is pounding brass between 8 P.M. and 7 A.M., 1YK 294: 1AFA, 127; 1ADN 104; 1KC: 100; 1HGF 80. A total of 1,000 was reported for the Eastern Mass. and it is notable that no spar stations are reported as being in operation. Three more cheers for C.W.

CONNECTICUT—1MY, A.D.M., for this state sends in his first report of the year. He mentions quite certainly the berries, 1AW handled 81; 1HXZ 222; 1FD, 107; 1MY, 318; 1HQ, 256. These totals are quite satisfactory. We have received reports on such well known men as 1MO, 1QP, 1BHW, and 1OA have broken all records in working foreign 1AB and certainly deserve to be heard by home operators. The gang are on their honor to be heard, thereby dashing to pieces one of Vermily's fondest hopes. However, it is encouraging to know that the A.R.R.L. are taking the right path and show the world it could be done. To our friend Reinartz goes all the glory of having designed short wave transmitting circuit that makes all this 100-meter work possible. We heard 1HX working 8XAD the other morning. Some
The finest spirit of sportsmanship seems to exist throughout the whole 7th district. The D.M. has been listerning on one frequency and only six 7th district men have been logged during the Trans-Atlantic quiet period. That's a fine record.

Traffic is moving through the division in big gobs now. Many of the best stations in the district are flying fever and settled on local traffic, with the result that more messages are being delivered.

WASHINGTON-There doesn't seem to be much doing outside of the regular activities this month. An epidemic of burning out tubes seems to be the order of the day. Traffic is seeming to move over longer jumps as the weather improves.

Dist. No. 1: No reports received. The O.S. is putting his station in condition and is off and on the air now and then.

Dist. No. 2: 7ABB is the only station reporting and tops the list for traffic handled. He is still QSO WNP. When it comes to conspiciuity, 7ABB can't be beat. He is there pounding away every night as regular as a clock. Seattle seems to have dropped behind this month. Almost every station has had some hard luck, masts down, aerials broken, or tubes burned out. 7DI has just come back on the air and 700 was going fine until the jinx perched on his antenna. 7AIH and 700 have been having trouble with their transmitters. 7FD has recently rebuilt his station and is doing good work.

Dist. No. 3: There are only two stations on the air in this district at present. Both are doing good DX but are shy on traffic. 7AIH and 700 have combined into a 20-watt station with 10 watts in the antenna. Separate calls are being used. With the assistance of WVS the other station on the job, they expect to raise the total for this district next month.

Dist. No. 4: The long looked for reports from the stations in this district finally came through and we find a goodly number of hams on the job. The antenna at 7WX-7BB came down in a storm and only the quick work of RB in his pajamas at 4AM saved the pole from a similar plight. Nine of 7WM are received with terrible intensity on one night and on the same band. The 100-watt class also lower looks so good to 7AFN that he has made up his mind to have one, 7CB has been resennoned to 774, and 7AIH and 700 are both running with 5 watts. Don't get thrilled now when you hear 7CB calling you it is no longer held by a Yagi as the bird has been looking forward to the 7th district convention which will probably be held in the near future. 7PRI has burned out, but he is in this district too, while some stations are clear out others are on reduced power. 7AJV was QSO Wisconsin on 5 watts and 7BJ and 7AIZ on the job. 7SN is active in traffic QST good C.W.

Dist. No. 5: Frank Mueller, Jr., the O.S., has resigned to attend the University of Washington.

We will all miss him and will look forward to the time when we see him list on an appropriate occasion.

C.M. of Hartford and is doing excellent work on 50 watts. Hartford brass bounders will please support their young local man and keep him ready for big and only asks that they be given a chance. This is one of those districts where traffic doesn't hang around over 19 hours. 7AVJ has gone to town keeping the chinken working in his laundry, so forgot to send in his report. 7AIJ has been having trouble with his 50 watts. 7FC is in traffic, watch his bands. 7HD reports 148 mgs. (Here's our thanks.) The D.M. wishes to extend a hearty invitation to all members to call on him when in the vicinity, and if no more than 14 come at once, we can probably bring 'em away for a short nap after doing some DX. Please note my new QSA in QST.

NORTHEASTERN DIVISION

Glenn E. West, Mgr.

February, 1924
the signals when he does hammer theuld key. "If there will soon be a transmission station in Havre.

VIII Founded February 1924

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.

VIII Founded February 1924

USF

there will soon be a transmission station in Havre.
has found it necessary to resign on account of too much business. 8CBW is working on 5 watts. A 100-watt hoist is being set up on a 50-watter and is waiting for a 250-watter and is going to do some real DX. (Ouch!) 8GF sent a 250-watter last year and a W. E. to R. W. went to rest in the west also. 8FH is building a new transformer trying to outdo 6KA in overloading the DX stations, but is going to handle much traffic. 6ABX is the Dist. Supt.

ARIZONA—6ZJ handled 271 C.W. messages. Henry is keeping low in power on 100 meters. (Can't do CW peaking at least and receiver down to 50 meters.) 6QJ is at Hampton, just started up with C.W. sink rectifier. 6GS has not changed over to C.W. yet. 6NR handled 29 messages. No report from Tucson and Phoenix. P. A. Miller, Flagstaff, an old timer from the 9th district will be in the air soon as his set arrives, and will make a good relay station as he is well experienced. QRN has been almost continuous. 6QH has worked 3 times and the season opened very unusual wX conditions this fall.

ROANOKE DIVISION
W. T. Gravely, Mgr.

VIRGINIA—Dist. No. 1: 8HY is C.M. of Norfolk instead of 8BNE. 8BNE is D.S. 8UV. 8BNE an 8BE are doing the big work. 3IU vamped and off the air. 30KK, a new station at Hampton, just started up with C.W.

Dist. No. 1: 8SAU just had his heterodyne and 5 adding storage battery plate supply. 8SB does some work and has a Grebe CR-13. 38Q is off the ham stuff and with a commercial company. 3AB also has Grebe CR-13 and is on as often as time will permit. 3BCJ has the CR-13 up, moved down and received 3AO. moves back into the basement. 3GQJ is a new station which will open up January 1st. 3BN has 100 watts with MG supply and is working on 190 meters. A 20-watt set with CRAG on 100 meters. (Can't do it OM, under A.D.M.) 3HJ is having trouble with his CR-13 too which he says is the broken. 3UR is C.W. and some C.W. and 9QJ is in touch with your hams. 3JH is helping Grebe CR-13 and 8BE, 3QJ is copying from 9QJ.

Dist. No. 2: Nothing heard from 3TI, the only station in this district, but we feel that he is safe.

Dist. No. 3: 31W is the only active station reporting in this district and is sure getting out. His wave is down and his signals have improved greatly. 3IF, G, 3IF, 3IBJ is back again. (They all come back, OM.) 3JY is on often. 3OV handles a few when time permits. 3VO, we are sorry to say, leaves this district now and will be greatly missed. He will be missed in the future as 3VO and expects to get on the air by February 1st at Buffalo, N. Y. (Here's luck, OM, and may the old set perform.) 3MO has the super heterodyne which takes all his time from the transmitter.

Dist. No. 4: Nothing heard from 3TJ, the only station in this district, but we feel that he is safe.

Dist. No. 5: 31W is the only active station reporting in this district and is sure getting out. His wave is down and his signals have improved greatly. 3IF, G, 3IF, 3IBJ is back again. (They all come back, OM.) 3JY is on often. 3OV handles a few when time permits. 3VO, we are sorry to say, leaves this district now and will be greatly missed. He will be missed in the future as 3VO and expects to get on the air by February 1st at Buffalo, N. Y. (Here's luck, OM, and may the old set perform.) 3MO has the super heterodyne which takes all his time from the transmitter.

ROCKY MOUNTAIN DIVISION
N. R. Hood, Mgr.

9AMB 160 Mags.

8JRT is in good shape—good understanding among hams, much traffic, and better DX. Hathaways C.W. Denver, Colo.

[CLOSED]—Denver Dist. The traffic totals of the Denver district are creeping higher each month. Hathaways of 9AMB still take the box seat for most messages, but some are beginning to show a slight amount of sickness of A.D.M. Segal. (Glup to hear him back on the air.) 9QJ has been out of the city so his traffic report is nil. 9CN is burning out tubes at a fast rate. 9RXA has no meters, all having burned out. 9HXQ is in on a transcon route which ranges traffic across and back in the same district. 9AMT and 9AMB are building new receiving sets, and 9BIJ has been on regular as has 9CCZ, 9BDX, 9BJK, and 9DTS. The traffic in the southern part of the state is needed. (F.B. Men, we are mighty glad to see it.)

Dist. No. 1: This district is in fine shape and steadily moving traffic. 9GSA has been idle on 9IB, a new station, leads this month with 350 msgs. 9EA is still strong at 47, and 9DBE 32.

Dist. No. 2: This district has opened up the southern part of the state needed.

[UTAH]—Dist. No. 1: 8ARU leads in Utah this month with 199 msgs. 8BUH runs him a close second with 194. 8RM follows with 164. This is a good total for three stations. 8PE reports for the first time since his appointment with 97 msgs. (Good work, OM.) 8ROJ is out of traffic, and 9IB has been doing well for the last month with 250 msgs. 9EAE moved 71, and 9DBE 32.

Dist. No. 2: This district has opened up the southern part of the state needed.

February, 1:34 QST IX
WYOMING—Traffic in this state has dropped off due to building sets. 750-7LU has been on receiving and moved large batches of messages. It seems to be poor QSO west and poor delivery after QSL. (How come?) 7ZQ spend all his time handling for WNP and FAAK. Maybe traffic will move after they are logged. 7ZV has not yet set up the old station after moving to Casper, but will be on shortly.

WEST GULF DIVISION
F. M. Corlet, Mer.

SKR runs off with first place on the greatest number of messages handled, relayed and delivered, with 407 to his credit. This of course throws the honors to northern Texas. Southern Texas wins both second and third place, station 5SKH with 256 and 5SKK second with 180. In the city leading station is 56J with 100. Only one station reported from New Mexico, 5ADU with 72N got out of the "B" class with 500. 5AKN reported 55 messages, commenting on some QRM from business. He reports 60 passed along. The division's star station for outgoing messages handled this month is 5BR. If he had not been located here 5AJW would have been in the lead for Dallas with 114. He has a 100-watt battery and too bad it was 114 for miles. 5HY comes next in line with 102, 5AKN. 95, 5AIC 18 and 5JY 15, making a total for the city alone, or an even average of 125.9 megas per station.

Dist. No. 1: 5FX reported 42, he is working the area here with all his might including answer with daylights. 5FX has a battery supply coming up for a 100-watt transmitter. 5G2 reported 27. He is trying to make a 50-watt battle. 5GN tops the list with 58, 60W, all piled up with getting a steel tower in the air, moved 19. 5AI, says its too all "FEB QUES" in the air these days and not much "OK No. 3, Go next one," so its only 7 moved this time. 5AHC's transmitter is out of commission, but will be OK soon. He handled 2. 5AM is the only one moving from 4:38 to 6:39. He moved 12 and is ready for traffic. 5AMJ passed 25 alone, he always has something to do. 5AMK is out of luck, doesn't have even a schedule with one west. 5AER reports his station closed down indefinitely on account of R.C.L. has quit commissioning. (About fixing it up so they won't even know it's running—it can be done—D.M.)

Dist. No. 2: 5AFT reports. He is still using one 5-watt bottle and works 99YR in St. Paul in daylight. 5AHU handled 52. 5CH has had a bunch of trouble for a while but is out of sight and he blew two tubes and is working on reduced power, but handled 117. 5ADH was not idle either, he handled 72 through 56J and managed to relay 24 messages. 5ADV leads the bunch here with 125, no messages hang on the hook with 72 and 5CV third with 50. 5EC, reports by wire, some Morse operator made the sign "M.P.C." 5ECF is doing the duty and a guy gave 102 messages passed thru here. 5ADV and 5TO are giving one day service and wants more message traffic. 5ECF, reporting on station under commission, holding down here, handled 31. 5AHT has only been on the air about 20 days and is ready for traffic. 5AFH leads the bunch with 90, 5UY helps out with 25, and 5AGH wins it up with 113.

Dist. No. 3: 5LO is putting traffic thru right along. He handled 76. 5AHF is getting started up again and will appreciate a report or two. 5AHF: "Get a hold of me this week; 202 meg does not look like he has quit for some other hobby or something. 5AOF handled 6. He is using a single 5-watt, and WNP reports his "FX Y" is working all over. Traffic handling went out luck, but going out, maybe. He moved 36. 5XAD is still relaying. It should be a hammering message, a completed. 5AMA passed 55 of them on their way.

Dist. No. 7: 5ZU has four 5-watters going every night now. He handled 110. 5ALR, on only two weeks, handled 11. 5GK is commission. 5MT handled 2. 5VK was not on the last week as the flood carried away the city power dam and power was too low to receive. He handled 265 and takes second place in the division.

Dist. No. 8: 5YT is out of commission due to the trouble. 5KQ handled 68. 5JX handled 52. 5QAV is rebuilding during the holidays, but moved 122. 5AHK is having tube and generator trouble, and has been off about half the time. He handled 48. 5ANC may be out of commission for a month, everything blown up. 5AHF reported 29, handling a second time. He handled 27. 5ZM handled only 8 this time.

Dist. No. 9: 5JU, rebuilt handle 17. He is on Monday and Thursday mornings. (What time?—D.M.) 5CBX's antenna came down in a storm. 5B6 is very sorry but the station leads the state with a total of 190. He is on every morning. 5AJK breaks into the relay game and sends in his logs. 5AHG has a couple of 5 watt bottles. He handled 22.

Dist. No. 10: 5TW is all set for QSRing. Shoot him your traffic. 5AGA, East Central Oklahoma Radio Assn. is all set for traffic handling. They moved 12 this month. 5ADH says it takes most of his time helping the R.C.L. out but being a DX station he managed the handle of messages. 5AGZ has three 5 watt bottles working in the shape. He passed 6 messages along. 5VM has been on only three weeks, but handled 12.

NEW MEXICO—5ADU seems to have the whole state to himself. He handled 172 and has been heard by WNP and Australis. 5ALC is a standing State College, but will probably be on at this point. Week-ends soon as both the ghosts are replaced that were wrecked in wind storm.

MEXICO—BX reports a total of 36 messages. The revolution is on again but up to December 26th it had caused considerable slump in transmitting. 5ECG and 5AHR operate occasionally so as to keep their stations from getting rusty. 5TO was logged in New Zealand in special intelligence. (ECG)

HILO—Dist. "B": 5ECU with his 15-watter continues to handle all coast traffic. He is doing excellent work in both reception and transmitting. His signals were again logged in New Zealand during a special test.

HAWAIIAN DIVISION
K. A. Cantin, Mer.

HONOLULU—Dist. "A": The 2:00 to 10:30 P.M. quiet hours going into effect here has caused considerable slump in transmitting. 5CER and 5AHR operate occasionally so as to keep their stations from getting rusty. 5TO was logged in New Zealand in special intelligence. (ECG)

HILO—Dist. "B": 5ECU with his 15-watter continues to handle all coast traffic. He is doing excellent work in both reception and transmitting. His signals were again logged in New Zealand during a special test.

MARITIME DIVISION
W. C. Borrett, Mer.

Amateur radio in the Maritime division has gone ahead during the last month by leaps and bounds. The dinner held at the residence of
February, 1924

QST XI

Harold Lardner, 1DT, a report of which appears in this month's QST, started things off to a good speed and it is hoped that it will keep up. The D.M. arranged some transmission and reception contests which have been taken up with much enthusiasm and have been a good thing.

The General Electric Company offered a 261-A tube to the Maritime station that copy every district of the U.S. and the first three districts of Canada, on one tube. Several stations made a strong bid for this prize, the winner of which will be announced later. The Northern Electric Company offered a 5 watt tube to the station which wins the Maritime DX with most tests.

To date this competition is not very far advanced but nevertheless several stations are running a close race for first place. In addition to the above the D.M. offered several certificates for transmission and reception. The following have won certificates to date: 1RQ won 3 certificates, 1 for being the first Maritime station to log a French amateur, 1 for being the first station to log an England station, and 1 for being the first Maritime station to work a French amateur when he worked French 8AB with only a total input of 90 watts. (More power to you, old boy.) Our old friend 1AR won certificate for being the first Maritime station to be heard in the U.S. sixth dist. He received six cards from California last week.

Perhaps the best piece of news is that we now have two A.D.M.s in the division who have started up in good style by working the D.M. with traffic. T. R. Lacey of St. John, N.H. has been worked by 1DD on several occasions and wins a certificate for being the first N.B. station to work Nova Scotia. 1RQ at Charlottetown, P.E.I. has also got his set going and has also worked 1DD, and thereby wins the P.E.I. certificate. (Glad to connect with these fellows and we hope that they can induce many more in their Province to join the A.R.K.L.)

In Halifax the gang have mostly been busy getting ready for the Trans-Atlantic tests. 1RQ has been doing wonderful work both in receiving during the summer and in transmission before and after that time. 1DT, we suspect is in love or something like that. He has raved a lot about Trans-Atlantic tests and then went away for those days and left his receiving tubes burning all the time. However, he is back on the job now and should have his transmitter going before long. 1GK is now erecting a CP and should reach out. 1GF, 1AI, and 1AU find business taking up a lot of time but should be able to settle down soon. 1GF and 1BV have everything ready now and should be going soon. 1DJ has started handling traffic and writing letters to the gang which takes on most of his time. If he does anything worth while he says he will write and let you know. In the meantime get some more members for the A.R.K.L.

Next month the gang hope to have something more interesting. This may not be complete without a word of praise to our D.P.M., Mr. E. R. Binnie. He has done much good work and brought the game to the eyes of the public in great style.

The D.M. would greatly appreciate it if all Maritime amateurs would drop a line to their respective A.D.M.s, and that the Northern Radio amateurs should send their reports direct to the D.M. These reports should be in by the 20th day of each month. If you do not know who your A.D.M. is write the D.M. and he will tell you.

ONTARIO DIVISION

C. H. Langford, Mgr.

Starting with the central section we find more records broken this time by 2BP who put one over by working British 2KF and 2SH as well as French 8AB, on 100 meters. Before that, now fellows, take the tip and get in on this 100-150 meter stuff, both in tuners and transmitters. Individual is nil to B.C.L.s and there is practically no QRM at the receiving end. (Low power, FBI.)

All Canadian divisions are lining up for a per­manent Trans-Canada route. Transmission is around 125 meters. The scheme is to run the relay east and west one night and the next night west to east. Improving still further, 2AL suggests that all stations participating (except the transmitter) should send their reports to the D.M. at Ottawa the 20th day of each month. If you do not know who your A.D.M. is write the D.M. and he will tell you.

2AA reports hearing 8AB on an indoor aerial. (FB, OM.) 2WG guarantees that all traffic received are delivered. (That's fine, OM.) Hope all others will see things that way soon. (This is 8th of the requirements of an O.R.A.)

2ACU has been kept busy at 300's since last July. 3BF is acclaimed top man for the city. (Welcome, 3ACF!) Though (8th of the requirements of an O.R.A.) 2ACU has a showing of 1S more W's for his first report. Niagara district reports a fine Radio Association, but little pep as yet.

2KX is doing fine work in Contests. (OM.)

2ACU has been building a new transmitter for one of their members. (OM.)

Western Ontario seems to be easing up. Possibly in anticipation of the coming holidays the gang has got to be reported across the ocean or answer for it. 3DH, using a "13" expects to do fine work shorty. He is building a new transmitter now.

Eastern Ontario: The following have been heard on the air: 3AEP, 3KR, 3AF, and 3VO. 3AF, the old reliable, with all the stuff for a perfect 50-watt set, believes in silent hours from 12 to 12. Here's hoping he sees this and comes to life. The Ottawa Radio Association is very active under Dr. G. M. Geldert. The two real work­ers in Ottawa this month are 3AF and 3AP. Work of 3MP is still being done by the two. The Ottawa gang are doing fine work with traffic. 3NF is now using real D.C. and reports much better DX. 3AN is doing good work on his 3NF is on the air regularly from 1130 to 1900 P.M. At London town we have active stations 3TB and 3AG. 3AG is still building his station. 3NR is rebuilding his station. 3AT is on the job longer than usual now and should be going soon. 3DR is getting ready now and should be going soon. 3DP has started handling traffic and writing letters to the gang which takes on most of his time.
should be swamped with traffic.) SN is ready, everybody help.

Now gang, back to the start of this report and put another line on the Trans-Canada Relay Route. We have to make good. YOU HAVE ONLY ONE SHARE TO DO—LET'S GO!

QUEBEC DIVISION

Traffic in this division has not been very brisk, the crowd reporting that messages are hard to obtain short wave. 2NL, CGL, and KLE has staffed off. SN, every night sees them on the job. 2HG is reported from Cuba which is good DX. 2HE and 2BG are reaching out consistently as are 21G, 2AZ, 2BN, 2CG. We welcome 2HG back on the air. 2BN and 2CG are "up in the clouds" as they have worked all U.S. districts and have good cards from Alberta and Vancouver. 2CG is spending all his time on 125 meters and is reported QSA everywhere. 2AM handles at least his share of the traffic and has a fine note with good range. The whole bunch in the division are keeping quiet hours from 7:30 to 10:00 P.M. This is quite voluntary in view of the lot's praise is feeble. The observance. 21G reports hearing WNP once, otherwise we are still not QSO North Pole. 2CG received interest from the general public for limited communication open between Burlington, Vermont and Montreal when the heavy snowstorms pulled down the telegraph and telephone lines. Our main center, Montreal, has a phone fest every Sunday morning, when 2CM, 2ES and 2HV as well as all the Peters may be heard chatting over the happenings. 2HV is becoming a good code man for which we are truly thankful and we want 2CM and 2ES to trap.

The division manager requests all the boys to give him the news about themselves as we have not heard from 2CM in a long time. This being while, send the dope direct to the D.M. and he'll see that you get all the credit that's coming for good work.

WINNIPEG DIVISION

MANITOBA—There's lots doing here these days with nearly a dozen stations in operation and rapidly completing progress with much greater ease now. 2AW, new O.R.S. is clearing traffic in fine style and promises a busy life when he can get on the air, 2IG is reaching out OK on 15 watts A.C.W. 2DK has just hit the air with 15 watts, D.E. His has a new call, and with that equal to count the dots. H1 reports nil traffic yet but will soon be knocking them over in his usual style. 2CN is obtaining FB D.O. from O.R.A.C. and has reported working 2SH in Washington, D.C. 2CO can only operate in the morning of 5 A.M. on account of ORM from his spark. He will be on soon with his C.W. again. 4EA reports hearing WNP on a detector only and has been logged by Can. 3PG using 5 watts. 4AG at Riverport has difficulty in working the Raw gang on account of QSS. (This is a good chance to make a study of that and find out why, gang. D.M.) 4AG would be more QRK if he would come off that 25 meter perch. H1 4DY worked 4CN in Vancouver and is QSA in Manitoba. He is the first station heard to be reported by WNP. 4CR reaches out for 2IG on his 100-watt and is QSA in Montreal and Vancouver. 1DE is still working on his big tube set.

SASKATCHEWAN—1HH is kicking out great QSO's on 15 meters, and 2NG worked every district in the U.S., but says the 50-watt pup is hungry as he has only 720 volts to feed it with, and those Williams C.R.S. won't grow on weakbrush bushes. The B.C.L's are receiving code instruction every Saturday and Sunday night when C.W. and home, and they are becoming very enthusiastic over the brass-monitoring end of the game. 4AO is once more on the air and getting out fine. He is spending much time experimenting with chokes and filter systems, and has been reported by WNP using 5 watts. 4RH—Y.L.S.—5 watts some time, (Maybe) 4DN after a speedy recovery of the broken collar bone, took the count again with a very severe attack of Grippe, but has recuperated, and hits the air once in a while even if he is overburdened with work.

The Moose Jaw gang were visited by the famous "Oyster Slum" trio from Regina on Dec. 2nd. (Just a word of explanation) Bert Howser, announcer at CKCK got married and celebrated by coming to the Mill City bringing 5 crazy musicians and the bunch congregated at A.R.R.L's station where they broadcast special program to 1AO and 4ER. (As far as they know) but it was picked up and acknowledged by listeners in a number of miles, no publicity. For an unsung demonstration of the artists, 1EN is going strong and has been reported in every district and every one of her fair virtues is described here. 0BH, 9THX is heard now and power, but gets out fairly well at times.

VANCOUVER DIVISION

A. J. Ober, Mgr.

This division is in full swing, traffic moving in all directions. It is just another month and nothing new is in the news. WNP—5 watt stations having worked WNP. The new D.P.M. is 5AH. (Gang, if you're interested in your division. This is coming later.) 3PM and 4ER have both been heard and worked but no reports from 4CN or 4TV. 0A4X, 9THX, 401M is heard on the air with good quality and power, but gets out fairly well at times.

VANCOUVER DISTRICT—4GO has had to fall back on a pair of openers, now has received another 30 watt set so will be going strong. 401M, an old station, is back on the air again with A.C. C.W. 4HG and 5ER have been inactive in the past month. 4A4X (our ex-AM) was on the air for a few weeks at Xmas. (FB, OM.) 6CN was not on the last part of the month, will not be on again for a few more months. He is now in the license and is handling traffic. 5AH is having battery trouble. 5EH has come back on the air again and hopes to be with the gang for the rest of the winter.

VANCOUVER ISLAND DISTRICT—3OT worked WNP for 18 minutes and reports something from him. He finds it difficult to get QSO east. 5HK with 5 watts of D.C.W. is going in Victoria.

PRINCE RUPERT DISTRICT—No report from 2BP, so don't know what's going on in his district. (Let's hear from you, OM—D.M.)

EDMONTON DISTRICT—4HE blew a resistor, rewired his set in reverse feedback, put in a large filter, and reports getting out better. He has had tuning trouble, and is experimenting to bring in those DX stations. His reports were received from 1st district stations. 4CL works all districts except the third, as is QSO WNP. 4GI is heard good from Minnesota, 4AI heard good from Iowa, and 4PI heard good from South Dakota. 4PI heard good from North Dakota and 4WE heard good from Minnesota, and 4EF heard good from South Dakota. 4EF heard good from North Dakota and 4WE heard good from South Dakota. The blame for everything, from a neighbors noisy cat to a thunder storm.

ALBERTA DIVISION—4AH is knock'n 'em over with 10 watts, and the purest long currents to feed the plates. He is QSO Can., 3AI, SWS and the 3rd district. The C.W. and 4DG has worked every district in the U.S. but says the 50-watt pup is hungry as he has only 720 volts to feed it with, and those Williams C.R.S. won't grow on weakbrush bushes. The B.C.L's are receiving code instruction every Saturday and Sunday night when C.W. and home, and they are becoming very enthusiastic over the brass-monitoring
Call Heard

HEARD DURING DECEMBER

Unless Otherwise Specified

IMPORTANT NOTICE

When preparing a list for QST, it is essential to observe the following rules:

1. Make your lists cover the period from the first of one month to the first of the next month preceding the date of issue of QST.
2. List only calls heard during the period covered by the list.
3. Forms close on the fifth of the month of the month of issue.
4. List the calls neatly on a separate sheet of paper, with a line of space between lines; do not embody them in a letter.
5. Arrange the calls as they will appear in QST: across the page, numerically from left to right, and with similar stations grouped together.
6. When preparing a list for QST, it is possible, but don’t let your list come in late.

T. W. Higgs, SKO
45 Howard Rd., Westbury Pk., Bristol, England

G. Rogers
Dunavon, Chesterfield Rd., Southford, Mddx., Eng.

Kenovan Secretan, SLF
149 Lower Parade, Barnes, London, SW, 13, Eng.

S. Snackman, 1AC
10 Ardmore Rd., Ponsonby, Auckland, New Zealand

F. D. Bell, 4AA
Palmerston South, New Zealand

W. L. Shiel
103 MacAndrew Rd., Dunedin, New Zealand.

Ralph Slade, 4AG
Dunedin, New Zealand, (Sept. 23 to Nov. 24)

Harold T. Maps, “BX”
Guanajuto, Gto., Mexico

J. Agusty, 4JE
San Juan, Porto Rico (Dec 4 to 17)

Albert Ravelo, Cuban 8 BY
Box 90, Santiago, Cuba.

File of the American Radio Relay League
February, 1924

QST XIII
The New Constitution of the A.R.R.L.

Adopted December 18, 1923, and Published Here For Your Information

CONSTITUTION

Article I
1. The name of this organization is The American Radio Relay League, Incorporated.

2. Its objects shall be the promotion of interest in Amateur Radio Communication and Experimentation; the relaying of messages by radio without charge; the furtherance of the public welfare; the advancement of the Radio Art; the representation of the radio amateur in legislative affairs; the maintenance of fraternalism and a high standard of conduct amongst its members; and the promotion of such other activities as are allied thereto.

Article II—Membership
1. Any person engaged in or interested in Amateur Radio shall be eligible to membership.

2. Applications for membership shall be submitted to the Executive Committee and a majority vote of this Committee shall elect to membership. The Committee may refuse to elect any applicant whose character, reputation or conduct would make him, in their opinion, an undesirable member; provided, that an applicant who is refused membership may have his case reviewed by the Board of Directors upon the recommendation of a minority of the Executive Committee. The Board of Directors in such case may, in its discretion, reverse the action of the Executive Committee.

3. Members shall comply with the requirements of the Constitution and By-Laws of the League, and with the radio laws and regulations of the country in which they reside.

4. A member may resign his membership by a written communication to the Secretary. If all his dues and other indebtedness have been paid his resignation shall be accepted.

5. Upon the written request of ten or more members that, for cause therein stated, a member of the League be expelled, the Board of Directors shall consider the matter, and if there appears to be sufficient reason shall advise the accused of the charges against him. He shall then have the right to present a written defense, and to appear in person or by duly authorized representative before a meeting of the Board of Directors, or their authorized representatives, of which meeting he shall receive notice at least thirty days in advance. Not later than their next meeting thereafter, the Board of Directors shall finally consider the case, and if in the opinion of two-thirds of the members present a satisfactory proof of his undesirability has been established, and the accused member has not in the meantime tendered his resignation, he shall be expelled.

Article III—Officers
1. The officers of the League shall be a President, a Vice President, a Secretary, a Traffic Manager, and a Treasurer.

2. The President and the Vice President shall be elected by the Board of Directors, and shall hold office for two years or until their successors are elected and qualified. The Secretary, the Traffic Manager, and the Treasurer shall be appointed by the Board of Directors.

Article IV—Management
1. The affairs of the League shall be managed by a Board of Directors under the Constitution and By-Laws and the general provisions of the laws under which it is incorporated. The Board of Directors shall consist of the President, the Vice President, one Director from each of the several territorial divisions of the League in the United States and Possessions, elected by the members of the League thereof, and a Canadian General Manager.

2. No person who is commercially engaged in the manufacture, selling or renting of radio apparatus or literature shall be eligible to membership on the Board of Directors. Directors shall serve without compensation from the League in any capacity.

3. The Board of Directors shall have such powers and duties as are prescribed by statute for a Board of Directors. It shall direct the investment and care of the funds of the League, shall make appropriations for specific purposes, shall act upon all questions of expulsion of members, and in general shall direct the business of the League, either itself or thru its officers and committees. It shall appoint the Secretary, the Traffic Manager, and the Treasurer and fix their salaries, and they shall be subject to removal only by
an affirmative vote of a majority of the members of the Board.

4. The President shall have general supervision of the affairs of the League, under the direction of the Board of Directors. He shall preside at the meetings of the Board of Directors, and shall, ex-officio, a member of all committees. The Vice President shall be responsible for such matters of general supervision as may be delegated to him by the President. In the absence or disability of the President, the Vice President shall preside at meetings of the Board of Directors and in general act in his stead.

5. The Secretary shall be the general manager of the League affairs under the direction of the President and the Board of Directors. He shall attend all meetings of the Board and record the proceedings thereof. He shall collect all moneys due the League and turn same over to the Treasurer. He shall certify the accuracy of bills or vouchers on which money is to be paid, and shall draw and countersign all checks. He shall have charge of the books and accounts of the League, and shall furnish to the Board of Directors from time to time such statements as may be required. He shall conduct the general correspondence of the League, and shall keep full records. He shall be in responsible charge, under the President and the Board of Directors, of all property of the League. He shall, with the approval of the Board of Directors, employ such clerical force as may be necessary and shall be responsible for the work of all employees under his jurisdiction. He shall be, under the direction of the Executive Committee, the general manager of the League publications. He shall prepare and submit at each annual session of the Board of Directors a comprehensive report on the progress and status of the affairs of the League under his jurisdiction. He shall perform such other duties as may be assigned to him by the Board. His entire time must be devoted to the affairs of the League, unless otherwise authorized by the Board of Directors.

6. The Traffic Manager shall have charge of the Traffic Department of the League. He shall report to the Board of Directors and shall furnish it from time to time such statements as may be required, and insofar as his duties will permit, shall attend all meetings of the Board of Directors, at the expense of the League. He shall prepare and submit at each annual session of the Board a comprehensive report on the progress and status of the affairs of the Traffic Department. He shall manage the relay traffic of the League and the general activity of the Traffic Department. He shall perform such other duties as may be assigned to him by the Board. His entire time must be devoted to the affairs of the League, unless otherwise authorized by the Board of Directors.

7. The Treasurer shall be the recipient of all moneys of the League and shall deposit the same in the name of the League in a depository satisfactory to the Board of Directors. He shall sign all checks drawn by the Secretary when such drafts are known to him to be proper and duly authorized. He shall invest such funds as may be ordered by the Board of Directors. He shall make a report at the annual session of the Board of Directors, and such other reports as may be prescribed, and, insofar as his duties will permit, shall attend all meetings of the Board of Directors, at the expense of the League. He shall perform such other duties as may be assigned to him by the Board of Directors. He shall furnish bond satisfactory to the Board of Directors, the expense of same to be borne by the League.

8. The Board of Directors shall meet in annual session for the conduct of League business in the month of February of each year.

9. Special meetings of the Board of Directors shall be called by the President at least every three months, by written notice stating the specific object or objects thereof, mailed to each Director at least three weeks prior to the date of said meeting.

10. The Board of Directors shall delegate sufficient of its powers to an Executive Committee consisting of the officers of the League, to enable the said committee to conduct the affairs of the Board of Directors between its meetings. The Committee shall keep a record of its meetings and actions, and shall report at every meeting of the Board of Directors.

11. The Board of Directors or the Executive Committee (subject to the direction of the Board) may at any time authorize any officer, director, other person, or committee, to perform any acts or functions which in the Corporation or By-laws may be prescribed to be performed by any specified officer, other person, or committee, whenever by reason of death, absence, disability or other cause, sufficient ground therefor shall appear to the Board or Executive Committee.

12. A majority of the members of the Board of Directors present in person, by alternate, or by proxy, shall constitute a quorum at any meeting of the Board.

Article V—Official Publication

1. There shall be an official publication maintained by the League in the form of a monthly magazine, the name of which shall be "QST". A copy of this magazine shall be supplied each month to every member
of the League in good standing. The general business management of this magazine shall be in the hands of the Secretary, under the direction of the Executive Committee. The policy of the magazine shall be determined by the Board of Directors and such policy shall be carried out by the Secretary under the direction of the Executive Committee.

Article VI—Traffic Department
1. That section of the League's activities concerned with the relaying of messages, tests, and related matters involving radio communication, shall be known as the Traffic Department and shall be managed by the Traffic Manager. Its purpose shall be the arranging of a traffic network for the expeditious handling of private messages between member-stations without charge, to establish and maintain orderly operating of amateur stations, to effect compliance with government radio communication laws, and to carry on such other practical operating activities as may be authorized by the Board of Directors.

BY-LAWS

Membership and Dues
1. The Secretary shall notify members of the expiration of their membership not less than thirty days in advance thereof.
2. Members in arrears shall be carried on the League records for ninety days, but if they have not renewed their membership by that date they shall be dropped.
3. The dues shall be $2.00 per year, payable annually in advance.

Divisions
4. The operating territory of the League in the United States and Possessions and in the Dominion of Canada shall be partitioned into Divisions as follows:

In the United States and Possessions:
- ATLANTIC DIVISION, the states of New York, Pennsylvania, New Jersey, Maryland and Delaware, and the District of Columbia;
- CENTRAL DIVISION, the states of Wisconsin, Michigan, Illinois, Indiana, Ohio and Kentucky;
- DAKOTA DIVISION, the states of Minnesota, North Dakota and South Dakota;
- DELTA DIVISION, the states of Louisiana, Mississippi, Arkansas and Tennessee;
- EAST GULF DIVISION, the states of South Carolina, Georgia, Florida and Alabama, and the island of Porto Rico;
- MIDWEST DIVISION, the states of Nebraska, Iowa, Kansas and Missouri;
- NEW ENGLAND DIVISION, the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut;
- NORTHWESTERN DIVISION, the states of Washington, Oregon, Montana and Idaho and the Territory of Alaska;
- PACIFIC DIVISION, the states of California, Nevada and Arizona, and the Territory of Hawaii;
- ROANOKE DIVISION, the states of Virginia, West Virginia and North Carolina;
- ROCKY MOUNTAIN DIVISION, the states of Colorado, Wyoming and Utah;
- WEST GULF DIVISION, the States of Texas, Oklahoma and New Mexico.

In the Dominion of Canada:
- MARITIME DIVISION, the provinces of Nova Scotia, New Brunswick and Prince Edward Island, and the British province of Newfoundland and its dependency, Labrador;
- ONTARIO DIVISION, the province of Ontario;
- QUEBEC DIVISION, the province of Quebec;
- WINNIPEG DIVISION, the provinces of Saskatchewan and Manitoba and The Northwest Territories;
- VANCOUVER DIVISION, the provinces of Alberta and British Columbia and the Yukon Territory.

5. In each division of the League there shall be a Division Manager who, under the direction of the Traffic Manager, shall have authority over the Traffic Department of the League within his division. He shall be responsible for the appointment of Assistant Division Managers, District Superintendents, and City Managers throughout his division. He shall be responsible to and shall report to the Traffic Manager.

6. The Division Managers shall be elected by the members of the League residing within the division concerned, and a plurality of the votes cast shall elect his successor.

Directors
7. From each division of the League in the United States and Possessions a Director shall be elected by the members of the League residing therein.
8. The Directors shall be members of the Board of Directors of the League; they shall keep themselves informed on conditions and activities in their respective divisions, and on the needs and desires of the League members therein, that they may faithfully and intelligently represent them in the Board of Directors. They shall, so far as able, attend all meetings of the Board.
9. The Directors shall have the authority to appoint committees and assistants to aid them in the discharge of their duties.

Article VII—Amendments
1. This Constitution may be amended at any meeting by a two-thirds vote of the entire membership of the Board of Directors, to be determined by yeas and nays, provided due notice of such proposed amendment shall have been submitted every Director at least sixty days in advance.
In the absence or inability of the Director to attend a meeting of the Board of Directors he may appoint a member of the League as an alternate, who may attend the meeting and act in his stead.

10. The traveling expenses of members of the Board of Directors or their alternates, from their homes to the place of meeting of the annual session of the Board, and returning to their homes, both by shortest route, shall be paid by the League.

11. Upon the written request of twenty-five per cent. or more of the members of a division or of ten or more members of the Board of Directors that, for cause therein stated, a Director be removed from office, the Board of Directors shall consider the matter and, if there appears to be sufficient reason, shall advise the Directors of the charges against him. He shall then have the right to present a written justification of his conduct and to appear in person or by duly authorized representative before a meeting of the Board of Directors, of which meeting he shall receive notice at least thirty days in advance. Not later than their next meeting thereafter, the Board of Directors shall finally consider the case, and if in the opinion of two-thirds of the members present a satisfactory proof of his undesirability has been established and the matter has not in the meantime been adjusted to the satisfaction of the complainants, and his resignation has not been tendered and accepted, the office may be declared vacant and a new election ordered in the division affected.

12. On any date not later than noon of the first day of November of an election year in any division, nominating petitions signed by ten or more members of a division and naming a member of the division as candidate for Director, may be filed with the Secretary. The Board of Directors shall solicit such petitions in the September and October issues of "QST" in each election year by a notice that will show the names of the incumbents.

13. The Executive Committee shall delete the name of any nominee who may be ineligible to election and the name of any who may withdraw by written communication. The remaining names shall be listed on a ballot, in the order of the number of nominations received. During the first week of November the Secretary shall send by mail to every member of the League in the divisions in which elections are being held, a ballot listing the candidates for Director in his division, and a return envelope, soliciting a vote for one name. The ballot shall contain a copy of By-Laws 12, 13, 14, 15 and 16. The Executive Committee shall constitute itself a Committee of Tellers; but any member of the League who shall deliver to the Secretary on or before the first day of November of election year a written petition signed by at least ten members of a division, stating their desire that he be a member of the Committee of Tellers, shall also be a member of that committee insofar as concerns the counting of the vote from his own division; provided that the aforesaid signatures shall not have appeared on another similar petition. Ballots, to be counted, shall reach the Secretary not later than the first day of December of election year. The Committee of Tellers shall meet at the headquarters office of the League as soon after the first day of December as possible and in secret, but in the presence of each other, shall count the vote, after first eliminating the ballot of anyone disqualified from voting. They shall forthwith prepare and sign a report of the results of the vote, declaring duly elected as new Directors the candidate in each division receiving the greatest number of votes of the League members therein; and they shall turn over all their records and ballots to the Secretary for presentation at the next annual session of the Board of Directors.

14. For the 1923 elections, a Director shall be elected for a term of one year in the following divisions: Central, New England, Northwestern, Roanoke, Rocky Mountain and West Gulf; and for a term of two years in the following divisions: Atlantic, Dakota, Delta, East Gulf, Midwest and Pacific. Thereafter the terms of all Directors shall be for two years, or until their respective successors are duly elected and qualified.

15. The terms of all Directors shall begin at noon on the first day of January of the year after that in which they are elected.

16. Whenever a vacancy occurs in the office of Director in any division, a special election shall be held as soon thereafter as practicable, in the general manner hereinbefore prescribed for regular elections.

President and Vice-President

17. The President and the Vice President of the League shall be elected by the Board of Directors at their annual session in presidential election year. Should either officer be chosen from the membership of the Board of Directors, that officer if he accepts the office shall immediately resign his office of division Director, and a new election to select his successor shall be held in the division affected as soon thereafter as practicable, in the general manner hereinbefore prescribed for the election of Directors.

18. A President and a Vice President shall be elected at the 1924 annual session of the Board of Directors and every two years thereafter. Their terms of office shall begin at the conclusion of the meeting at which they are elected and shall continue for two years, or until their successors are duly elected and qualified.
19. A vacancy in the office of President shall be filled by the Vice President. A vacancy in the office of Vice President shall be filled by appointment by the Board of Directors for the unexpired remainder of the term.

Canada

20. On any date not later than the first day of November of an election year in Canada, nominating petitions signed by ten or more Canadian members of the League and naming a Canadian member as candidate for Canadian General Manager, may be filed with the Secretary. The Board of Directors shall solicit such petitions in the September and October issues of "QST" in each Canadian election year by a notice that will show the name of the incumbent.

21. The Executive Committee shall delete the name of any nominee who may be ineligible to election and the name of any who may withdraw by written communication. The remaining names shall be listed on a ballot in the order of the number of nominations received. During the first week of November the Secretary shall send by mail to every member of the League in Canada, a ballot and a return envelope, soliciting a vote for one name. The ballot shall contain a copy of By-Laws 20, 21, 22 and 23. The Executive Committee shall constitute itself a Committee of Tellers to canvass the vote; but any Canadian member of the League who shall deliver to the Secretary on or before the first day of November of election year a written petition signed by at least ten Canadian members stating their desire that he be a member of the Committee of Tellers, shall also be a member of that committee; provided that the additional signatures shall not have appeared on another similar petition. Ballots, to be counted, shall reach the Secretary not later than the first day of December of election year. The Committee of Tellers shall meet at the headquarters office of the League as soon after the first day of December as possible, and in secret, but in the presence of each other, shall count the vote, after first eliminating the ballot of anyone disqualified from voting. They shall forthwith prepare and send a report of the results of the vote, declaring the eligible persons and the greatest number of votes elected as the new Canadian General Manager; and they shall turn over all their records and ballots to the Secretary for presentation at the next annual meeting of the Board of Directors.

22. A Canadian General Manager shall be elected in 1923 and every two years thereafter. His term of office shall begin at noon on the first day of January of the year after that in which he is elected and shall continue for two years, or until his successor is duly elected and qualified.

23. The Canadian General Manager shall be a member of the Board of Directors. He shall be the liaison officer of the League between the Board of Directors and its Canadian members. He shall have general supervision of League activities in Canada and shall be responsible to the Board of Directors for League welfare in all matters in Canada. He shall be informed on conditions and activities in Canada and on the needs and desires of League members therein, that he may faithfully and intelligently represent them in the Board of Directors. He shall, so far as able, attend all meetings of the Board of Directors.

24. The Canadian General Manager shall have the authority to appoint committees and assistants to aid him in the discharge of his duties; he shall appoint an alternate who, in his absence or disability shall act for him. All such appointees shall be Canadian members of the League. In the absence or inability of the Canadian General Manager to attend a meeting of the Board of Directors the alternate shall attend in his stead and shall have full power to represent the Canadian divisions.

25. A vacancy in the office of Canadian General Manager shall be filled by special election as soon thereafter as practicable, in the general manner hereinafter prescribed for regular elections.

26. The policy of the League in Canada shall be that of a friendly hand for the amateurs of a sister country pending their growth to such numbers and strength that their ability to form and conduct a self-governing non-commercial amateur organization throughout the Dominion is evident. The activities of the League in Canada shall be regarded as a temporary stewardship undertaken at the request of Canadian amateurs. Whenever Canadian amateurs shall petition for their own organization, and it is manifest to a majority of the entire Board of Directors that the success of a separate Dominion organization is assured, the Board of Directors shall aid in establishing and proclaiming a separate all-Canadian organization to be known as the Canadian Radio Relay League to operate under a constitution similar in tenor to that of this League; and this League shall henceforth relinquish all direct activity in Canada.

1923 Elections

27. Especially for the elections of 1923 the dates specified in these By-Laws for the nomination and election of Directors and Canadian General Manager, including the dates specified for the various steps to be taken in the handling thereof, shall be changed to read exactly five months later. Especially for the 1924 session, the date specified in the Constitution and these By-Laws for the holding of the annual session
39. On all questions of order and procedure not otherwise determined by the Constitution or these By-Laws, or by a special rule of order adopted by a two-thirds vote, the provisions of the Working Code appended to the Revised Cushing's Manual shall constitute the Standing Rules of Order for meetings of the Board of Directors; and Special Rules, A, B, D, E, shall be included therein and are hereby severally adopted.

40. The regular order of business at meetings of the Board of Directors shall be as follows:

(1) Roll-call
(2) Consideration of Minutes
(3) Appointments and Elections
(4) Special Orders (if any have been made)
(5) Reports of Officers
(6) Reports of Standing Committees
(7) Reports of Special Committees
(8) Unfinished Business
(9) New Business

The above order or any part of it may be suspended by a two-thirds vote at any meeting.

Amendments

41. These By-Laws may be amended in any part by a two-thirds vote, to be determined by yeas and nays, of the entire membership of the Board of Directors, at any meeting; or, provided due notice of such proposed amendment shall have been submitted every Director at least sixty days in advance, may be amended by a two-thirds vote, to be determined by yeas and nays, of the Directors present at any meeting, a quorum being present and voting. They may not be suspended except in the particular cases provided for in the By-Laws themselves.

42. Without changing their import the Board of Directors may from time to time renumber these By-Laws so as to serve the purpose of ready reference thereto.

CALLS HEARD

(Concluded from page XVIII)