“Reliable”—
is the one word that best describes that type of service rendered by
Cunningham Radio Tubes in millions of receivers and the type of
service rendered by Cunningham dealers in thousands of com­
munities.
These tubes are winning new friends every day and are holding old
friends year after year. The enormous increase in the number of
Cunningham Radio Tube users has not been brought about by
magic. It has been brought about by the fact that only quality
materials, quality workmanship and advanced scientific ideas are ex­
emplified in the Cunningham product.
For new heights of efficient sensitivity, install Cunningham Radio
Tubes in every socket of your receiver.

Since 1915—Standard for All Sets
ALL TYPES C & CX

Cunningham Inc.

New York Chicago San Francisco

Manufactured and sold under rights, patents and inventions owned and or controlled by Radio Corporation of America.
CLEAR at a whisper....

CLEAR at the volume of a brass band....

REAL!

TURN it low—use the great power as a reserve to get the climax of a song without a crash. Turn it higher—let the dance music sound out clearly above the talk and the shuffling of feet. Or use it in a great hall—and get the actual volume of a great orchestra. Every instrument is real! With RCA Loudspeaker 104—get natural tone and natural volume.

RCA Loudspeaker 104 is not only a power loudspeaker, but eliminates the "B" batteries of most sets. With RCA Radiola 25 or 28, it can be adapted to eliminate all batteries. It operates on the 50 to 60 cycle, 110 volt A.C. lighting circuit. $275

RCA Loudspeaker 102 adds a power unit to the Model 100. Plugged in on the house current, it has power to deliver almost any volume of tone—clear and undistorted. For use on 50 to 60 cycle, 110 volt A.C. lighting circuit... $140

RCA Loudspeaker 100 gives clear, mellow, undistorted tone up to any volume your set can give it. It is really the only loudspeaker to buy when you use the power tubes... $35

RCA Loudspeaker
MADE BY THE MAKERS OF THE RADIOLA

SAY YOU SAW IT IN Q S T—IT IDENTIFIES YOU AND HELPS Q S T
Hammarlund's New Creation
The "MIDLINE" Condenser

The new Hammarlund "MIDLINE" condenser makes its bow with the claim of superiority over any other type ever produced.

Experience (yours and ours) is responsible for its many excellent features. "Straight-line-capacity" crowded the low waves; "Straight-line-frequency" crowded the high waves; "Straight-line-wave-length" merely compromised between the two. But the Hammarlund "Midline" retains the important advantages of these earlier types without any of their disadvantages.

All of the tried and true Hammarlund features are included: soldered, non-corrosive brass plates with tie bars; rib-reinforced aluminum alloy frame; minimum dielectric; one-hole mounting with anchoring screw; bronze clockspring pigtail; friction brake. In addition, there have been added ball and cone bearings, and a full-floating rotor shaft, the only function of which is to turn the rotor plates. It supports no weight; it may be entirely removed, or it may be adjusted for coupling to other condensers for tandem operation, or for mounting a variable primary coil.

The "MIDLINE" is much more compact and even stronger and more beautiful than previous Hammarlund models.

The better dealers will have it soon.

For Better Radio

Hammarlund

HAMMARLUND MANUFACTURING COMPANY
424-438 W. 33d Street, New York
### THE COMMUNICATIONS DEPARTMENT, A. R. R. L.

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<table>
<thead>
<tr>
<th>State</th>
<th>Address</th>
<th>City</th>
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<tbody>
<tr>
<td>L. M. Wallace</td>
<td>507 No. James St.</td>
<td>Hazleton</td>
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#### CENTRAL DIVISION

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<tbody>
<tr>
<td>H. E. Largen</td>
<td>805 Washington St.</td>
<td>Washington, D. C.</td>
</tr>
<tr>
<td>A. R. Goodall</td>
<td>1824 Indianapolis Ave.</td>
<td>Indianapolis</td>
</tr>
<tr>
<td>H. W. Daniels</td>
<td>1632 Washington St.</td>
<td>Chicago</td>
</tr>
<tr>
<td>C. S. Taylor</td>
<td>504 Market St.</td>
<td>Des Moines</td>
</tr>
<tr>
<td>G. L. Crossley</td>
<td>711 Newton Ave.</td>
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#### DAKOTA DIVISION

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<td>Fargo</td>
</tr>
<tr>
<td>F. J. Beck</td>
<td>12362 Vance St.</td>
<td>Minneapolis</td>
</tr>
<tr>
<td>C. S. Miller</td>
<td>34 Penn Ave., No. 15</td>
<td>St Paul</td>
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#### DELTA DIVISION

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<tr>
<td>L. M. Hunter</td>
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</tr>
<tr>
<td>C. A. Frazier</td>
<td>1200 36th Ave.</td>
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</tr>
<tr>
<td>J. W. Gillett</td>
<td>610 28th Ave.</td>
<td>Little Rock</td>
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<tr>
<td>L. K. Bush</td>
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<td>Yorks</td>
</tr>
<tr>
<td>A. J. Westor, Jr.</td>
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#### MIDWEST DIVISION

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<tr>
<td>F. S. Kekeven</td>
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<td>Kansas City</td>
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<tr>
<td>L. B. Lazerus</td>
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#### NEW ENGLAND DIVISION

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<tr>
<td>Frederick</td>
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</tr>
<tr>
<td>M. L. Smith</td>
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<tr>
<td>V. W. Hinde</td>
<td>30 E. 44th Ave.</td>
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<td>D. B. Finner</td>
<td>48 E. 43rd Ave.</td>
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<tr>
<td>C. T. Kerr</td>
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#### NORTHWESTERN DIVISION

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<td>K. S. Nauweg</td>
<td>502 E. 26th St.</td>
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<tr>
<td>A. H. Willam</td>
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<td>C. E. Ditton</td>
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<td>C. E. Newcome</td>
<td>500 E. 4th St.</td>
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<tr>
<td>L. E. Smith</td>
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<tr>
<td>St. Clar Adams</td>
<td>500 E. 2nd St.</td>
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<tr>
<td>R. B. Yelen</td>
<td>500 E. 1st St.</td>
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<tr>
<td>T. F. Larnes</td>
<td>500 E. 22nd St.</td>
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</tr>
<tr>
<td>S. Clar Adams</td>
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#### ROCKY MOUNTAIN DIVISION

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<tr>
<td>C. C. Stedman</td>
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<td>Denver</td>
</tr>
<tr>
<td>Art Johnson</td>
<td>534 E. 20th St.</td>
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<tr>
<td>N. B. Kowal</td>
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#### SOUTHEASTERN DIVISION

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<tr>
<td>A. D. Trun</td>
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<td>Montgomery</td>
</tr>
<tr>
<td>W. F. Greenan</td>
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#### WEST GULF DIVISION

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<tr>
<td>W. B. Forrest</td>
<td>300 E. 26th St.</td>
<td>Houston</td>
</tr>
<tr>
<td>K. K. Etch</td>
<td>300 E. 25th St.</td>
<td>Houston</td>
</tr>
<tr>
<td>E. A. Sahn</td>
<td>300 E. 24th St.</td>
<td>Houston</td>
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#### MARITIME DIVISION

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<tbody>
<tr>
<td>Loyd Reid</td>
<td>300 E. 23rd St.</td>
<td>St. John</td>
</tr>
<tr>
<td>T. B. Levey</td>
<td>300 E. 22nd St.</td>
<td>St. John</td>
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<tr>
<td>W. G. Borrett</td>
<td>300 E. 21st St.</td>
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</tr>
<tr>
<td>W. A. Hynden</td>
<td>300 E. 20th St.</td>
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#### ONTARIO DIVISION

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<tr>
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<tbody>
<tr>
<td>W. T. Sloan</td>
<td>1237 E. 20th St.</td>
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#### QUEBEC DIVISION

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<tbody>
<tr>
<td>A. C. Reid</td>
<td>1441 W. 20th St.</td>
<td>Toronto</td>
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#### QUEBEC DIVISION

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<tr>
<td>A. C. Reid</td>
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#### VAN-ALTA DIVISION

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<tr>
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<tr>
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<tr>
<td>A. R. Asmussen</td>
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<tr>
<td>F. E. Buff</td>
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#### PRAIRIE DIVISION

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<th>State</th>
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<tbody>
<tr>
<td>P. E. Ruttian, Jr.</td>
<td>300 E. 20th St.</td>
<td>Winnipeg</td>
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</tbody>
</table>

*Temporary stations in Maryland are requested to report to SCM Easton of Wilmington, Del. until an SCM is elected for the Section.*
Why the CR-18 is so Efficient

The eight outstanding features of this low-wave receiver, given below, will satisfy the most critical amateur. Grebe experience, of seventeen years standing, guarantees the quality of every detail.

An Antenna Coupling Coil provides variable electro-magnetic coupling between antenna and grid circuit. Permits of harmonic tuning to increase signal strength, gives greater selectivity and reduces interference and induction noises.

Losses are reduced to a minimum.

Plug-in Coils allow rapid-change from one frequency band to another.

Grebe S-L-F Condensers insure ease of tuning and maximum signal strength.

Beat Frequency Control permits tuning to a fraction of a kilocycle.

Plate Circuit design gives smooth control of regeneration without affecting wave-length calibration and tuning.

Cushion Sockets eliminate microphonic noises.

The Six Self-Supporting Air Dielectric Coils are very rugged, which insures long life.

Write for full description and charts

A. H. Grebe & Co., Inc., 109 West 57th St., New York
Factory: Richmond Hill, N.Y.
Western Branch: 443 So. San Pedro St., Los Angeles, Cal.

This Company owns and operates stations WAHG and WBOQ; also low-wave rebroadcasting stations, mobile WGMU and Marine WRMU, and stations 22V and 2XE.

Trade Mark

All Grebe apparatus is covered by patents granted and pending.

A modern coupled regenerative circuit receiving between 10 and 200 meters (1500 to 30,000 kilocycles).
VOLUME X  SEPTEMBER 1926  NUMBER 9

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- O. W. L. S. (Page 7)
- Financial Statement (Page 8)
- Break-In and Remote Control (Page 8)
- Vacuum Resistances (Page 9, John M. Clayton)
- Four Tuners in One (Page 13, Stephen I. Gilchrist)
- Luminous Frequency Standards (Page 14, Harold P. Westman)
- Using Wave-Meters Without Indicating Devices (Page 17, L. H. Dawson)
- Converting the ET3019 (Page 19, Wm. M. Henderson)
- Election Notice (Page 20, Frank Hildbert)
- Examining Quartz for Oscillator Use (Page 22, Joseph Morgan)


Kenneth B. Warner (Secretary, A.R.R.L.), F. Cheyney Beekley (Managing Editor and Advertising Manager)

Robert S. Kruse, John M. Clayton, David H. Houghton, Assistant Technical Editor, Circulation Manager

Subscription rates in United States and Possessions, Canada, and all countries in the American Postal Union, $2.50 per year, postpaid. Single copies, 50 cents. Foreign countries not in American Postal Union, $3.00 per year, postpaid. Remittances should be by international postal or express money order or bank draft negotiable in the U. S. and for an equivalent amount in U. S. funds.

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Member of the Radio Magazine Publishers' Association.
THE AMERICAN RADIO RELAY LEAGUE

The American Radio Relay League, Inc., is a non-commercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is 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 the world and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite. Correspondence should be addressed to the Secretary.

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2515 Catherine St.,
Dallas, Tex.

Address General Correspondence to Executive Headquarters, Hartford, Conn.
Editorials

Loyalty

Government regulation of radio broadcasting has now broken down completely. Although the White Bill passed the House and the Dill Bill passed the Senate, the Congress adjourned without enacting any legislation because the differences between the two bills could not be reconciled in the short time remaining before adjournment. An emergency resolution, which would have given the Department of Commerce adequate authority to regulate radio until legislation can be enacted in December, was then passed by both Houses but unfortunately not in sufficient time to be signed before adjournment, which is necessary for it to become effective. Thus the adjournment of Congress left the country exactly where it has been all these years—with only the ancient 1912 law. Then Secretary Hoover sought an opinion of his powers under that act from the Attorney General. It confirmed what he must have suspected for years—that he must give a broadcasting station a license upon demand, and that that station can use practically any wavelength and power and operating hours it chooses. Thus there can be no control over broadcasting until the end of the year.

Amateur interest in this spectacle is chiefly in the opportunity it gives us to compare broadcasting and our own non-commercial amateur radio. Broadcasting is essentially a matter of commercial competition, and it will not be particularly surprising to see the "business" instinct take advantage of every legally permissible opportunity to send broadcasting to the everlasting bowwows. Already many stations are shifting their waves, increasing powers, and changing hours, since they have no particular co-operation amongst themselves and no general loyalty to an all-embracing organization of their own. How different this selfish individualism from the splendid loyalty to organization which has always characterized our American Radio Relay League! Our A. R. R. L. stands out to-day like a lighthouse in a fog as a really co-operative association whose members are loyal to the organization and its principles, and probably the only one whose members will be sufficiently possessed of loyalty to organization to abide by the "gentlemen's agreements" of the Fourth National Radio Conference to which they are parties.

Is it necessary to emphasize again that the League still stands for the amateur wavelength allocations to which it agreed? We trust not. It is now more important than ever that we observe the wavebands specified on our existing station licenses. More than ever before we are on our honor to do the fair thing. The stuff of which radio groups are made will be clearly shown in the coming few months, and we want to be able to say that amateurs played the game squarely. You fellows haven't any idea how much strength your representatives at Washington will gain if they are able to say in the future that amateurs did not take advantage of the technical breakdown of authority to run amok and become radio pirates, but that instead they were square-shooters and played the game like sportsmen! It won't be sporting—as the "G's" say, it won't be cricket—to do anything else now. One thing does need emphasizing: This is only a temporary situation. It is definitely assured that a Congress conference committee, of members from both Houses, will meet in November for the sole purpose of reconciling differences in the two bills that have been passed and perfecting a new bill that can be adopted as soon as Congress convenes in December. It is perfectly simple to see that when new regulations do come, they may come with a vengeance to those who to-day decline to play fair, and those who show they are made of the right stuff will fare much better. In other words, behaving ourselves now is certain to pay us huge dividends in the near future.

So we know what A. R. R. L. amateurs are going to do, don't we, fellows?

The I. A. R. U.

Although the International Amateur Radio Union was formed in April of last year, it was just a year ago that the greatest number of American amateurs was enrolling, and hence right now is the peak in the expiration of the first-year memberships. We want to say a word to our A. R. R. L. members who belong to the Union to urge the importance of their prompt renewal of membership.

The original concept of the Union, it will be remembered, was as a federation of na-
The list which appears on page 33 of July still stands with the exception of the following corrections.

Official Wavelength Stations added:
Canadian 2BE.
U.S. 9CXU.

Crystal-control OWLS added:
**2DS
**9AUG
**6AOI
**2BRB

Cancelled:
9ECC

Those not familiar with the uses of the OWLS are reminded that these are the A.R.R.L. guideposts. They announce their wavelengths frequently while engaged in ordinary amateur communication and their accuracy is kept up so that they can be relied upon for rough calibrations of receiving sets and wavemeters. Some OWLS announce in wavelength, others in KCs. The idea has worked out only fairly well; it has many drawbacks. It is the opinion of a considerable number of the officials of the Union that it by rights should be the originally-conceived federation of independent national societies, and that the chief service of the Union to date has been in the establishment of healthy and flourishing national sections which have developed organization spirit in the national groups where no representative amateur association existed before. It is therefore hoped that in a relatively short time the successful sections of the I. A. R. U. can be converted into autonomous societies, all of these national associations then locking hands to form a Union.

This prospect for the Union, it seems to us, is a most encouraging one. It answers any doubt that may be residing in the minds of American amateurs concerning why there should be a United States Section and a Canadian Section of the I. A. R. U. when they already have their A. R. R. L. to represent them in international relations. The day is coming, boys. Meanwhile your dollars are helping along the work of the Union to the place where genuine societies of the real article in transmitting amateurs may exist in the other countries of the globe, capable of joining with our A. R. R. L. in the international federation. This good work rates the heartiest support of every ham in the richest country on earth. Think it over, O. M., and if your I. A. R. U. membership has expired (or if you've never joined), send in that dollar's dues at once. It will pay rich dividends in better international amateur radio.

K. B. W.

Financial Statement

By order of the Board of Directors the following statement of the income and disbursements of the American Radio Relay League for the second quarter of 1926 is published for the information of the membership. K. B. WARNER, Secretary.

STATEMENT OF REVENUE AND EXPENSES FOR THE THREE MONTHS ENDED JUNE 30, 1926.

REVENUE

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**Net Gain from Operations**                      | **$631.61**  |
Break-In and Remote Control

By John M. Clayton, Assistant Technical Editor

E ver since the advent of good C.W. transmitters and receivers QST has been advocating the use of break-in systems and has urged the gang to put in some form of break-in arrangement in order to facilitate calling, answering and traffic handling. There is nothing like a good break-in communication with some fellow ham whose station is similarly equipped.

Suppose your station is equipped to work break-in and you want to send a CQ. You would start off something like this, “CQ CQ CQ u 3ZZZ 3ZZZ 3ZZZ bk CQ CQ CQ u 3ZZZ 3ZZZ 3ZZZ bk”, etc. That little “BK” does the whole trick. It tells the other fellow the whole story. He knows that you are ready to receive answers to your CQ even while still calling CQ; he knows that you are wiping over the band with your receiver listening for answers. If you are equipped with break-in you start to call him as soon as you hear his “bk” and you keep on calling him until he either answers you or someone else. If he answers, almost the first dot he makes you stop calling and see who he is calling, and if it is you, you are all set for some genuine fun.

If it is to be a rag-chew, you can stop him in the middle of the conversation by making a long dash and a short “bk” and he can do likewise. If it is traffic handling and you start off by dropping several words, you do not have to wait until he has finished a long message to ask him to QT A two words—no sir, you step on the key just as soon as you lose the first word and tell him to go ahead on the last word you received OK. If you have QRM and are losing him, or he is fading, you just make a dash and say “AS QRM” or “AS QSS” and he QRX’s until you say “GA”. And you can keep this up by the hour, handling traffic with the same rapidity, precision and accuracy as wire telegraphy would permit.

Many hams are able to work break-in but have not become acquainted with the more or less standard abbreviation which tells the world that break-in communication is desired. We have worked several fellows in the laborious “you talk and I’ll listen” fashion, only to learn after a twenty minute QSO that the other fellow had a break-in outfit, and wouldn’t use it even when we said “pse bk me”, simply because the “bk” didn’t mean anything. If a fellow tells you “bk” or “bk me” by all means give him a long dash and a quick call, if you are working him. If he says this during a “CQ” he is inviting you to call him immediately. As soon as he hears you call, he is going to stop his CQ until you sign. So just as soon as he lays off CQ, give your call once or twice. If he does not come right back at you, you might as well give up for he is listening to someone else. Break-in operation, even when calling, will save many minutes of useless calling and will help to establish many additional QSO’s and when they are established it will speed up traffic handling greatly.

Simple Break-In Systems

Practically C.W. and I.C.W. commercial coastal stations are working break-in with ships at sea nowadays. Their methods are obvious when it is learned that most of the transmitters are located many miles from the receiving station. By means of landlines and relays the transmitter is started, stopped and keyed from the receiving station far away from the transmitter’s QRM. The commercial operator can hear any ship who is not transmitting exactly on his wavelength even while handling traffic. He can sit on the key for an hour and at the same time hear about 95 per cent of the ships who are calling him. Fine, but impractical for amateur stations? Not by a long shot.
The simplest form of break-in consists in merely listening on the receiver with the antenna “send receive” switch on the “send” side, connected to the transmitter. If your receiver is placed close to the transmitter so that the antenna lead-in to the transfer switch is close to the receiver, or if the receiver is in inductive relation to the coils in the transmitter, on short waves you can hear many many stations when the antenna is connected to the transmitter.

Operating the receiver in this fashion you should have no trouble in working break-in with all the fellows you hear, who are prepared to do likewise. You may find, tho, that you cannot pick up stations on wavelengths very close to that to which your transmitter is tuned. You will find with some types of keying that the transmitting tubes continue to oscillate weakly (but more than enough to kill all reception on the transmitter’s wavelength) even when the key is open. If you are keying in the primary circuit of your plate transformer and you get interference from the transmitter when the key is open, it may be due to the fact that the center-tap on the filament transformer is not in the electrical center of the transformer and plate voltage is secured from this unbalanced filament center-tap. Sometimes the trouble can be cured by the scheme shown in Fig. 1, which is the familiar resistance center-tap arrangement. The resistance can be a 200-ohm potentiometer. With the key open, the slider of the potentiometer is turned, while listening on the receiver, until the transmitting tubes oscillations cease. Break-in can then be accomplished on all waves. This arrangement will not work in all cases. A positive cure for all types of transmitters will be described later on.

Separate Antennas

In some cases it is not possible to pick up sufficient energy from the antenna lead-in or the grounded transmitter secondary due to the fact that the receiver is not inductively associated to either, or is across the room from the transmitter. In such cases and also when extreme DX reception, on break-in, is desired, an antenna should be used with the receiver. In the old days of spark we used to use the same antenna, having the transmitter and receiver alternately connected to it by means of a relay operated by the transmitting key. This is not a very satisfactory method since it involves high voltage insulation on the relay, and is not at all needed with C.W. when a most modest one-wire antenna can be permanently connected to the receiver. In almost all cases a piece of bell-wire string around the picture molding in the house, or run through the length of the attic, will bring in all the DX (with less static) one could possibly want. As practically all short wave receivers are equipped with primaries which are not tuned to the received signal, the only precaution to be observed with the separate antenna is to make certain that the natural period of the antenna (or its main harmonics) is not the same as the working wavelength of the transmitter. If such is the case, the receiving antenna will pick up enough of the transmitters voltage to cause rather disastrous sparking in the mash of the detector tube when the transmitter, and grid leaks and grid condensers will be burned open. No trouble should be had in avoiding this, though. Then, barring keying troubles, the separate receiving antenna will allow even better break-in than before.

Key Locations

The ideal method of keying a self-rectifying transmitter, or one employing chemical rectifiers with not too large a filter is in the primary of the plate transformer. The inductance of the transformer allows the keying current to reach the tube gradually instead of with a terrific bang, as would be the case if keying were done in the grid circuit or in the high voltage lead. As has oft been said, the less the bang of plate voltage on the tube, the less will be the key thumps, and the smaller the strains on the tube itself. From a keying standpoint, then, it is agreed that keying in the primary of the plate transformer is as good a method as any. From the break-in standpoint, though, it is not always possible to stop the tube from oscillating even when the key is wide open and even with the balanced center-tap arrangement.

A highly satisfactory method of break-in keying is in the grid circuit of the tube. This very effectively prevents the tube’s oscillating and makes the receiver absolutely quiet when the key is open. But grid circuit keying results in terrible key thumps. Why not combine the two systems by using a relay with two sets of contacts, one of which closes the grid circuit first, and a fraction of a second later closes the plate transformer circuit, reversing the process when the key is opened? This method
has been tried and has been found to be a complete success both from the key-clickless and break-in point of views. A system similar to this was described in a “Communication” by Norman R. Hood in the March 1926 issue of QST on page 57.

A Leach relay, or some form of relay having two sets of insulated contacts, is required. The Leach device was described in detail in QST several years ago. A general idea of its construction can be obtained from the illustration accompanying the above-mentioned “Communication”.

A relay of this type is not absolutely essential, however. The illustration of Fig. 2 shows a very good single contact relay which was made from a standard “main line” telegraph sounder. The usual brass sub-base was removed and a piece of 3/16 inch bakelite having the same dimensions and drilled with the brass base as a template, was substituted. Two large Eby binding posts were attached to the bakelite base and the contacts were made of 1/2 x 1/4 inch silver slugs 1/16 inch thick. These pieces of silver can be obtained from almost any jeweler. Notches were filed in the hammer and anvil of the sounder and the slugs were fitted in and soldered in place.

On the hammer, directly below the backstop screw, a hole 3/16 inch in diameter was drilled to a depth of about 1/8 inch, and a hard rubber rod was fitted in the hole and held in place with glue. The top of the rod was cut off flush with the hammer.

and filed down smoothly. This insulation prevented the hammer from closing the contact through the stop-screw when in the “up” position. Bearing contacts were avoided by the use of a heavy piece of woven braid soldered to the end of the hammer and the “U” shaped bearing support. A piece of thin phosphor bronze spring can be substituted. With the contacts described, the relay will satisfactorily break 25 amperes without sticking or sparking excessively even though the relay is operating at Vibroplex speed. This relay comprises the elements of a good break-in relay in that its contacts are large enough to break the plate transformer primary circuit of almost any amateur set in use today.

An additional set of contacts should be used to open and close the grid circuit. The construction of a suitable insulating arm and contacts to fit this relay is shown in Fig. 3. By means of the screw which was used as the downward stop for the hammer, a piece of bakelite strip (C) 1/8 inch thick, 3 inches wide and 2 1/2 inches long is attached to the hammer. At one end of the strip a phosphor bronze spring A is bolted. Through the other end of the bronze spring a Ford spark coil contact is riveted. Below C is a bracket B which carries another Ford contact B. The space between the contacts is so arranged (by bending the spring) that the A-B contacts close just a small fraction of a second before the main power contacts make. A flexible lead is soldered to A and another lead to the bracket B. These leads are connected to the grid circuit as shown in Fig. 4. When the key in the relay winding circuit is closed the hammer comes down, the A-B contacts close the grid circuit and immediately afterwards the main power contacts close and the plate transformer supplies voltage to the plate of the tube. When the key is opened the process is reversed.

Keying Synchronous Rectifiers

When keying a synchronous rectifier, in order to get a good note under operating conditions, it may be necessary to resort to the same kind of keying just described. Usually keying in the primary of the plate transformer alone results in a bad note. With the relay just described the “sine” can be keyed in both plate and grid circuits and a good note plus break-in is assured.

Remote Control

It is difficult to say how far remote control is. One may justly call a transmitter remotely controlled when it is situated across the room from the receiver, or when it is a hundred feet from the operating table. For the sake of getting started, though, lets say that a transmitter is remotely controlled when you have to go down a couple of flights of stairs and out into the yard before you can start or stop it!
The further the transmitter is from the receiver, the easier the break-in job becomes. If the transmitter is situated in a dog-house out in the yard 75 or 100 feet from the receiver you are comparatively safe from tube oscillations with the key open, and your problem becomes one of merely starting the filament heating transformer and keying the plate supply, the receiver being operated on a separate antenna.

There are countless ways in which the thing can be done. First, though, let's say just a word or two of the advantages of a remotely controlled outfit. In the first place the transmitter can be placed directly under the antenna where it is out of the way of a lot of punk dielectrics and where the lead-in does not have to come through a few dozen walls and run across the inside of a perfectly conducting room. Then you are assured of quietness in the receiver and can work break-in perfection. The modern tube transmitter does not have to be petted every two seconds and nursed like a sick chicken. Once the transmitter has been adjusted and tuned properly it should keep on operating satisfactorily until a tube filament burns out or a part breaks down, which (fortunately) does not happen every evening. The only precaution to observe is that you do not try to get the very last drop of energy out of the transmitter by working it right at the spilling-over point.

If the distance between the house and the transmitter is not great a scheme such as shown in Fig. 5 can be used. Three 110-volt leads are to be run from the house to the transmitter. These leads should be supported on insulators run down the side of the house, and should be run across the yard as close to the ground as possible. Use weatherproof wire, too. The filament transformer is controlled by the switch on the operating table and the plate supply by the key in the primary of the plate transformer. A further refinement consists in mounting the plate milliammeter (MA) on the operating table, and running a twisted pair of leads from the plate transformer center-tap to the MA, and back to the set. This meter will tell you all you need to know about the operation of the transmitter. It tells you whether or not the tube is oscillating and everything running smoothly.

If the distance between the transmitter and the operating table is great enough to cause any appreciable voltage drop in the 110-volt line the scheme shown in Fig. 6 should be used. R and R1 are relays similar to the type shown in Fig. 2. S is a single pole knife switch and K the key. The battery B is a four volt affair. Do not use the receiver's A battery as the drop in voltage when the relays are operating will be sufficient to cause the receiver to run out of oscillation if it is being operated at the verge of going out anyway. When the switch is closed the relay R1 closes and the filament transformer lights the tubes and when the key is operated the plate voltage to the tube is controlled. The 110 volt leads are kept out of the operating room entirely, and are terminated directly in the transmitter's dog-shack. The three battery leads should be run as mentioned in the preceding paragraph.

A two-wire control is shown in Fig. 7. The relays are of the construction previously suggested with the exception that R2 is a high resistance affair closing with very small currents flowing through its winding. The key and switch are wired in series. A variable resistance (a rheostat will do) is shunted across the key contacts. Keying merely short-circuits this resistance. The relays are so adjusted that when the switch is closed, sufficient current will flow through the resistance and the line to "pull" R2 and close the filament line, but the current will not be great enough to operate the keying relay. When the key is pressed (and R3 short-circuited) the added current is sufficient to throw relay R1 operating the plate transformer. This system has been used by a number of operators, and recently a special relay having a single winding and two sets of control arms has been developed by Brainerd of 8LO. We hope to be able to describe this relay in QST sometime soon. The system described requires careful adjustment of the relay springs and contacts, but it will operate entirely satisfactorily.

Remotely controlling the synchronous rectifier is a different problem since the rectifier will start off "butter side up" a lot of times and some form of polarized reversing relay is needed to reverse the plate leads from the rectifier.

In all of the above described systems it is urged that the constructor does not skimp on the size of main power contacts. Nothing makes a man madder than to have to run a couple of hundred feet to pry open a pair of "frozen" silver contacts. If the dimensions suggested are used this trouble will be obviated for once and for all.

A word of caution, also. In break-in systems it is absolutely necessary that the transmitting tube filament be kept lit all the time if break-in is desired. When the
tube is cold it takes an appreciable time for the filament to warm its "innards". All during this process the wave will climb to beat the band and break-in work will be impossible. So if you are going to call a man, on break-in, first light the transmitting tube filament for quite a few seconds before calling him.

Remember that even the simple system of relays and remote control is not necessary for break-in operation in practically all cases. Usually the stunt of a separate receiving antenna permanently connected to the receiver will be all that is needed. The relays and remote control ideas are refinements, nice to have, but not absolutely necessary.

Once you have tried break-in and have had the fun of working it with some of the fellows, you will never give it up, and we hope you will join us in urging the rest of the gang to work their sets this way. Break-in certainly helps better operating tremendously.

Vacuum Resistances

FROM Germany there is being imported a new type of resistance unit which possesses several novel and new features. The units are of such construction that they should maintain their original resistance indefinitely. They are made in the following manner: the units consist of two glass members, the first being a short glass rod and the second a glass tube which contains the rod. The rods are cut to the exact length desired and are provided with terminal leads which are welded into the glass itself. It is important that good electrical contact be provided between the leads and the resistance material, so the rods are placed in a revolving drum, and a highly conductive emulsion is sprayed directly against the ends of the rod, covering the lead wires with a good conducting surface. The drum, holding about 100 of the units, is next revolved in an electrically heated circular oven, where the terminal layers are baked thoroughly. The drum then goes through another stage in which a slightly conductive spray is projected on the individual glass rods. This spray covers the whole rod so that a good contact is provided between the high resistance and the previous metallic coating around the leads. While this is being done, the resistance thus being formed is being tested on a direct reading resistance measuring meter, thereby obtaining a uniform and predetermined resistance. The rods now covered with the resistance layer proceed through a second chamber where they are dried and baked. This whole process is done automatically and the results are quite uniform. The resistance units then pass through another stage in which they are provided with the outer glass shell, sealed in and evacuated. They are finally automatically pumped and cut off and provided with silver plated end caps. Then they pass through a maturing or ageing process being placed on a rack and subjected to a load of 0.1 watt for 24 hours and a load of .5 watt for a half an hour, after which they are tested for resistance and for quietness. The latter being done by inserting the unit in the first stage of a four stage resistance coupled amplifier. The finished units fit the standard grid leak clip. They are available in any value between 50,000 ohms and 10 megohms, and are manufactured by the Loewe Radio Company of Berlin and distributed in this country by Tobe Deutschmann.

—J. M. C.

Hinds & Edgerton of 19 So. La Salle Street, Chicago print a little card listing the "R" system of audibility, the International abbreviations and the latest "Q" signals—just the thing to hang on the wall of your shack. The cards may be obtained free of charge by addressing the above.

6BUR sez that a Ford radiator punched full of holes and buried so that water may be poured into the spout makes a good ground. When the surrounding terra firma dries out, you can get water right to the spot in a minute.
Four Tuners in One

By Stephen I. Gilchrist

Among QST’s rapidly growing reading family I know there are hundreds of experimenters who are never quite sure that the short wave tuner upon which they rely is the best to suit their several operating conditions. It is to them that this article is written, or dedicated, or subscribed; whichever way they may wish to regard it.

I would like to hold the support of this article back long enough to get across a lot of views on coils, but know that QST has not the space; so I’ll get down to business in hand.

The Detroit Free Press 4-In-One Tuner—named in honor of the very human newspaper by which I am employed in non-radio moments—is a result of the “try-everything-once” itch and my inability to regard the last short-wave receiver hooked up as other than inferior to the one which had been torn down to make way for the last one hooked up—and this often, despite the fact that the last one hooked up was the one that had been up, prior to the last one which had been torn down. I know that last statement is eminently clear to all those who have been similarly afflicted.

To be a little more plain, it seemed that I was always doomed to wanting a tuner that was superior to the one that I had. My experiments had to do with four standard regenerative circuits, but I have never come to the conclusion as to which of the quartet is the superior. This situation led to the change-over arrangement. I am disposed to look on it as a means for serious study of short-wave reception.

I believe that any others who may take a fancy to constructing the 4-In-One will find one peculiar feature that solely will justify its existence; that in any one of its four phases, stations will be heard that do not seem to come in well on the others. This has been my experience while comparing different circuits. That feature (if correct) is a lot, to my way of thinking.

The four circuits embraced differ in their methods of regeneration and also to methods of coupling the antenna to the condenser-tuned grid circuit or secondary circuit. The combinations are:

1—3-coil arrangement used as primary, secondary, and tickler.
2—3-coil arrangement used as primary, secondary and tuned-plate coil, Armstrong fashion.
3—2-coil arrangement used as secondary and tickler—the antenna being coupled to the secondary thru a small condenser after the method that you may name after Austin, Young, Schnell, Hoffman or Zurian, or by whatever name you know it best.
4—2-coil arrangement used as secondary and tuned-plate coil with antenna coupling as in circuit 3.

The four circuits included are so familiar to QST readers that printing will not be necessary.

The Weagant—Reinartz could have been included also, but this would involve what I believed at the time, to be the risk of greater losses than were necessary. You see that I have reasoned that the receiver would be beset by losses galore, although I had decided that none of the four phases would have the edge on any of the others. Herein comes the shock that I have not recovered from yet—that the 4-In-1, in every one of its phases is better with all of its plug-in stands and its socketed detector tubes than my previous tuner with a de-based tube, and a darned good tube, too. You figure it out.

Carpentry Enters In

Parts necessary to the construction of the set are:

27 plug-in jacks, such as those made by General Radio.
54 spring plugs (this for a complete set of plug-in coils to cover all amateur bands). If the builder prefers to change coils on the same stands he can get along with forty connectors.
16 hardwood strips 2” long by ¾" wide by 1/8" thick, and 26 hardwood strips 8” long by ¾” by 1/8” thick. After they have been drilled, let them boil in a large stew pan until the paraffin ceases to bubble. I learned that from QST many moons ago. Binding posts—Fahnstock clips screwed to the baseboard.
C1—midget condenser of 40 µfd. maximum capacity.
C2—2 brass angles about 1” long by ½” wide.
C3—grid-coil tuning condenser of 150 µfd.
C4—plate-circuit variable condenser, 500-µfd. capacity. (more of this later)

* SUW, 1550 East Grand Boulevard, Detroit, Mich., also makeup editor, Detroit Free Press.
C5—100-, 150- or 175-µfd. grid condenser. The writer has found the set smooth with all in the 40-meter band, but 175 works well over all the amateur bands in addition. R1, R2—rheostats to suit tubes.

REAR VIEW OF THE SET
The three-coil arrangement operating with a tuned-plate circuit.

R3—5 megohms gridleak, but you can use any resistance from 4 to 10 megohms.
Sw—filament switch.
J1—phone jack.
AFT—6/1 ratio audio transformer.
2 dials of any type you prefer.
1 panel 24”x7”x3/16” hard rubber preferred.
Baseboard—23”x10”x¾”.
2 UX sockets.
2 rubber socket pads, or pieces of soft felt or rubber sponge.
C-battery, 4.5 volts, variable if your leanings are that way.

The Jack System

If the reader will turn to the diagram he will notice that each jackblock has been given a Roman number which should not be confused with the numbers given to the different circuit provided for. I believe the present arrangement of these blocks to be the best. Others may have entirely different ideas and are invited to hop to 'em.

At any rate—here is the arrangement.

I—A 2” block with jacks spaced 1” on centers. This block is used only when one wants a series antenna condenser for one of the three-coil circuits. Then the antenna is connected to “AN1” and a short-circuiting wire plugged into I. In other words I acts as a single-pole switch with very low capacity and leakage.

II—a block exactly like I, meant to take the antenna coil when using a three-coil circuit. The antenna goes to “AN2” for a fixed tune arrangement or to “AN1” with a shortening strip in block I if the idea is to use C1 to clear up dead spots or for antenna tuning.

III—A 3” block with jacks spaced 2”. This block holds the grid circuit tuning coil—i.e. the secondary—in all of the circuits.

IV—A 2” block to receive the tickler when it is used.

V—This block is not really necessary as it is meant to receive a brass-angle condenser of the Schnell variety and the same thing exactly can be accomplished by the use of C1 and the block I.

I—This block may be omitted for most purposes and the post GR1 wired directly to the front jack on strip II.

VII—A three-jack block like VI. Spacing of jacks 1” on centers. A type “A” plug joins the two outer jacks when using a tickler and a type “H” jack joins the center and left jacks when the tuned plate circuits are used.

VIII—Drilled same as VI and VII. Takes type “H” plug, center and right for tuned plate, center and left for tickler.

IX—tuned plate coil, or shorting plug (type “E”), on circuit.

X—Blocking condenser for tuned plate circuit, shorting plug (type “E”), for tickler circuits.

XI—Choke, type C or resistance, type D.

XII—Open when using tickler, shorted by type “H” plug when using tuned plate circuit. Before putting in shorting plug make sure that X is either open or has blocking condenser in place. X and XII must never be shorted at the same time.

Tracing the Circuits

The reader has already decided on a number of changes he would make in the set but we may as well trace the circuits that result when using the present set. Let us begin with all jacks vacant and plug in the different devices as needed.

Circuit 3—the Austin etc. etc. arrangement.

SOME OF THE PLUG-IN COILS

Left to right: Tuned-plate coil, tickler on hinged support, secondary coil which happens to be in two sections and hinged tickler. Uprights are of bakelite tubing, tapped for 6/32” screws. No coil dimensions are given as these are a matter for personal opinion.

The antenna lead is connected to the Fahnstock clip AN1. The brass angle series condenser G goes into V or else this block is shorted by a type “E” plug and the condenser C1 adjusted to suit. The ground can be connected at any of the points provided—if one wants to use it at all. This completes the antenna circuit. The grid coil for the desired wavelength is plugged into III, and the tickler in IV. From the B battery the circuit is as follows; thru the A.F. transformer primary to a choke C or resistance D plugged into XI, then thru a
type "E" plug at IX and another type "E" plug at VII and a type "H" plug at VIII and so finally to the plate. The last plug is in the center and left jacks. The condenser C4 is now connected to the plate circuit by a type "E" plug at X.

Jack blocks I, II, VI and XII remain unused.

Circuit 4—the 2-coil arrangement with tuned circuit, again start with all jacks vacant. The antenna circuit is made up just as before—that is to say with V either shorted or occupied by the brass-angle condenser G. The grid-circuit goes into III as before. IV remains vacant as do I and II. A type "H" plug connects the center and right jacks of VIII and another type "H" connect the center and right jacks of VII thereby extending the plate lead to IX into which the tuned plate coil is plugged. The blocking condenser B goes into X and the motor of the condenser C4 (which now tunes the plate coil) is connected to the coil by shorting XII with another type "H" plug. XI may be shorted or occupied by a choke or resistance as you see fit. The short is probably the best.

Circuit 1—the three coil arrangement with tickler. Start again with all jacks vacant. Plug primary or antenna-pickup coil into II and a type "H" plug into the two rear jacks of VI. Then connect antenna to AN2 or else use antenna series condenser CI by connecting antenna to AN1 and shorting I with another type "H" plug. The grid-circuit coil goes into III as usual. The rest of the tickler system is built up as for the first circuit which gives a "throttle condenser" control, or else one can set the throttle condenser near maximum and swing the tickler of VII.

Circuit 2—the 3-coil arrangement with a tuned plate coil. The scheme for this can be followed out readily enough by now and need not be given in detail. In the particular set—and with the particular antenna—used here, the primary coil operates best when set at right angles to the secondary, that is to say with the loosest coupling available.

Many ticklers have been tried and the writer finds the least tuning effect with a solenoid tickler of the same diameter as the secondary but spaced well away from the latter. I do not wish to put that forward as a final say-so merely as my result.

My experience has been that better signal strength and sufficient selectivity are obtained by the use of a fairly large grid-circuit tuning condenser. It then becomes reasonable to use a 500-mfd. condenser in the plate circuit.

Diagram of the connections to correspond with the top view of the set.

Everyone that builds another such plug-in set will certainly do all manner of things to the general layout so there's no use in going into much more detail. The causes for some of the construction will be mentioned however. The tube sockets do not rest directly on the rubber-sponge cushions but have a 1/16" sheet of insulation interposed because rubber sponge is so excellent at collecting moisture quickly, and hanging onto it for a long time.

In drilling the plug-in mounts, space the plugs 1/64" further apart on centers than you did the jacks. They go in a bit stiffer, but the contact is always good. The nice mechanical work in this regard, also in the insulating shaft-extension of the midget condenser and the drilling of the panel is that of R. C. Wendler, 8DRV, my neighbor and former code instructor. He saw to it that the 3-in-1 looked like Dr. Jekyll instead of Mr. Hyde.
Luminous Frequency Standards

QUITE recently there has come from Germany the news of a new type of frequency standard, the luminous piezo-electric crystal resonator. Through the courtesy of Mr. David Loewe of New York City the writer has had the privilege of playing with one of the resonators as manufactured commercially by the Loewe Radio Company of Berlin. Before describing the Loewe type resonator, it is not amiss to say something about quartz resonators in general.

Much interest has been worked up in the use of the piezo-electric oscillator for transmitter frequency stabilization and wavemeter calibration but little has been said of the forerunner of the quartz oscillator—the resonator. It was with the quartz resonator that Dr. Cady did a large amount of his original piezo-electric work. In Fig. 1 a simple form of resonator is depicted.

The piezo-electric quartz crystal is taken from the uncut quartz as has many times been explained in QST and other radio journals. A crystal does not have to be tremendously piezo-electrically active to be a good resonator. A "dud" as an oscillator may be perfectly satisfactory as a resonator.

There are many circuits in which the resonator may be used. Possibly the simplest is shown in Fig. 2 in which the tinfoil coatings of the crystal are connected to the tuning condenser in a 201-A tube oscillating circuit. The ordinary regenerative receiver furnishes ample power for resonator use. If the coil and condenser combination is such as to be capable of being resonated with one of the fundamental frequencies of the crystal, as the condenser C is varied a short musical click or "twang" will be heard in the headset when the secondary of the oscillator passes through the frequency of the crystal. As explained by Dr. Cady the note—it is a musical click at any rate—is accounted for in the following fashion: The crystal has a definite amount of inertia. Once it has been set into oscillation it tries its best to keep on oscillating even after the source of excitation has been removed. When the oscillator hits resonance with the crystal, the crystal vibrates. As the oscillator condenser is varied just a little off resonance, the crystal momentarily continues to vibrate at its natural frequency. Since this frequency differs from that of the oscillator, the two frequencies combine to form the beat "twang" heard in the headset. Since the crystal maintains its vibration only for a very short time when the oscillator is off tune with it, the beat note is of very short duration. That setting of the tuning condenser at which the strongest resonance click occurs is one of the natural frequencies of the crystal. If the crystal has been previously calibrated, an extremely accurate frequency standard results.

As the crystals do not have to dissipate much power the crystal resonators can be tiny things ranging in size from a few millimeters long and a few tenths of a millimeter thick, up to a piece almost as long as a lead pencil. And since they are never worked in a circuit which impresses a comparatively high voltage of their surfaces, there is comparatively little danger of their being shattered through vibrating themselves to pieces.

In almost all cases use is made of the "lengthwise" vibration in the crystal. As a result, resonators working up in the thousands of meters are comparatively thin pieces of quartz. The lower limit of frequency of the resonator type of crystal is governed entirely by the size of uncut quartz available from which a good piece of crystal may be extracted. For very long waves, Dr. Cady cements two crystals to an iron bar and makes the iron bar vibrate at radio frequency, but this is another story.
Working on the quartz resonator, Professor Giebe and Dr. Scheibe of Germany have found that the oscillations in a quartz resonator may be made visible by a luminous effect. They found that a quartz resonator sealed in a vacuous chamber in which a mixture of helium and neon gases are present, will glow brightly when the quartz crystal is set into vibration through an externally induced voltage. The vibration of the quartz polarizes the "plates" forming the crystal mounting, and this polarization brings the gas to luminescence. This happens only when the exciting voltage's frequency very very closely corresponds to the natural frequency of the quartz resonator. If the frequency of the impressed E.M.F. is varied the least bit from the resonant frequency of the quartz, the resonator will cease to glow.

In practical form these resonators have been developed by the Loewe Company and are being offered for sale in this country. The crystals are cut so that their temperature coefficients are essentially zero. The resonant frequency of one of these resonators can be considered as a standard, when the crystal has been calibrated from some known frequency.

The resonators will glow with a brilliant sunset colored glow when a voltage as low as 30 is induced on the plates. They will glow only when the frequency of the induced voltage does not differ from the resonator's frequency more than one part in several thousand.

For our O.W.L.S. work nothing could be simpler than one of the Loewe resonators. Set the resonator on the operating table near the transmitter, and as long as the resonator glows you know your transmitter is operating at the frequency of the resonator. If anything goes haywire, out goes the lamp!

The easiest way to get acquainted with the resonator is to connect it as shown in

![FIG. 4](image)

Fig. 2. Do not try to find the glow, at first, but listen in on the headset and when the loudest click is heard, vary the tuning condenser very very slightly and the glow will appear. The tube in the oscillator should be a 201-A and the plate voltage around ninety.

For broadcast work (or the super O.W.L. S.) a complete station frequency monitoring system is available. The broadcast type appears in Fig. 5. Five of the resonators are mounted on a bakelite strip, and are all connected in parallel and across the pick-up coil. In this case the coil is a honeycomb. The middle crystal is ground to the wavelength of the broadcasting station. The first crystal to the right is ground to 0.1 meter below the middle one, the 2nd to the right, another 0.1 meter below the crystals at the left are 0.1 and 0.2 meter above the station's wavelength. The complete assembly is set up somewhere in the operating room and as long as the station is on its correct wavelength the middle "lamp" glows. If the wave wanders south, the middle lamp goes out and one of

![FIG. 3](image)

The resonators are enclosed in a glass bulb and fitted with base and two pins similar to a vacuum tube. When fitted with a pick-up coil, shunted by a condenser as shown in Fig. 3 these resonators constitute a practical form of direct reading frequency standard. The crystal being in a permanently fixed mounting inside a vacuum, will never change its frequency characteristics as long as it is not actually broken.

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the others light up. The operator knows immediately whether to increase or decrease the wavelength of the transmitter!

The Loewe resonators are available in wavelengths from 35 meters to 1,200 meters. The commercial accuracy to which they can be adjusted is 1/50 of 1 per cent! If still greater accuracy is desired they can be ground even closer to the wavelength you want.

—J. M. C.

Pacific Division Convention

October 15—16—17, San Jose, California

The Hotel Vendome has been chosen as the Headquarters for this year's Annual Convention and it will be in charge of the Santa Clara County Amateur Association.

A wonderful program has been prepared and such well known speakers as Col. Dillon, McGown, Best, Loghry of the Signal Corps, Wilkins Power Co. expert and Director Babcock will all be there. Headquarters is sending A. A. Hebert, Treasurer and Fieldman as its representative.

Special hotel rates of $1.65 per night has been obtained and special Railroad Rates will be granted. Be sure to tell the Station Agent when buying your ticket. Registration including banquet is $3.50. The Committee will appreciate it if you will drop a card to F. J. Quement, Chairman, 51 Pleasant St., San Jose, Calif. of your intention to be present.

Using Wavemeters Without Indicating Devices.

Only recently we were greatly surprised to learn that a large number of the gang do not know how to use a wavemeter which has no indicating device — no thermo galvanometer, flashlamp or other device for indicating resonance between the wavemeter and the transmitter. We thought everyone knew how to use a wavemeter of this type. The old style General Radio 247W meter was not equipped with any resonance indicator, and we thought that everyone knew how to use one of these meters.

In adjusting the transmitter to a particular wavelength the wavemeter without an indicating device can be used as easily as one with an indicator. Practically every transmitter from the lowly 201-A tube type up has either an antenna ammeter or a plate milliammeter, or both. If your transmitter has only a plate milliammeter, the wavelength to which the transmitter is tuned, can be measured by bringing the wavemeter up close to the primary of the transmitter, varying the capacity in the wavemeter and watching the plate milliammeter. As resonance with the transmitter is approached, the plate milliammeter will either sharply rise, or fall, depending upon the type of primary circuit you are using and also upon the portion of the circuit you are coupling the wavemeter to. The point of maximum deflection (in either direction) of the plate milliammeter is the resonant point between the wavemeter and the primary.

In like manner as the wavemeter is brought into resonance with the antenna circuit, there will be a change in current in the antenna ammeter. The point of maximum change in the deflection of the antenna ammeter is the resonant point of the wavemeter with the antenna, and is the wavelength to which the antenna is tuned. In both types of measurements, however, care should be taken to couple the wavemeter to the antenna or primary circuit only closely enough to get a readable deflection on the meter in the transmitter. If the coupling is too close the wavelength of the transmitter will be changed as resonance is secured, and the wavelength as measured by the wavemeter will not be the correct one.

If the transmitter has no meters of any kind in its circuit, the old scheme shown in the illustration can be used. The wavemeter is set close to the primary of the transmitter and a single turn of heavy wire is attached to the terminals of a small flashlight bulb in a miniature socket, and placed in inductive relation to the wavemeter, and fairly close to it. When in tune with the primary, the lamp will light when resonance is reached. This is due to the fact that the wavemeter, when tuned to the primary, has the effect of tightening the coupling between the lamp and the driver.

—J. M. C.
Converting the ET3619

By Harold P. Westman, A.R.R.L. Information Service

The ET3619 is a direct-coupled transmitter designed several years ago by the General Electric Company for sale through the Radio Corporation of America. It uses four UV202 Radiotrons in a direct-coupled Hartley circuit for operation in the 150-200-meter band. Many of these sets have been sold recently and many of the purchasers are not sure how they should change the set connections to fit the present wave bands and the present regulations of the Department of Commerce.

As a matter of fact the sets may be converted quite easily to operate in the present-day, shorter wave-bands, and to use loose-coupling to the antenna circuit, as is required by the latest regulations. UX210 tubes may replace the older UV202s.

For operation in the 150-to 200-meter band, it is only necessary to loose-couple the antenna circuit, as shown in Fig. 1. This may be done by disconnecting the antenna leads from the oscillator helix and inserting a coupling coil between the antenna series condenser (the side which originally went to the inductance) and the antenna ammeter (also the side which originally went to the inductance).

The antenna coupling coil may consist of three to five turns of No. 10 or No. 12 bare orenameled wire wound on a four-inch tube. The wire should be spaced equal to its diameter. This may be easily done by winding two wires parallel to each other and then removing one of them.

The tube may be mounted on a long brass hinge and hung from the top binding strip of the helix support. About a two inch hinge will do the trick nicely. Use brass hinges as iron or steel are magnetic and will cause losses which brass averts. The coupling coil may be held at its proper position by a piece of string tied to the lower side of the coil form and passed through the end hole in the upper half of the hinge which should extend above the top supporting bar of the helix. See Fig. 3.

The proper size of antenna to be used with this set may be found in the article on this subject appearing in the May, 1926, issue of QST on page 46. Make your ant-

![Fig. 1 Circuit Changes](image1)

![Fig. 2 Extra Antenna Coil for Higher Bands](image2)
and the other for phone. Remember this when tuning up. When phone is used, the regulations of the Department of Commerce require that the circuit be tuned to the 170-to 180-meter band or the 83.3-to 85.6-meter band. These are the only two bands where amateur phone transmission is allowed.

### 80-Meter Work

If it is desirable to use the set on the 83.3-to 85.6-meter phone band, it will be necessary to do a little more work than for the 170-to 180-meter band. The radio frequency choke should be replaced by a smaller one. This is the large coil of fine wire wound on a porcelain form, located in the lower left hand corner of the set (viewed from the rear). It should be replaced by a coil of 100 turns of No. 30 D.C.C. wire wound on a 1" tube. The wire from the old choke may be used. Mount the new choke on an angle bracket so that it stands vertically and put it in the position the old choke occupied. This will be at right angles to the main oscillator helix.

### 40-Meter Work

When 40-meter transmission is desired, it is advisable to remodel the set completely. Phone transmission is not allowed in this band and in any case it is essential to remove all unnecessary equipment from near the oscillating circuit. Even the iron framework should be replaced by wood. About ten turns of the inductance is all that is necessary for this band. Use a hack saw and cut through the top support strip and the base. This will give two self-supporting units. Five of the fifteen turns may be cut off for the antenna coil and will save making the more complicated arrangement described above.

The circuit should be a simple one having as few accessory parts as possible. Whether or not you can get away with 4 tubes in parallel on 40 meters, is uncertain. In some cases, this is possible without taking any particular precaution, while in other cases it is necessary to insert grid chokes or resistances. If you want to be sure, you can put them in at the start. They will do no harm and can do a considerable amount of good.

The simplest method of finding out whether all tubes are working or not is to start one operating and then plug in the others one at a time and note if the output goes up as each is inserted. If it does not go up or actually goes down, you can be sure that the tubes are not working properly and grid chokes are needed.

These chokes may consist of 20 or 25 turns of fine wire (some of the excess from the old plate choke) wound on a form the size of a lead pencil (¼" or ¾" dowel will do nicely) and tapped at the center turn. They should take the place of the connecting wires between the grids. Two such chokes will be required and the tubes will be connected together in pairs. Both chokes will have their ends connected to the grid of a tube and the two center taps should be connected together. The chokes are marked L in Fig. 3.

The circuit may be a simple Hartley as shown in Fig. 3 and will give excellent results if properly adjusted. For methods of adjustment see QST for June, 1925, page 23. This article, "Adjusting the Transmitter", will give you a world of information on the subject.

The condenser which is shunted across part of the coil, usually called the closed circuit, may be counted in place of the

"Signal Switch". The same antenna series condenser may be used. As the metal frame has been replaced by wood, the antenna binding post may be a small stand-off insulator similar to the General Radio type No. 260.

The sockets are mounted upon a strip of wood laid across the tops of the side pieces. The plate blocking and grid condensers can be mounted directly beneath this strip. The small flexible leads of these condensers...
should be connected to 6-32 machine screws mounted in it. The leads to the helix should be run to these screws and can then be moved as much as desired without any danger of breaking the condenser lead off.

The helix is mounted on two narrow strips laid across the lower part of the end pieces. These strips may be 1" x ½" wood. The radio frequency choke can be placed at the left end and will have a short lead to terminal No. 1.

The numbers on the original terminal board correspond to the following circuit connections and if the ET3620 rectifier unit is used its terminal connections are also as shown.

ET 3619
1. High-voltage positive
2. High-voltage negative
3. Microphone battery positive
4. Microphone battery negative
5. Microphone
6. Microphone
7. Microphone battery switch
8. Key
9. Key
10. Radiotron filament
11. Radiotron filament center tap
12. Radiotron filament
13. Microphone battery switch and ground

ET 3620
14. High-voltage positive
15. High-voltage negative
16. 110-volt A.C. line
17. 110-volt A.C. line
18. Radiotron filament
19. Radiotron filament center tap
20. Radiotron filament
21. Switch in microphone battery circuit
22. Switch in microphone battery circuit and ground

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ELECTION NOTICE

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

1. You are hereby notified that an election for an A.R.R.L. Director, for the term 1927-1928, is about to be held in each of the above Divisions, in accordance with the Constitution. 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; and By-Laws 14, 15, 16, 17 and 18, providing for their nomination and election.

2. The election will take place during the month of November, 1926, on ballots which will be mailed from Headquarters in the first week of that month. 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.

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 1927-1928. (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 November, 1926. There is no limit on the number of petitions that may be filed, but no member shall append his signature to more than one such petition.

4. Present Directors from these Divisions are as follows: Central, Mr. Clyde E. Darr, Detroit; Hudson, Dr. Lawrence J. Dunn, Brooklyn; New England, Dr. Elliott A. White, Hanover, N. H.; Northwestern, Mr. Karl W. Weingarten, Tacoma; Roanoke, Mr. W. Treadway, Gravely, Danville, Va.; Rocky Mountain, Mr. Paul M. Segal, Denver; West Gulf, Mr. Frank M. Corlett, Dallas.

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 of Directors:
K. B. WARNER, Secretary.
Hartford, Conn., 2 August, 1926.
Examining Quartz for Oscillator Use

The Description of a Simple Instrument for Determining the Optical Properties of Quartz Plates

By L. H. Dawson*

The quartz crystal piezo-electric oscillator had become very important in controlling the frequency of an oscillating circuit for radio and other purposes. Little has been written of the methods of testing and of cutting the crystals for oscillator purposes. These methods are optical methods, and being very simple to understand and carry out, it is thought that radio amateurs will be interested in the description of the following test-table and the directions for the use of same.

The natural quartz crystal may be pictured as a hexagonal cylinder surmounted by a hexagonal pyramid as shown in Fig. 1, a and b. It has four principal axes of symmetry, one, AB which is parallel to the sides of the hexagonal cylinder and is called the optical axis, for along this direction the crystal has unique optical properties, and the other three CF, DG and HE, lie in a plane at right angles to the optical axis and at 60° to each other. These latter axes are called electric axes and have the property that a pressure exerted on the crystal in a direction parallel to any one of these produces electric charges of opposite sign at the termini of the axis, or conversely charges of opposite sign placed at the extremities of an axis will produce a slight compression in the crystal.

Piezo-electric oscillators are usually cut in such a manner that the optic axis lies in a plane of the oscillator and is perpendicular to one of the sides. Referring to Fig. 1 (a) and (b), OMN is the oscillator with the optic axis AB lying in its plane perpendicular to the side MN. One of the electric axes, HE, must lie truly perpendicular to the plane MNO, Fig. 1 b.

In order to understand the principle of the manner of determining the direction of the optic axis we must recall certain elementary facts about quartz. Crystalline quartz is a substance that is double refracting that is, when a ray of light is passed through the crystal in any direction except along the optic axis the ray is broken up into two plane polarized rays, polarized in planes at right angles to each other. Due to this peculiarity, when a ray of convergent or divergent plane polarized light is passed through the crystal parallel to the optic axis and viewed by some means for polarizing light, a system of concentric colored rings are seen. This occurs only when the direction of the ray of light and of the optic axis of the crystal coincide. Thus a means is available for determining the direction of this important crystallographic axis.

There occurs in nature two type of quartz crystals, the so-called right handed, or right turning, and the left handed or left turning crystals. When a ray of plane polarized light is passed through the crystal parallel to the optic axis, the former rotates the plane of the light to the right and the latter rotates the plane to the left. Piezo-electrically, the effects in the right handed crystal are exactly opposite to those

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*Heat and Light Division, Naval Research Laboratory, Bellevue, D. C.
in the left handed crystal; thus similar faces in the left and right handed varieties of oscillators will produce charges of opposite signs. Apparently, however, either type make equally satisfactory piezo-electric oscillators. It is a common phenomenon to find these two types of quartz in the same crystal, and an oscillator cut from such material will not produce satisfactory results as the left handed effects neutralize the right handed effects. This mixture of right and left handed quartz is known as "twinning" and must be carefully avoided in the selection of quartz for piezo-electric oscillators. The detection of twinning in quartz consists in passing a ray of parallel, or nearly parallel, plane polarized light through the quartz in the direction of the optic axis and observing this ray by means of some piece of apparatus that will polarize light. If the crystal happens to be twinned then beautifully colored patterns will be seen. Often these patterns will consist of pointed figures penetrating the crystal, but sometimes they may be present as parallel colored strips, or at times they may be very irregular. It must be borne in mind that this takes place only when the plane polarized ray passes through the crystal parallel to the optic axis.

An instrument for the determination of the position of the optic axis and for detecting twinning is shown in the diagrams of Fig. 2 and 3 which are vertical sections at right angles to each other. There are two common methods in optics for producing plane polarized light, first by a nicol prism and second by reflection. The nicols are usually very expensive, therefore in the present instrument the light is polarized by reflection, and the ray of light after passing through the quartz is examined on a reflecting surface. To produce plane polarized light by reflection the light from a source such as an incandescent lamp is allowed to fall upon a flat piece of glass at the so-called polarizing angle which is 58° for glass.

In the construction of the instrument, obtain or make a small table (Fig. 3) of convenient height and cut a circular hole K in the top of the table. This hole should have a diameter of about 8 inches. Cover this with a piece of ground glass L (preferably plate glass since there is less distortion of the image in plate glass than in ordinary glass). The ground glass produces a field of light which is of uniform intensity all over. Next procure two pieces of plate glass of good quality about 6 or 8 inches square, and paint one side of each with dull black paint. Mount one of these in position B as shown in the figure, and the other on an upright G in position F. These are the polarizing mirrors. The mirrors may be
placed upon wooden frames, with the black side next to the frame. It is convenient to mount these mirrors on some arrangement such as a ball and socket joint to facilitate the adjustment, although this is not necessary as a permanent arrangement may be used if care is taken to have the ray of light from the source strike mirror $B$ at $58^\circ$, and the reflected light from $B$ strike mirror $F$ at the same angle. The ray of light should be parallel, or nearly so. In order to obtain such a light source an automobile headlight $A$ with the lens removed, may be used. The focusing may be done by the adjusting screw on the headlight. Again, care must be taken that the light focal length (ordinary reading glass is satisfactory) and adjust it above the quartz under examination until a clear image is obtained in mirror $F$. Rotate the quartz in all directions until the brilliantly colored ring system is seen. At first this will require some patience, but after a little practice it can be done quite readily. When the ring system appears, the direction of the optic axis and the ray of light from $B$ to $F$ coincide.

To detect the characteristic colors due to twinning in a piece of quartz bring the quartz into a position in which the optic axial ring system described above is visible and then swing lens $H$ around. If no twinning is present a field of uniform color will be present, while a presence of twinning will be indicated by the appearance of areas of brilliant colors extending into the quartz.

![Microscope](image)

**A Low-Capacity Socket**

The socket which appears in the illustration was designed especially to reduce the shunt capacity across the elements of any tube which is inserted in it. The ordinary socket raises the total tube capacity to some considerable extent. This new one is so cut away that the plate and grid terminals are separated by an air gap of half an inch. The base is of moulded bakelite provided with two half-moon shaped projections for steadying the tube. The contacts are of the "push-pull" type and are of heavy spring material. The socket will hold all of the standard UX-type tubes. As the path between plate and grid is broken by an air gap the resistance path between these elements of the tube are virtually governed by the internal structure of the tube, plus the resistance across the base of the tube itself. In very short wave receivers (or 7½-watt transmitters, either) this type of socket should materially help things. It is made by the Airgap Products Company of Newark, N. J.

—J. M. C.
Easy Tuner Design

THRU the courtesy of Veech T. Baird of the Hammarlund Mfg. Co. we are able to present the following charts for the easy design of tuners and wavemeter circuits. The charts are laid out primarily for the use of the Hammarlund standardized coils shown in one of our photographs but may also be used for tuners, wavemeters etc. using coils of other sorts provided they are not "trick coils" but are plain cylindrical windings—the sort of thing we call a solenoid.

Short Wave Tuners

The standard Hammarlund coil for short-wave work consists of a winding of No. 16 wire wound on a 3" tube of a substance somewhat like celluloid. The winding is spaced so that there are 10 turns per inch. This is the kind of winding used in the Grebe CR 18 receiver, the Gross short-wave tuner etc.

Figure 1 gives almost everything one needs to know in order to build a short-wave tuner from a length of this standardized coil. Begin by deciding what the lowest wave for the coil is to be. Suppose it is 30 meters and we are fairly sure that we can keep the capacity of the tube, socket and wiring down to 10 µfd. This means that we will have a little more than 10 µfd. across the coil at 30 meters—for the tuning condenser never gets clear down to zero capacity. Let us suppose that the particular condenser we intend to use gets down to 5 µfd. This means that we will have a total of 15 µfd. across the coil at the lowest wave we want to tune to, i.e. when the dial is set at O. Now we know the wavelength and the capacity. Turning to Fig 1 we lay a ruler across as shown by the dotted line A—crossing thru 15 µfd. and 30 meter and striking the "Turns" scale at the place to show us the number of turns of the 10-per-inch coil which we will need. It turns out that we need almost exactly 14 turns—which makes a winding 1.4 inches long. Next question—what is the top end of the tuning range? That depends on the capacity of the variable condenser. Suppose that we used the condenser shown in the photograph, which has a maximum capacity of 100 µfd. Adding the set capacity of 10 µfd. this becomes 110 µfd. Now we can find out the top end of the tuning range by running another line across the chart of Fig. 1 from 14 turns to 110 µfd. This is line B and it can be seen to cross the wavelength line at 78. The range of the combination is from 30 to 78 meters—or if one prefers it is from 9844 to 9994 kilocycles.

Opening Out the Scale

Immediately someone will object that this is too much territory to cover—the stations...
will be too crowded. Very well—there are several easy ways to cure that. Suppose we use a smaller condenser instead. Since we are talking Hammarlund products anyway we can use one of their 65 or 45 μfd.

The tiny 32-µµf condenser would give a top range of 48 meters. Incidentally—those of us who believe in tuners with small-capacity condensers are overlooking a good bet when we fail to use some such little condenser—not necessarily Hammarlund but some make or other which is solidly built and has a ¼" shaft so that a freak knob isn't needed.

If you don't happen to believe in a large L/C ratio the wavelength range can be narrowed down—i.e. the scale opened out—by proceeding from the other end of the scale. First of all we cut down on the size of the coil and bring the wavelength back up by using a fixed shunting condenser. This fixed shunt can be a fixed air condenser such as those made by Cardwell or else it can be provided by the stunt suggested by Wadsworth of SBE—also by a number of later contributors. This stunt consists of vernier condensers which would give top ranges of about 65 and 55 meters respectively. The tiny 32-µµf condenser would give a top range of 48 meters. Incidentally—those of us who believe in tuners with small-capacity condensers are overlooking a good bet when we fail to use some such little condenser—not necessarily Hammarlund but some make or other which is solidly built and has a ¼" shaft so that a freak knob isn't needed.

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this turns out to be 40 meters, very much the same sort of range that was gotten with the 32-µfd. “midget” condenser. Which

SOME OF THE HAMMARLUND STANDARD COILS

The upper cut shows a coil on 1-inch tubing and the lower cut one on 3-inch tubing. The tubing is of material similar to celluloid to which the wire is stuck so firmly that a 3" length of the 3 inch tubing wound with No. 26 wire can be turned inside out without destroying it.

will give the better signal strength is another question that needs some experimental work.

Other Uses of the 3" Coil

If one wants to know the inductance of a length of the coil this can be gotten from Figure 1 or else from Figure 2. Remember tho that these figures apply to the one type of coil only—the 3" coil with 10 turns per inch.

Other Coils

If some other sort of coil is to be used one must turn to Fig. 3. The use of this curve is best illustrated by example. Suppose that we wish for some reason to use a coil of 4" in diameter. Curve K of Fig. 3 is drawn for such coils but the inductance values shown at the side of the chart are those for coils having only ONE TURN PER INCH OF LENGTH. Suppose that the idea is to use a winding 3½ inches long and to put enough turns on this form to secure an inductance of 90 microhenries. The chart shows that a coil diameter of 4" and a length of 3½ inches will give an inductance of .915 microhenries if there is one turn per inch—i.e. 3½ turns. Now we want an inductance 100 times as great as this, which calls for \( \sqrt{100} \), i.e. 10 times as many turns. Therefore the coil will need to have 35 turns, or 10 turns per inch.

Broadcast Wave Tuners

Offhand it may not be very clear why one should wish to go through such gyrations. A little thought will show that Figure 1 may be used at broadcast waves by simply multiplying the capacity, wavelength and inductance scales by 10. The turns scale

A SPECIAL HAMMARLUND CONDENSER FOR SHORT-WAVE TUNERS

The plate spacing is more than double to avoid dust noises and the minimum capacity is only 3 µfd, while the maximum is 100 µfd. The construction permits the removal of rotor plates if a lower maximum is desired.

Applied the Information

The purpose of printing this sort of information is—quite frankly—to help out (Concluded on Page 59)
The home building of a shielded R.F. amplifier, wavemeter or oscillator is quite a job. A ready-made unit to fit such needs would be of considerable convenience. Several shielded units have been constructed and while they are designed for reception, they may be used equally well for other purposes. Since the intention was in each case to devise a shielded R.F. unit, the story of one will be told from that angle.

Radio frequency amplification of the tuned amplifier type has, during the past three years, become the most popular of broadcast tuner and amplifier systems. The theoretical and ideal properties of a tuned radio frequency amplifier are so desirable that much experimentation is constantly being done with the object of more nearly approaching the ideal.

Shielding a tuned R.F. amplifier is the best and simplest method of increasing the selectivity and improving stabilization of the amplifier system. Complete shielding of an amplifier will prevent station pick-up, permit the construction of three or more stages of tuned radio frequency amplification, and greatly decrease interstage coupling.

The effect of metal shields on coils has been well covered in QST and in the Proceedings of the Institute of Radio Engineers, and will therefore not be entered into here. However, before getting to the main feature of this article a brief explanation of why shields improve the selectivity of most types of R.F. amplifiers will be given.

In an unshielded (tuned) radio frequency amplifier, poor selectivity may be due partly to coil pick-up and partly to interstage coupling.

Station pick-up by the coils interstage and intercoil coupling have electromagnetic coupling as the chief reason for their existence. By placing the tuning system in a metal case, with shields between stages, magnetic coupling may be practically eliminated and consequently the faults mentioned above are prevented.

Realizing this, Samuel Cohen, began experimental work eighteen months ago on a solution to the problem of making the shielding of a radio frequency amplifier practical and within the constructional powers of the layman.

The object of this experimentation was to bring forth completely shielded, single stage, tuned radio frequency amplifiers. This unit design was chosen because the user of the shielded units would not be limited to any definite number of stages of amplification.

In starting the experiments on these units several things were set as points of perfection. First, the tuning should be sharp in a set made up of the units. Second, good amplification should be obtained, greater than in unshielded amplifiers. Third, the stabilization system should be operative over the entire frequency spectrum and simple to adjust. Fourth, the assembly of the units into complete sets, or the use of the metal cases for other than tuned radio frequency amplifiers, should be simpler than the construction of ordinary unshielded amplifiers.

A five tube receiver made of the units
The first two units at the left are R.F. amplifiers, the next is a detector and the one at the right is the two stage audio amplifier. The control panel carries an A-H voltmeter, a pilot lamp, a filament switch, a filament rheostat and a phone jack. The extra knob provides resistance control of detector regeneration. If the detector oscillates serious radiation is prevented by the amplifier stages.
The first problem was the design of a good radio frequency transformer. In working on this part the thought was always borne in mind that the transformer had to operate perfectly in a metal case. Therefore tests were frequently made with a preliminary metal case having dimensions closely approximating those of the final one.

When the transformer gave satisfactory results comparative tests were made between identical shields of brass, copper and aluminum. When the proper size of the case was found for each metal and the best placement of the transformer was located the three were compared for amplification and resistance effect on the coil. The amplification of the coil was directly proportional to the effect of the case on its resistance, therefore the curve given in Fig. 1 will show the two results at once. As will be seen, aluminum proved to be best.

This is but a comparative curve and not one of the transformers used in the cases.

The completed transformer construction is shown in Fig. 2. The primary coil consists of 14 turns of No. 36 enameled wire spaced with a silk thread wound in the slot. The secondary of 74 turns of No. 26 D.C.C. wire is wound directly over the primary. This transformer is tuned with a 350-micromicrofarad variable condenser for tuning a radio frequency transformer when completely shielded.

Digressing for a moment it might be interesting to some to know something about the direct reading method of measuring the coil resistance. A photograph of the setup is given and the circuit diagram is given in Fig. 3. This resistance measurement system was developed by the Weston Electrical Instrument Co. and operates in the following manner. The input to the measuring circuit is adjusted until the ratio of 1 to 12 is about 10 to 1, when the circuits are in resonance. The voltmeter reading and the ammeter reading of 12 are then combined in our old familiar ohm's law for the resistance of the circuit. Subtracting from this result the resistance of the ammeter and the condenser we have the high frequency resistance of the coil. In our resistance tests made in the General Instrument laboratory a moving light beam galvanometer was employed for the 12 readings.

Returning to the subject of amplification. At the present time only two stages have been measured. Two stages of tuned radio frequency amplification made up of shielded units gives an amplification of 144. A special vacuum tube voltmeter (but of the same type that was used in these tests) is being made so that three and four stages can be investigated.

The stabilizing method used in the shielded units is simple, and yet produces an amplifier that is perfectly stable over the entire broadcast band.

This method is known as the Reacto-phase system and consists of an impedance element in series with a small semi-variable condenser connected between the grid and output of the tube as shown in Fig. 4. The operation of this impedance is exactly the same as those used in ordinary A.C. work.

In their simplest form these impedances are wound on a 1/4" form with number 40 enameled wire, the number of turns being controlled by the size of the transformers used. Somewhere between eighty and two hundred is correct.

For the average tuned R.F. transformer with few primary turns as they are now made, a 100-turn coil will generally be sufficient.

The small series condenser can be any one of the mica dielectric instruments having a capacity range of 100 micromicrofarads to 500 micromicrofarads. The
system can be used for tuned or untuned R.F. amplifiers and also for stabilizing intermediate frequency amplifiers. To stabilize an amplifier or the shielded units when using this balancing method, it is only

necessary to tune in a station and then adjust the condenser until the tubes stop oscillating. One to two minutes per tube is all that is required.

Thus with good transformer and circuit design several of the points of perfection have been reached. Good amplification and easy stabilization are so far assured. The choice of a five by eight by nine inch case for the size and binding post placement on the bakelite shelf as shown in Fig 5, take care of the constructional simplicity. There remains only the selectivity to be tested.

As an example of what can be done in selective tuning, a set made up of three shielded units as amplifiers, shielded unit amplification, one as a detector (the units as amplifiers) shielded unit amplification, one as a detector (the units are interchangeable detectors or amplifiers) and one case and shelf for an audio amplifier.

This seven tube set was operated under the antenna of WEAF with no interference from that station at any time. This extreme selectivity necessitated the use of a shielded battery cable and compartment. For ordinary work the amount of pick-up from the battery leads will not cause any trouble.

As many shielded units may be connected in cascade as is desired. More than six is not suggested however. The filament control of the radio frequency and detector tubes is not critical. One rheostat can be used to take care of them all. Once the correct setting is found for best signal strength, no further adjustment is necessary until the battery runs down.

It may occur to some readers that the use of more than one R.F. stage will result in a "three-handed set". This is of course true and some work has been done to devise a form of the set which will make it possible to concentrate the controls. It should be noted, however, that the change to such form will necessarily complicate the construction and that the inevitable result must be less flexibility in the use of the individual unit. It is worth noting at the same time that the radio public has used "three-handed sets" successfully in very large number.

Aside from straight cascade amplifiers these units lend themselves admirably for use as first detectors in super-heterodynes and as additional steps of amplification for present receivers. Readers of QST will probably be interested in the unassembled units. The aluminum case as well as any

THE WESTON METHOD OF MEASURING COIL RESISTANCE

The part labeled "line" should be about ten feet long to secure good separation between the input and measuring circuits.

C1 C2—Tuning condensers to adjust circuits to resonance.
A1, A2—R.F. ammeters.
V1—R.F. voltmeter drawing very small current. This may be a vacuum tube voltmeter or, under proper conditions, a Weston thermovoltmeter.
L3—Coil under measurements.
L1, L2—R.F. input transformer.

COIL RESISTANCE MEASUREMENT APPARATUS IN THE G. I. LABORATORY

The equipment shown is used to make measurements by the Weston method of Figure 3 or by the substitution method. At the right is the driver with its power supply. Next to that is a small pick-up coil which may be used to transfer power to the circuit under measurement. The current in this circuit may be measured by the thermo-galvanometer at the extreme left or else by the Western Electric thermo couple and the reflecting galvanometer. The thermo couple is in the square box just to the left of the three legged iron stand holding the galvanometer scale, while the galvanometer itself is mounted on the wall and fed through the shielded cable. The cage around the apparatus at the left is made of incomplete turns of wire which act as a static shield but permit r.f. energy transfer through magnetic coupling. The large object in the center of the cage is a Bureau of Standards Type precision condenser. At the right front of the case is a mercury switch for use with the substitution method, which is described in detail in text books and in circular 74 of the Bureau of Standards.

2—Of course the choke and condenser must be changed in accordance with the frequency. Tech. Ed.
no pick-up from the audio end or intermediate frequency amplifier (if one is used).

Using the coil (condenser) case and shelf it is easy to make oscillators, wavemeters, calibrated oscillators, and other laboratory equipment. Always use the coil form if special inductances are required for use in special circuits. This form is the result of much experimentation and is the correct physical size to produce a coil having the lowest resistance in the case.

Some adaptations of the unassembled units will call for additional parts mounted on the front of the case such as resistance units for controlling detector regeneration. Aluminum is easily worked and therefore no trouble should be encountered in drilling the walls for such parts.

There are one or two difficulties yet to be ironed out in the construction of short wave amplifiers built up with the Shielded Units. Fair results have been obtained down to 80 meters. When everything has been smoothed over, the information will be forthcoming.

These shielded units, both assembled and unassembled, when used in the construction of super-heterodyne receivers materially decrease the trouble ordinarily encountered in the construction of shielded sets of this type.

**A New Voltmeter**

PIN-JACK voltmeters have been available several months from a number of meter manufacturers. The latest idea in the form of a plug-in voltmeter is the type shown in the illustration. The voltmeter is equipped with pins designed to fit voltmeter terminals of several broadcast receivers. The pins are mounted on swivels so that any variation in the jack spacings on receivers of different makes can be compensated for. The meter is a high resistance type having a resistance of approximately 125 ohms per volt. This means that the instrument will draw very little current from the A battery, be it dry cell or storage cell type. A high resistance stand for this meter has just been developed. In the base of the stand a high resistance is so connected that when the meter is plugged into the jacks provided on top of the stand, the high voltage scale of the meter can be used for measuring B battery voltages and for shooting trouble in a receiver. The meters are available in two standard scales, a 160/4 volt one for dry cell tubes and a 160/8 volt one for storage cell tubes. The meters and high voltage stands are made by the Weston Electrical Instrument Corp'n of Newark, N. J.

--- J. M. C.

**Strays**

The N. Y. Central Lines have recently completed some "train control" tests, the problem being to provide communication between the caboose and the engine on a mile-long freighter. Apparently the problem has been solved by the use of a radio telephone transmitter in the caboose end and a receiver up forward in the cabin.
Radiotron Model UX210

THROUGH the courtesy of Mr. J. C. Warner of the Research Laboratory of the General Electric Company, we are able to present herewith detailed information with regard to the new vacuum tube type UX-210. We believe that it will be thoroughly appreciated by our readers even at this late date. The following text, except for a change in sequence, is printed verbatim as received, the portions have been omitted for lack of space.

Radiotron model UX-210 is a vacuum tube designed for use as an oscillator, modulator or power amplifier in radio transmitting circuits. It is also intended for use as a power amplifier with loud speakers where high output is required.

The ratings of the tube are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Amplifier</th>
<th>Oscillator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Volts</td>
<td>6.0 to 7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Filament Amperes</td>
<td>1.25 (max.)</td>
<td>1.25</td>
</tr>
<tr>
<td>Plate Volts</td>
<td>450 (max.)</td>
<td>350</td>
</tr>
<tr>
<td>Plate Amperes</td>
<td>0.50 (max.)</td>
<td>0.64</td>
</tr>
<tr>
<td>Output (Watts)</td>
<td></td>
<td>7.5</td>
</tr>
<tr>
<td>Maximum Safe Plates</td>
<td>12 watts</td>
<td>15 watts</td>
</tr>
</tbody>
</table>

Installation in Transmitting Sets

In modulated CW circuits, particularly when buzzer modulation is employed, the peak voltages between grid and filament may become very high and in order to protect the tube from damage from this source a 1/32" spark gap should be connected between the grid and one side of the filament.

In case of severe overload, resulting in overheating of the tube, the electron emission may decrease. Unless the overload has liberated a large amount of gas, the activity of the filament may be restored by operating at rated filament voltage for ten minutes or longer with plate voltage off. This process may be accelerated by raising the filament voltage to 9 volts but no more. The plate power dissipation should never exceed 15 watts, and should always be kept as low as possible as the life of the tube is materially increased by conservative operation.

The UX-210 cannot be operated in parallel with the UV-202 because of the differences in amplification constant, plate impedance and mutual conductance.

When used as a modulator or a power amplifier negative grid bias should always be used and should be sufficient to limit the plate dissipation to 15 watts or less. If the plate current is greater than the normal amount when the proper grid voltage is applied, it is often an indication that the tube is oscillating or that it is picking up a radio frequency voltage from other circuits. An inductive grid leak tends to aggravate this condition.

Use of Low Power Tubes at Short Wave Lengths

When Radiotrons, Models UX-210, UV-203A, UV-211, UV-204A and UV-851 are used at wave lengths of less than 50 meters, special precautions should be taken in order to be certain that the tube is not harmed by abnormal conditions.

Two of the most common causes of failure at short wavelengths are burnout of the grid or plate lead inside the tube or base and puncture of the glass stem or other insulation breakdown.

In general the tubes are satisfactory at wavelengths above 10 meters for the grid
and plate high frequency currents shown in the following table. A fuse blowing at the value given, placed in circuit close to the grid or plate terminal of the tube, will serve as a protection to the leads. A grid or plate lead inside of the tube should never be operated at such a temperature that it shows color.

H-108880 shows the variation in oscillating output when the filament voltage is varied. This curve indicates that the emission is ample for full output even when the filament voltage is slightly less than normal.

Use as an Amplifier in Receiving Circuits

The UX-210 is particularly suitable for operation of large loud speakers, since it is capable of delivering relatively large outputs without distortion.

The following table gives the correct values of grid bias for different plate voltages:

<table>
<thead>
<tr>
<th>Plate Voltage</th>
<th>Negative Grid Bias</th>
<th>Filament Terminal Voltage</th>
<th>Approximately Plate Current in Milliamperes</th>
</tr>
</thead>
<tbody>
<tr>
<td>425</td>
<td>75</td>
<td>7.5</td>
<td>22</td>
</tr>
<tr>
<td>350</td>
<td>75</td>
<td>7.5</td>
<td>18</td>
</tr>
<tr>
<td>250</td>
<td>75</td>
<td>7.5</td>
<td>12</td>
</tr>
<tr>
<td>187.5</td>
<td>6.0</td>
<td>6.0</td>
<td>6</td>
</tr>
<tr>
<td>135.0</td>
<td>6.0</td>
<td>6.0</td>
<td>4.5</td>
</tr>
<tr>
<td>112.5</td>
<td>6.0</td>
<td>6.0</td>
<td>3</td>
</tr>
<tr>
<td>90.0</td>
<td>6.0</td>
<td>6.0</td>
<td>3</td>
</tr>
</tbody>
</table>

With plate voltages up to 160 volts, the filament may be operated directly from a 6 volt storage battery without rheostat control.

Great care should be taken to prevent brush discharges in any part of the tube.

Short Wave Data for Transmitting Radiotrons

(Safe values for wavelengths above 10 meters).

<table>
<thead>
<tr>
<th>Tube</th>
<th>Safe Plate Voltage D.C. Plate or RMS A.C. Watts</th>
<th>Safe High Frequency Plate Current or Milliamperes</th>
<th>Safe High Frequency Plate Current Through Tube or Milliamperes</th>
</tr>
</thead>
<tbody>
<tr>
<td>UX 210</td>
<td>350</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>UV 203-A</td>
<td>1000</td>
<td>75</td>
<td>7.5</td>
</tr>
<tr>
<td>UV 211</td>
<td>1000</td>
<td>75</td>
<td>7.5</td>
</tr>
<tr>
<td>UV 204-A</td>
<td>2000</td>
<td>200</td>
<td>10</td>
</tr>
<tr>
<td>UV 881</td>
<td>2000</td>
<td>600</td>
<td>10</td>
</tr>
</tbody>
</table>

For wavelengths below 10 meters even greater care should be used to obviate such a discharge and overheated interior lead wires. It may be found necessary to reduce the plate voltage and dissipation as the wavelength is reduced in order to prevent trouble.

In all cases the plate power dissipation should be limited to not more than 12 watts. The electron emission of the X-L filament is a measure of the efficiency of the filament as a source of electrons. It is approximately 75 milliamperes per watt of filament power resulting in a total emission of nearly 700 milliamperes.
Characteristic Curves of the UX-210 Radiotron

The characteristic curves of the UX-210 Radiotron which follow are plotted from data obtained on a number of tubes and represent the average of these data. Individual samples of the tubes may vary somewhat from this average.

In making use of curves of plate impedance and amplification constant it must be remembered that these values are based on very small input voltages; hence are not applicable to the case of an oscillating tube. Also, in amplifier circuits where input voltages are more than a few volts, some variation from these values will be found.

It is customary to make tube characteristics such as the plate voltage-plate current and plate voltage-plate impedance curves with zero grid voltage. This does not represent the usual condition of operation, since a negative grid bias is ordinarily required. However, it is not necessary to plot additional curves for each value of grid voltage, since within the limits of grid and plate voltage ordinarily used, it is possible to calculate the various quantities from the curve for zero grid voltage. This follows from the fact that applying a certain voltage to the grid has the same effect in the plate circuit as applying to the plate the same voltage multiplied by the amplification constant. It is then only necessary to find the equivalent plate voltage and make use of the curves drawn for zero grid voltage.

As an example, suppose that it is desired to find the plate impedance of a UX-210 at 350 volts on the plate and 20 volts on the grid. Print H-108883 shows that the amplification constant at 350 plate volts and zero grid voltage is 7.9. For most purposes this value of amplification constant is sufficiently accurate for use in the remainder of the calculation, but for extreme accuracy a second approximation may be made to correct for the negative bias. Thus, using 7.9 as the amplification constant, the equivalent plate voltage is found to be 350 - (7.9x20) = 192 volts. For this value of plate voltage the amplification constant is found to be 7.7 and from this the new value of equivalent plate voltage is 350 - (7.7x20) = 196 volts. This refinement is seldom necessary and 192 volts will be used for the remainder of the example.

Thus, with 192 volts as the plate voltage, it is found from H-108883 that the plate impedance is 4500 ohms; and from H-108879 that the plate current is 28 milliamperes.

It is obvious that the above method fails if the grid voltage times the amplification constant approaches the plate voltage.

In using the grid voltage-plate current characteristics it should be remembered that these are static characteristics and must be used accordingly. For example, these curves alone cannot be used for predicting the length of the so-called “straight part of the characteristic” because the true dynamic characteristic of the tube is very different from the static characteristic and depends upon the constant of the load circuit as well as the constant of the tube. Consequently, the dynamic curves must be determined for each individual circuit condition.

A limit on distortionless amplification is encountered when the grid draws current, which occurs with the UX-210 tube at approximately zero grid potential, if the filament is lighted from D.C. source of power. When A.C. filament excitation is used the limit is at a negative grid voltage of approximately 4 volts.

The maximum output of undistorted power is obtained when the load resistance is twice the plate impedance of the tube under the conditions used.

In order to obtain the optimum operating conditions as illustrated for plate voltages of 350 and 450 volts, the plate impedance for approximately the correct conditions should be obtained from print H-108883. A straight line with a slope equal to the reciprocal of the load resistance should be drawn across the family of plate current curves at a point where its intersection with the minimum current line is at a grid bias,
which is twice the grid bias of its intersection with the plate voltage line.

The latter intersection is the operating point. The plate impedance of the tube at the operating point should be found and the slope of the straight line shifted accordingly. This will shift the operating point slightly, but more than one correction is usually unnecessary.

The straight line finally obtained is the optimum load characteristic and its slope is the reciprocal of the load resistance. This line gives the maximum and minimum plate voltage and plate current and the output power is calculated from the following equations:

\[
P = \frac{1}{8} (E_{\text{max}} - E_{\text{min}}) (I_{\text{max}} - I_{\text{min}})
\]

and knowing these two quantities the A.C. plate current can easily be determined or it can be directly calculated from the plate current swing as shown on the curves.

To clarify the use of this method an example is given below for the 350 volt case.

Given \( E_b = 350 \text{ volts} \)
\( I = 1.5 \text{ m.a.} \)

The load characteristic is then drawn and its slope and position found as described, using H-108882 to obtain tube impedance. From this the following values are obtained.

\[ E_c = 30 \text{ volts} \]
\[ E_{\text{max}} = 60 \text{ volts} \]
\[ E_{\text{min}} = 0 \text{ volts} \]
\[ I_b = 13.5 \text{ m.a.} \]
\[ E_{\text{max}} = 60 \text{ volts} \]
\[ E_{\text{min}} = 195 \text{ volts} \]
\[ I_{\text{max}} = 27.5 \text{ m.a.} \]
\[ I_{\text{min}} = 1.5 \text{ m.a.} \]
\[ P = \frac{1}{8} \times 285 \times .026 = .026 \text{ watts} \]
\[ R_p = 285 = 11,000 \text{ ohms} \]

At a value of load resistance lower than the optimum the grid swing is limited at the negative end by the minimum current obtained and the swing does not reach the zero bias curve. At a value of load resistance higher than the optimum the zero volt curve is reached first and the swing does not reach the minimum current line. In either case, less power is obtained than at the optimum load. It should be remembered that these results are for undistorted amplification and do not hold where distortion is allowed.

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New Fixed Condensers

The condenser shown in the photo is the latest from the Dubilier Company. It is known as their type 700, and has several very appealing features. It is enclosed in an aluminum case which makes it impervious to moisture or the most violent form of atmospheric conditions; it is tested at 1,500 volts (D.C.) which shows it to be an excellent capacity in grid and plate circuits of low power transmitters, and if several are hooked up

in series or series-parallel arrangements (as was done by Hanson in the KEK transmitter) the type 700 can be used in even the largest of ham tube transmitters. The condensers can be "stacked" either by machine screws through the eyelets or by soldering to the "tags", the lugs being thoroughly tinned. The type 700 is available in capacities from 250-µµfd. to 20,000-µµfd., all tested at 1,500 volts.

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A.R.R.L. Information Service Rules

Please help us by observing the following rules:

1. Keep a copy of your questions and diagrams and mention that you did so.
2. Number the questions and make a paragraph of each one.
3. Make diagrams on separate sheets and fasten them to the letter.
4. Print your name and address (not merely your radio call) on your letter. Don't depend on the return address on the envelope as this is destroyed when the letter is opened.
5. Don't ask for a comparison of the various manufacturers' products.
6. Before writing, search your files of QST—the answer probably is there.
7. Address all questions to Information Service, American Radio Relay League, Inc., 1711 Park Street, Hartford, Conn.
8. It is not essential to enclose an envelope as long as you supply postage and PRINT CLEARLY your name and address on your letter.
Metallized High Resistance Units

By Joseph Morgan*

Unfortunately the development of resistance units has not kept pace with coils and condensers. This is not because the resistance unit is any less important, but chiefly because the problem is a much more difficult one.

Before tracing briefly the history of the design of high resistance units, it may be advantageous to list some of the more important applications of such units to present day radio. In radio, the chief uses for high resistance units are for grid leaks, amplifiers, coupler units, potentiometers, and for A- and B-battery eliminators. A good high resistance unit must be constant in value, noiseless, free of appreciable inductance or capacity, compact, durable, and have sufficient carrying capacity.

Naturally the first type of resistance unit was a coil of resistance wire. The limitations of this type of unit are many. In the first place, such a unit is very bulky if the resistance exceeds 100,000 ohms. Second, they are incapable of carrying much current without undue heating. Third, it is impossible to construct high resistance wire wound units which have inductance and capacity sufficiently low for grid leaks and coupling units. Finally, these units are very expensive.

In order to overcome certain of these disadvantages, some years ago a unit was devised which consisted of two metal electrodes dipped in ink. The resistance was controlled by the distance between the two electrodes and the concentration of the ink.

This unit was in many ways very imperfect. It was not compact; it was not portable; it was not permanent; and the resistance could not be adjusted within ten per cent of the desired value.

Shortly after this, the very familiar unit consisting of a piece of paper dipped in India ink and clamped between two copper contacts was developed. There was scarcely any virtue outside of cheapness and compactness which was possessed by this type of resistor. It could not be made within 20 per cent of the desired value; it changed from day to day; was entirely unable to carry currents even of the order of a few milliamperes, without breaking down. It's chief merit was that of a humidity indicator, but unfortunately it does not seem to have been employed for this purpose.

An improvement upon the aforementioned type was made by enclosing the carbon paper and contacts in a small glass tube. Even with this protection, these units were erratic in behavior.

It was at this point in the development of high resistance units that The International Resistance Co. engineers began experimenting with a view to the development of a strictly scientific product. After many months of patient research, a method was found for coating the inside of glass tubes with a thin layer of metal. The glass tube was provided with brass caps and the caps were in metallic contact with the metal coating through the medium of low melting point alloy. This improvement over previous units, the film of metal was necessarily so thin in order to obtain the desired high resistance that it was impossible to make a perfect contact with the alloy in the brass caps.

Further, the heat due to carrying the larger currents required for coupling units, made permanent changes in the resistance of these microscopically thin metallic films. This type of resistor frequently showed excellent characteristics immediately after manufacture. However, after several months of use these units deteriorated rapidly due to crystallization of the conducting film. Almost every conceivable type of substance was deposited on the inside of these glass tubes. Every known kind of glass and countless alloys for sealing it were tried.

The present standard International resistor of the coated filament type and the new 15 watt resistor unit of the helical type. The resistance element in the latter is a coated glass filament, as in the smaller units.

Each new specimen was subjected to the most rigorous scientific tests. Literally, thousands of specimens were constructed.

Out of all this experimentation, there was finally evolved the present type of metallized resistor with the glass core which fulfills the most exacting requirements which could be placed upon a high resistance unit. The glass tube, internally coated with a thin film, was abandoned. In its place a fine glass filament is used. This filament is spun on a very ingenious and efficient machine in lengths of five hundred feet and is entirely uniform in diameter. The glass fibre is then passed through a conducting solution, and then into a high temperature furnace through which a steady flow of gas is maintained. This process results in the production of a perfectly homogeneous conducting surface, thoroughly hardened upon one of the finest insulators known. The coated filament has many advantages over the internally coated tube. First, due to the much smaller area of the filament it is possible to have quite a thick coating of conducting material and at the same time produce a very high resistance. Second, it is comparatively easy to put a protecting layer over the conducting filament, whereas it is difficult to coat such a layer on the interior of a tube, particularly if the bore of the tube is small. Third, it is easy to make measurements of the conductivity of the coated fibre, as the fibre is fed out of the coating machine. It is difficult to make such measurements on an internally coated tube. The ease of measurement obtained in the case of the fibre insures a uniform product. Fourth, the experiences of our engineers have shown that it is possible to obtain excellent contact between the fibre and the metal cap whereas we have never been able to get satisfactory contact between an internally coated glass tube and its cap. In the case of the glass tube, comparatively short lengths of tubing must be used in the coating machine (at most eight or ten feet), whereas the coated filament can be made in lengths of five hundred feet, uniform throughout.

Fig. 1. Curve showing the effect of load-current in varying resistance. Note that the energies shown are far above those that will be encountered in receiving circuits, therefore this effect need not be considered in receivers. The helical units are meant for use in B battery substitutes and the like. See the table for suitable loads on the smaller straight-line units.
After the glass thread with its conducting coating has left the furnace it is next coated with durable protective film of insulating varnish which is then thoroughly dried by the application of heat. This impenetrable coating completely protects the conducting filament against atmospheric changes.

As the coated glass filament passes through the various stages of manufacture, its resistance per unit length is continuously tested. Literally, there is no inch of this fibre which has not been measured for resistance.

After the double-coated filament has passed through the measuring devices it is cut automatically in two foot lengths. It is then kept in sealed tubes until it is required for assembling the complete unit. Finally it is cut into lengths approximately 1 ¾" long and mounted in a glass tube with brass caps at the two ends.

A new form of power resistor has recently been developed by the engineers of the company. In this type of unit the filament is wound into the form of a helix, the diameter of this helix being exactly the inside diameter of the enclosing tube. The two ends of the helix are embedded in an alloy within the caps. The helix permits the use of a very long heavily coated fibre in a very small space. With this device it is possible to dissipate from 2 to 4 watts, depending upon the size of the unit, with less than ten per cent variation in the resistance of the unit.

The alloy in which the filament is embedded in the caps is the result of innumerable experiments. Its properties are such that it makes perfect electrical contact with the filament. The cap grips the contacting filament so tightly that it is impossible to pull the filament out without shattering it.

It is almost as if the cap, filament and alloy were made of one piece.

After the resistors are assembled they are again tested. The resistance units are normally made within a five per cent variation. On special orders it is quite possible to make them within two and one half per cent. Comprehensive tests on other makes and types have shown that on the average a resistor is seldom within ten per cent of rating and frequently exceeds fifteen per cent deviation from rating.

Current Carrying Data for Standard Straight Filament Resistors

The voltages and currents given in the table 2 are the values corresponding to the power loss which will produce such a 10 per cent change in resistance. The resistors are capable of carrying, with-

(Continued on Page 55)
Spark Coil Portable Transmitters

By Frank Wilburn

We have a little portable transmitter that has been signing 6EL from Prescott, Arizona. It has occasionally worked as far as Massachusetts though the reliable range is of course much less. However the set has worked into California, Texas, New Mexico, Oregon, Washington, Utah, Colorado, Missouri, Illinois, Nebraska and Minnesota with signal reports to the effect that the wave was steadier than is usual for portable sets.

The power supply consists of a pair of Ford coils connected in parallel to give more output. Either vibrator may be used to operate both coils which is a convenience if one goes bad. With a little experimenting the vibrators may be adjusted to give a high steady note. The spark coils must be "poled" correctly, that is they must not buck each other and they must be connected correctly to the tube. The output from a vibrator coil is in the shape of a very "lopsided" wave amounting to interrupted D.C. If the tube or condensers spark across try reversing the Battery leads at "X"; you may have the plate negative during the strong part of the cycle.

The oscillating circuit is Hartley, series fed. The R.F. choke isn't strictly necessary but is used to make sure. The size of the coils and condensers (except C1) depends on the wavelength at which the set is to be worked. This set happens to use a grid coil and a plate coil wound in the same direction on a 2¼" tube, using 6 turns of No. 16 D.C.C. wire in each coil.

Because space was scarce it was necessary to slip the coil over the vacuum tube. The antenna coil consists of two turns of lamp cord wrapped around the other coils.

The grid condenser is a 250-micromicrofarad Micadon with clips for holding the 50,000-ohm Dubilier "Meteak". The stopping condenser C1 is a 1000-micromicrofarad Dubilier "Micadon" and need not be changed for use in different wavebands. The tuning condenser, C2, an old "23 plate"
variable receiving condenser, cut down to fit the job and the space. Half the plates have been removed and the rest double-spaced after having been cut to a quarter-circle instead of a half-circle. (The capacity is probably near 60-micromicrofarads and it may be possible to use a more compact condenser such as the 65-µµfd Hammarlund vernier condenser. Tech. Ed.)

The antenna is cut to fit the wavelength (the 40-meter band in this case) and is

**THE LITTLE AIRPLANE SPARK COIL SET**

FORMERLY SCR 65

This set provides everything needed for a portable transmitting set except the tube socket, key and tuning condenser. These sets have been advertised in QST.

left fixed. Slight changes in wavelength can be made by tuning the primary circuit and the antenna will accept these somewhat different wavelengths since its tuning is not extremely sharp at the fundamental. Antenna current is indicated by the flashlight lamp which is short-circuited by a switch when the set is in operation.

The UX112 tube used was chosen because of its low space resistance. Flashovers take place between the elements rather than at the stem or base where they would do harm to the tube.

The set was built into the phone compartment of a Crosley "51" portable receiver. Incidentally, this receiver was very easily cut down to 40 meters and works quite satisfactorily.

1. The UX171 will probably be even better and just as safe. Tech. Ed.

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**Shielded R. F. Stages**

**MORE and more, the design tendency in tuned R.F. receivers leans toward the completely shielded type of construction. This does not mean that all of the apparatus is assembled in one huge tin-can. Each R. F. stage, with all of its elements, is enclosed in an individual can of thick metal. The only wires running from one can to the next are A-and B-battery wires (as they can be by-passes for R.F. right in the metal container itself, this does not matter)

![Illustration of a radio set](image)

and output leads to the next can. The shielded construction shown in the illustration is about as compact a job as we have seen anywhere. For the home-constructor, these units are available, either in completely assembled form or knock-down. The containers are of heavy aluminum and can be purchased separately to accommodate your own pet hook-up. The front of the shield is drilled for a condenser and the base is drilled for condenser, coil, tube, by-pass condenser and R.F. choke mountings. These units are supplied by Silver-Marshall of Chicago. Incidentally their latest plug-in coil forms now come with the ribbing moulded with notches to hold the wire. A distinct improvement over the previous type having smooth ribbing.

---J. M. C.

8ABX uses ordinary glass test tubes as forms for R.F. chokes. A rubber stopper in the open end of the test tube serves as a mounting to hold the chokes on the panel or baseboard.
Transmitters in Kit Form

WITH the arrival of transmitting kits in all powers from the UV199 tube size up to and including the the 250 size no one should have any hesitancy or troubles in purchasing the complete parts for a short wave c.w. transmitter. Things are made particularly easy for the beginner who wants to start off with a simple, cheap and efficient set—simple and efficient from necessity, and cheap so that he can feel his way around before crawling into ham radio in quarter kilowatt style.

We have previously described one form of very fine low power kit. The set shown assembled in Fig. 1, and known as the type A is another type of excellent “breaking-in” transmitter. When assembled it consists of a frame 12 x 12 x 12 inches with a wooden front panel 4 x 12 inches and another one 5 x 12 inches. The set is designed for use in the usual coupled Hartley circuit, the inductances being supplied for any of the amateur bands. Receiving condensers are used as primary and secondary tuning condensers, a plate milliammeter and a filament voltmeter are provided on the lower panel and the baseboard is equipped with fixed grid and plate blocking condensers, a grid leak, a Universal socket and an R.F. choke. Suitable binding posts are provided, on a long terminal strip, for antenna and counterpoise connections and for the filament and plate voltage leads.

FIG. 1, TYPE A TRANSMITTER

Coupling between primary and secondary is variable by means of the knob projecting through the front of the transmitter. The type A set is intended for use with any receiving tube or the UX210 7½-watt transmitting tube.

FIG. 2 AND 3. TYPE B TRANSMITTER

The type AA transmitter is practically identical with the type A, except that it is for use with a 50-watt tube. The various parts are over-size, double spaced condensers being supplied, and also a counterpoise series condenser in addition to the antenna condenser. The frame of the AA transmitter is 20 inches high, seventeen inches wide and 20 inches deep.

Still higher power can be obtained from the sets shown in Figs. 2 and 3. Fig. 2 indicates a front view of the modified type B transmitting kit. Three panels of wood support the various meters and variable condensers. The frame is 57 inches high, 19 inches wide and 27 inches deep at the base. The type B transmitter, built in and around this frame, uses a single quarter k.w. tube in a coupled Hartley circuit. Ample insulation is provided throughout, either well seasoned wood, porcelain, hard rubber or Pyrex being used at the point of contact of all R.F. conductors. Large double-spaced transmitting condensers are provided for primary circuits, and antenna-
counterpoise circuits. The inductances are interchangeable for use in all of the amateur bands. Although this set is normally intended for use with a quarter k.w. tube, it can be fitted up for use with any other type of tube at no additional cost. Appropriate filament, plate and antenna meters are provided. Heavy copper tubing is supplied for the permanent connections and large round braid for the flexible ones.

The illustrations of Figs. 2 and 3 do not show the previously described transmitter, but a modification of it, using two quarter k.w. tubes in a master-oscillator power-amplifier combination, one tube being the oscillator and the other the power amplifier. As with the regular type B this set can be supplied with parts for any type of tube. All of these kits are excellent jobs and are furnished complete from soup to nuts. They are supplied by the J. Gross & Company of New York City.

The assembled transmitter shown in Fig. 4 and 5 is supplied in kit form in three sizes, for 7½-watt 50-watt and 250-watt tubes. The illustrations show the 50-watt size. The frame is 14 inches high, 15 inches wide and 16 inches deep. The 7½-watt transmitter has a slightly smaller frame and the 250-watt set is slightly larger. Two 250-µfd. variable condensers (primary and secondary) are mounted behind the panels, which are of bakelite with engraved scales. The condensers are large affairs with double spaced plates. A 0-2 ampere thermocouple meter and a 0-15 volt A.C. meter are used to indicate antenna current and filament voltage, respectively. The

inductances regularly supplied are for 20-, 30- and 80-meter operation. The 20-meter band can be hit a little easier with a smaller type of inductance which can be supplied on request. The inductances are the familiar REL type, wound with flat strip on

moulded glass insulation. The coils slide on two glass rods. The grid and plate condensers are of mica and the r.f. choke is so designed and placed that there can be no trouble with it in any of the ham bands.

Modulation and speech amplifying equipment, supplied in knockdown form to match the panels of the transmitters, are available for any of these transmitters. One size uses a 7½-watt modulator and a 201-A speech amplifier. The next is a 50-watt modulator and a 7½-watt amplifier and the largest size uses a 250-watt modulator and a 50-watt speech amplifier.

Complete power supply kits are also available. The power panel is designed to match the oscillator and modulator units, and contains plate and filament voltmeters with necessary voltage regulation devices. The power units are made in two forms, a D.C. type and an A.C. type. The D.C. unit uses an Esco motor generator working off either A.C. or D.C. drive, the generator giving the appropriate voltage for the oscillator it is to be used with. The A.C. type has an Acme power transformer with plate and filament windings and the necessary aluminum, lead and all material (except the glass jars which can be purchased from any 5 and 10c store) for a chemical rectifier. In each case the transformer and rectifier material are sufficient for the type of oscillator the unit is designed for. In addition a filter comprising a brute force arrangement with choke coil and high voltage condenser can be obtained. These excellent units are supplied by the Radio Engineering Laboratories of New York City.

—J. M. C.
Experimenters' Section Report

The details of the organization of this section were given in the July issue on page 38 and need not be repeated here.

The 5 Meter Tests

The 5 meter tests which were announced on page 41 of the August issue were also pre-announced by a number of mimeographed letters. Since this is being written on the last day of July there is no chance to say how things are going beyond the fact that an unexpectedly large number is participating and that signals are being heard.

By all means take part in the test, preferably with a transmitter. If you don't happen to be enrolled in the Section start your test first and then send in your enrollment so that you will be kept informed as to progress. The details of the test were given on page 41 above referred to.

Good luck!

5 Meter Sets

Boyd Phelps of 2EB calls attention to a difficulty that one may easily get into when trying to build oscillators to operate over a waveband in the region of 5 meters wavelength. Referring to Fig. 1A one has the circuit most used by transmitting oscillators and sometimes in receiving oscillators at 5 meters. It is usually found that the tuning range is small because (referring to Fig. 1B) the variable capacity C1 is connected in series with a fixed L and a fixed C2, which is the grid-plate capacity of the tube. Since C2 is not only fixed but also very small it limits the tuning rather badly on the upper end of the range—speaking in terms of wavelengths which is the more convenient at 5 meters. There are several fairly obvious ways to cure the difficulty and one need not go into details.

Those who have begun the tests are complaining of the difficulty of building a receiver that does not have the tuning and the regeneration hopelessly interlocked. In some sets the alleged regeneration control does more tuning than the knob that is supposed to do the tuning. Several ways out of this difficulty were suggested in the July issue, p. 43. Phelps has also been trying the use of a separate heterodyne which gives one a chance to control the note and the strength of oscillations separately, giving some relief from the interlocking situation because at least the note isn't mixed up in the argument.

Field-Strength Measurement

Several excellent communications of field-strength measurement sets have come in.
A short paper on the subject is being prepared for the next issue.

Using the "H" Tube

Most of the sending sets on the 5-meter test seem to be using the DeForest "H" tube, but not all appear to be having a great deal of success with them—mainly thru not understanding the tube. Thru the courtesy of Mr. VonBrandt of the DeForest organization we herewith present a pair of dynamic curves on the tube, showing in two different ways the importance of using a high bias. Note that both the output and the efficiency fall rapidly when the grid resistance is less than 15,000 ohms. Crescent non-inductive resistors seems especially suited for this duty.

The Indiana State (Central Division) Convention

For the third consecutive year the Indiana Amateurs have held a convention that will go down in history as one of those clean and interesting affairs considered so much a part of that A. R. L. spirit so often spoken of.

As one of the newspapers said radio artists from Orange, Tex. to Hartford, Conn.; from Madison, Wis. to Tulsa, Okla.; and from Wayland, N. Y., to St. Louis, Mo., were present. From Indianapolis, Hammond, Anderson, North Manchester and Fort Wayne there were large delegations. Under the leadership of Edward T. Neispodzainy, otherwise known as Ned, President of "The Old Timers Radio Club" who sponsored the convention and ably assisted by A. R. Kahn, there was not an idle moment. With talks by A. A. Hebert, Treasurer of the League who discussed "The Headquarters Staff in Action", Fred H. Schnell of the C. F. Burgess Laboratories; R. H. G. Mathews, formerly division manager, acting as a representative of the U. S. Naval Reserve Service and Paul Magnus, 9bo, on short wave receivers, the formal discussions were well covered, especially Schnell’s talk on a "Grid Driver."

The entertainment part of the Convention consisted of a good talk by Harold E. Gray, one of the operators aboard the S/S Peary which accompanied the S/S Bowdoin to the Polar region last year and the hundreds and hundreds of feet of movie films shown were certainly appreciated. Fred Schnell’s lantern slides of his trip on the NRRL kept the crowd interested for more than two hours, and the stunts pulled off at the Y. M. C. A. gymnasium capped the climax. The best one being a ball game between “Sparks” and “CW” being won by the “Sparks” with a score of 16 to 2.

With visits to the Twin Branch Power Plant, one of the largest in the country and to the plant of the Studebaker Corporation, where the assembly of complete automobiles was watched the last day was filled to overflow when the traffic meeting, under the direction of Section Manager Angus and a general hamfest was held. With a good banquet and the distribution of 16 prizes contributed by those loyal advertisers in QST, whose names are so well known, we can close this report with an expression of deep gratitude to the Committee in charge, and say:-WELL DONE!

—A. A. H.
3LW, Willow Grove, Penna.

This station is the result of the usual development from the Lizzie coil stage, to five watts and thence to a 250-watt tube. The set was constructed by H. A. Robinson and is operated by him at Silver Lake Farm.

The oscillator panel at the left is of wood painted black with a solution of Victrola records dissolved in alcohol. Possibly the Victrola records account for the semi-musical note emitted from this station. The tuning condensers, meters and other controls are mounted on the front of the panel together with the UV204-A. The conventional inductively coupled Hartley circuit is used.

The primary inductance for the 40-meter band consists of twelve turns of \( \frac{3}{16} \) inch edgewise wound copper strip, spaced \( \frac{3}{16} \) inch and supported by two hard rubber strips. When working on 80 meters an R.C.A. inductance is employed. The same secondary is used for both 40- and 80-meter operation. The secondary is a twelve turn pancake of \( \frac{3}{16} \) inch copper strip.

An Acme filament transformer with a 500-watt Bradleystat in the primary heats the filament of the tube. It was found that the same output could be obtained with the voltage on the filament as low as 8, consequently the tube is operated well under normal filament rating.

To the right of the oscillator is the power panel, also of Victrola-ized wood. Mounted on this panel are the control switches for starting and stopping the synchronous rectifier, reversing the output polarity and controlling the plate voltage of the tube. Plate voltages ranging from 500 to 3,000 can be selected in steps of 500 by means of the two small single pole double throw switches. Behind the panel are the various motor starting resistances and the 500-watt Acme power transformer. The operation of the transmitter is all controlled from this panel. A 220-volt power line with 3 k.w. available is used for the transmitter, the filament transformer and synchronous motor being operated across one side of the line and the plate transformer across the other.

To the extreme right of the photo is the short wave receiver using an inductively coupled Wagner circuit, detector and two stages of audio frequency amplification. It is constructed in the usual low loss fashion using interchangeable coils space-wound with string. A box beneath the receiving table houses both storage A and B batteries with their chargers. The battery supply is...
so wired that either A or B can be put on charge by means of switches.

The main antenna at 3LW consists of a single wire, inverted L type, eighty feet long. The far end is supported by a 60-foot steel mast. A two wire fan type counterpoise eight feet high is used. Both wires are eighty feet long, spread thirty feet at the far end. Number 10 copper wire and Pyrex insulation is used throughout. The antenna has a fundamental of about 105 meters. For operation in the 80-meter band a series condenser is used to bring the fundamental down. On 37.7 meters, the third harmonic of the antenna (minus series condenser) is used.

3LW is an Official Relay Station and the operating rules are rigidly observed. Because of the fact that this is a one man station and Robinson has been very QRW at the U. of P., the station has not been on the air very much, most of the work being done over week-ends. Robinson modestly states that the DX is not very exceptional, however communication with Australia and New Zealand is maintained nearly every morning that the station is on the air. North and South poles and every continent except Asia has been worked.

8RX, Detroit, Michigan

This station is owned and operated by the members of the City of the Straits Radio Club of Detroit. The station is housed in an eighteen by eighteen foot house located at Halfway, Michigan. The station serves also as a meeting house for the Club every two weeks. Ample space and tools are on hand and the members of the club do considerable set-building and experimental work.

The receiver is of the throttle condenser regeneration control type with plug-in coils, detector and one or two stages of audio frequency amplification.

The transmitters are three in number. Number one, to the left of the receiver, is a 50-watt tube working in an inductively coupled Hartley circuit. The tuning condensers are 250-μf. Cardwell's. The primary inductance is 13 turns of the R.C.A. helix and the secondary 10 turns of the same. Eight inch coupling is regularly employed. The set is used for c.w. only, operating regularly in the 80-meter band. Plate supply comes from a high voltage transformer and a seventy-two jar chemical rectifier.

Transmitter number two is a 250 watt, also in a coupled Hartley circuit using special General Instrument 250-μf primary and secondary condensers. A synchronous rectifier and high voltage transformer furnish plate supply to the tube, which is a W.E. This set operates both in the 40- and 80-meter bands.

Transmitter number three is a 10-watt coupled Hartley fone set using two oscillator and two modulator tubes with Heising modulation. This job is used for 185-meter fone for local use in communication with members only. The plate supply for the fone set comes from a 500-volt motor generator.

The poles for the antenna are sixty feet high and sixty-three feet apart. The antenna-counterpoise lead-ins are brought in through the house at opposite ends. The bushings are of Pyrex. A great variety of antenna-counterpoise systems have been tried at the station. The membership, besides working on individual transmitters, are co-operating on Scout portable transmitters, airplane radio and other types of experimental work. The club has been affiliated with the A.R.R.L. since 1922.
STATION 6BJX is located in a corner of the attic at 2823 East Sixth Street, Los Angeles. It is owned and operated by Ernest O. Knoch. The three different "fists" heard from the station are due to the bug, the sideswiper and the straight key, but "KH" is behind them all.

The aim of the operator at 6BJX has been consistency rather than brilliant performance. No startling DX records have been made although the transmitter is heard regularly in all continents. A traffic schedule has been kept daily with PHHR since September of 1925, except for a break of one month due to sickness. Schedules are kept daily with stations East and North, so the hook is always cleared promptly. An average of 250 messages per month are handled, the bulk of which are to and from the Philippines. Traffic handling is not the sole occupation, however, as the R. C. C. certificate will attest.

Referring to the photograph from left to right appear the receiver which is a Hartley type with the conventional one stage of audio frequency amplification; the transmitter which uses a coupled Hartley circuit in which a 50 watt operates. The inductances in the transmitter are wound with copper from Mr. Ford's well-known masterpiece, on a tube formerly the property of the Quaker Oats Company. Under the table are the battery chargers, "S" tube rectifiers, R. F. and A. F. chokes, motor generator and a switch which changes from "S" tube rectified A. C. to motor generator. The M. G. is generally used. The generator supplies 790 volts to the plate of the tube at a current of 160 milliamperes.

The antenna is a single wire 120 feet long and 33 feet high. The counterpoise is 15 feet high and 100 feet long, and consists of a five wire fan with cross wires forming a network. The counterpoise is almost directly under the antenna. The combination is tuned to 120 meters, and the transmitter is operated at the third harmonic. A particularly peculiar feature of the signs emitted from 6BJX lies in the fact that the East Coast has been worked only twice on 40 meters, while the station is heard regularly in Europe and Africa.

Quite an array of interesting trophies from the Philippines are on display at the station. These have been sent to the operator in appreciation of messages which he had handled to and from the Philippines. Although a rather hay-wire layout, 6BJX certainly produces the goods, which after all is the main thing.

Amateur Crystals Available
Oscillating quartz crystals ground to approximately 160 meters are now available from General Radio at $15 each. The crystals are guaranteed to be good oscillators, and are supplied in wavelengths within 10 meters of 160, making them suitable for use in the 20, 40, 80 and 150-meter bands. To cheapen the cost, and allow the amateur to use his own crystal mounting, these crystals are supplied unmounted. Mountings can be obtained from G-R, however, at an additional charge. The crystals are duly licensed and are not bootleg. Something we have been waiting for for a long time. P.B.

—J. M. C.
NUMEROUS requests have been received from the new-comer in the amateur game as to the best hour of the day to work foreign DX. The following table has been compiled. It is believed it will give the required information concerning amateur activities in the countries listed. At a later date additional countries will be added to the list, just as quickly as the data is received.

<table>
<thead>
<tr>
<th>Country</th>
<th>Wavelengths (Meters)</th>
<th>Legal Assigned</th>
<th>Best D.X. QSO with Handling</th>
<th>Best Time (G.M.T.) for Traffic Handling</th>
<th>U.S.A. Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chile</td>
<td>150-230</td>
<td>75-88</td>
<td>33-36</td>
<td>0400 to 1000</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>37.5-42.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>95-115</td>
<td>70-75</td>
<td>43-47</td>
<td>0100 to 0200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9-18</td>
<td>4-7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>England</td>
<td>440</td>
<td>90-200</td>
<td>32-34 (Special)</td>
<td>2300 to 0800</td>
<td>Yes, if not classified as &quot;commercial&quot;</td>
</tr>
<tr>
<td></td>
<td>44-46</td>
<td></td>
<td></td>
<td></td>
<td>Experimental</td>
</tr>
<tr>
<td>Irish Free</td>
<td>150-200</td>
<td>90</td>
<td>45 to 90</td>
<td>2400 to 0800</td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>Not Assigned</td>
<td>36</td>
<td></td>
<td>0800 to 0500</td>
<td>Experimental</td>
</tr>
<tr>
<td>Spain</td>
<td>20-120</td>
<td>33 and 45</td>
<td></td>
<td>0000-0500</td>
<td>Experimental</td>
</tr>
<tr>
<td>Belgium</td>
<td>Not Assigned</td>
<td>30 to 45</td>
<td></td>
<td>2300 to 0600</td>
<td>Experimental</td>
</tr>
</tbody>
</table>

The best U.S. waveband for QSO with any of the above countries at the times stated is in the so-called 40-meter band.

South African-American Contest

The Rand Daily Mail of Johannesburg is instituting a new form of contest for the benefit of American hams. The award is to be a silver South African Springbok. If you don’t know what a Springbok is, consult Webster’s latest. It is a prize well worth going after. The purpose of the contest is to make the award of the Springbok to the U.S., Canadian or Honolulu amateur who establishes two-way communication with the greatest number of South African amateurs during the months of September and October of this year. The competition begins at midnight (G. M. T.) on September 1st. Two-way communications held more than once in the same week between any two stations shall count only as one point in the competition. South African amateurs will send a report each week to the S.A.R.R.L. of all amateurs worked in connection with the competition. American amateurs should send QSL cards, acknowledging QSO’s with the South African Stations immediately after the QSO’s. These cards should be sent to A.R.R.L. Headquarters from which they will be forwarded weekly to the Headquarters of the S.A.R.R.L. for checking purposes. When the competition is completed all cards will be forwarded to the station they are addressed to. All QSL cards must be marked “Rand Daily Mail Springbok Competition”. No schedules may be made between American and South African amateurs. The decision of an “International Committee” consisting of the Editor of the Rand Daily Mail, the Editor of QST, the A.R.R.L. Communications Manager, the Chief Engineer of the B. C. station at Johannesburg and the Secretary of the S. A.R.R.L., will govern the awarding of the prize. A suitable award will also be made to the South African amateur whose station is worked the most times during the competition.

Remember, gang, forward your QSL cards after each South African QSO, being certain that date, time and wavelength is shown on cards, to A.R.R.L. Headquarters, and mark the cards “Rand Daily Mail Springbok Competition”. Hop to it. The fellow who wins the competition is going to have a photo of the Springbok gently reposing at his feet in this section of QST, and he is going to be the proud possessor of a most novel trophy. Good luck.
France

"During the month of June, American and Canadian stations were received more consistently and with better signal strength than in the two previous months especially between the hours of 2 and 5 (G.M.T.). f8YOR managed to establish 28 QSO's with f8JN, KNOWN THE WORLD OVER U.S.A. in three nights. The big station f8JN, had a regular schedule with 22AG and kept contact beautifully. The best QSO's for f8JN were with GEFT, KFUH, KEGK, NEDJ, TUK in Siberia, ANDIR in Java, and the Chilean stations 2LD, 3IJ and 9TC. Regular QSO between France and f8QQ in Saigon, French Indo China, has been possible since November of 1925, either through direct QSO or through relay via 22AC or LA1X. f8JN has resumed his schedule with 8BLT, a ship going between Saigon and Marseille, and they are QSO throughout the entire passage. A regular schedule has also been kept with 6A6N for some time. At the present writing f8JN is working in the 20-meter band and has been QSO a number of PJ stations. f8BF, known the world over, was the first station of France to QSO p3AA. The official call f8KF has been assigned to f8CA. f8KF was the first in this country to QSO Byrd's KEGK. He has also been in contact with w2XA at a time when it was broad daylight all the way across. f8YOR with an input of 100 watts has worked TUK on 29 meters, ch2LD and has received an "r8" in New Zealand, despite the low power. All QSO's have been in the 38-meter band lately. This band is in great favor with all of the French amateurs, while the 44-meter band is gradually being abandoned. A number of the stations are cautiously migrating to the 20-meter band, since especially fine work was done on a wavelength of 20 meters by 8BF and 8CT last year. f8GI has been the first to QSO bzlAF on 20 and 17 meters"—f8YOR.

Chile

"During the month we have had quite a few good contacts with Europe. ch2AB was in communication with 11CO. ch2AH has worked s2CO. ch2LD has established the first QSO between Sweden and Chile when SMUK was worked by Desmaras. ch2LD also worked s2ND eight times in twelve days. ch3AT has also worked a number of Europeans, among them g2DX, f8TK and s2ND. The general conditions for QSO with the U. S. A. this month have not been very satisfactory. Communication, after winter came to this hemisphere has been very difficult when we hear the U. S. gang QSO our signals are reported as being very weak there. On rare occasions both countries report good signals at the same instant. We hope that as soon as these poor radio weather conditions pass we will be able to QSO the U. S. more often and more satisfactorily"—ch2LD.

Irish Free State

"Up to the beginning of this year, hardly any amateur radio men had been granted transmitting permits. Several keen enthusiasts, however, have now succeeded in obtaining the coveted permission and the following licenses have been issued to stations having these call letters: 11B, 11C, 12B, 14B, 15B, 16B, 17B, 18B and 19B. The Irish Radio Transmitters Society has been formed with a view toward stimulating interest in short wave work. The membership of this society is now twenty five. As far as actual DX work is concerned, there is very little to report. All licensed stations are allowed to use only 10 watt transmitters. 19B has worked TPA1 in Poland, whilst 18B has been QSO several European Countries. 15B has worked a number of G's when using an input of only 3 watts. He is sighing for the power available when he had the call g2KW! Colonel Dennis, gw11B, the first amateur to be licensed by the Free State Government was QSO the U. S. on several occasions. 17B will be in operation by the time this appears in print. In order that postage may be saved those who have QSL cards for "GW" stations may send their cards in a batch to The Irish Radio Journal, 34 Dame Street Dublin, Irish Free State. The cards will then be for-
warded promptly to their destination. It is proposed to form a Free State Section of the I. A. R. U. and in this connection 26 prospective members have signified their willingness to nominate Colonel Dennis as First National President. When the few remaining hams have signed the nomination form, it is hoped that the Free State Section will come into being.—W. R. Burne, qso 15B, Hon. Secy. Irish Radio Transmitters Society.

Short Wave Commercial Stations

Through the Courtesy of Mr. L. A. Briggs of the Operating Department of the R. C. A. we are presenting below, some additions to the list of short wave commercial stations previously run in this department of QST. Also a list of changes in wavelengths previously appearing in these columns.

New Stations

<table>
<thead>
<tr>
<th>Wavelength Approximate</th>
<th>Frequency</th>
<th>Call Letters</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.0</td>
<td>21420</td>
<td>PCRR</td>
<td>Kootwijk, Holland</td>
</tr>
<tr>
<td>17.7</td>
<td>16940</td>
<td>KFD</td>
<td>Denver, Colorado</td>
</tr>
<tr>
<td>18.3</td>
<td>16280</td>
<td>WRO</td>
<td>Schenectady, N. Y.</td>
</tr>
<tr>
<td>18.65</td>
<td>16100</td>
<td>KEB</td>
<td>Los Angeles, Calif.</td>
</tr>
<tr>
<td>21.8</td>
<td>13750</td>
<td>KEB</td>
<td>Los Angeles, Calif.</td>
</tr>
<tr>
<td>21.4</td>
<td>14015</td>
<td>KDZ</td>
<td>Point Barrow, Alaska</td>
</tr>
<tr>
<td>23.2</td>
<td>12870</td>
<td>WRO</td>
<td>Schenectady, N. Y.</td>
</tr>
<tr>
<td>24.3</td>
<td>13240</td>
<td>KFD</td>
<td>Denver, Colorado</td>
</tr>
<tr>
<td>25.2</td>
<td>13950</td>
<td>AGB</td>
<td>Nauen, Germany</td>
</tr>
<tr>
<td>26.9</td>
<td>11880</td>
<td>(call Beam station at unknown)</td>
<td>Dorchester, England</td>
</tr>
<tr>
<td>27.0</td>
<td>11105</td>
<td>PCPP</td>
<td>Kootwijk, Holland</td>
</tr>
<tr>
<td>29.3</td>
<td>10239</td>
<td>KEL</td>
<td>Bolinas, Calif.</td>
</tr>
<tr>
<td>30.0</td>
<td>9994</td>
<td>ANF</td>
<td>Malabar, Java</td>
</tr>
<tr>
<td>33.0</td>
<td>9359</td>
<td>PULL</td>
<td>Kootwijk, Holland</td>
</tr>
<tr>
<td>33.0</td>
<td>9369</td>
<td>FL</td>
<td>Eiffel Tower, Paris</td>
</tr>
<tr>
<td>35.0</td>
<td>9095</td>
<td>OCFJ</td>
<td>l'Isy les Mauilleaux</td>
</tr>
<tr>
<td>35.0</td>
<td>9566</td>
<td>WGY</td>
<td>Schenectady, N. Y.</td>
</tr>
<tr>
<td>37.9</td>
<td>8130</td>
<td>6XI</td>
<td>Bolinas, Calif.</td>
</tr>
<tr>
<td>37.43</td>
<td>3010</td>
<td>WLC</td>
<td>Rogers, Michigan</td>
</tr>
<tr>
<td>42.05</td>
<td>7120</td>
<td>KDZ</td>
<td>Point Barrow, Alaska</td>
</tr>
<tr>
<td>44.22</td>
<td>6783</td>
<td>EDA</td>
<td>Airplane with Detroit</td>
</tr>
<tr>
<td>50.0</td>
<td>5956</td>
<td>CA</td>
<td>N. Y. Times, Halifax</td>
</tr>
<tr>
<td>59.92</td>
<td>4587</td>
<td>(call Beam station at unknown)</td>
<td>Dorchester, England</td>
</tr>
<tr>
<td>66.82</td>
<td>4920</td>
<td>KDA</td>
<td>Airplane with Detroit</td>
</tr>
<tr>
<td>68.4</td>
<td>4380</td>
<td>WTV</td>
<td>Point Barrow, Alaska</td>
</tr>
<tr>
<td>70.0</td>
<td>2283</td>
<td>KFZP</td>
<td>San Francisco, Calif.</td>
</tr>
<tr>
<td>74.77</td>
<td>4010</td>
<td>KDX</td>
<td>Point Barrow, Alaska</td>
</tr>
<tr>
<td>74.77</td>
<td>4010</td>
<td>WLC</td>
<td>Rogers, Mich.</td>
</tr>
</tbody>
</table>

Changes in Wavelength

2XAD, Schenectady N. Y. from 20 to 26.4 meters.
POP, 20 meters, call has been changed to AGK.
POW 28 meters, discontinued.
2XAC 40 meters, Schenectady, N. Y. Discontinued.
2XAF, 41.88 meters, Schenectady, N. Y. changed to 22.79 meters.
SPR, 75 meters, call changed to FL, Eiffel Tower, Paris.
2KK, 80 meters, wavelength changed to 65.5 meters.
KIO, Kahuku, Hawaii, wavelength changed to 90.04 meters.
KEL, Bolinas, California, 95 meters. Discontinued.

Siberia

Quite a number of U. S. amateurs have been QSO the station signing TUK, and contact with this station has been established from all parts of Europe and even at its Antipodes. We are indebted to S. Kalachnikoff, an amateur in Tomsk, Siberia, for the following description of this pioneer short wave station. The station is located at the University of Tomsk, the center of scientific activities in Siberia. The apparatus was installed with the help of the Nijni-Novgorod Radio Laboratory. As seen in the photograph the transmitter uses two tubes rated at 150 watts each (input). Filament supply is obtained from a storage battery, the plate power coming from two 1,000-volt motor-generators connected in series. Most of the DX work of this station has been done on a wavelength of 34 meters. The station is in operation every day from 1700 to 2000 G. M. T. Communication has been established with z2AC, oA3B, oA6N, European, Indian, Chinese and many other stations throughout the world. The operators are particularly anxious to have more contacts with America. They are ready at any daily schedule to receive calls on wavelengths from 20 to 50 meters. All QSLs should be addressed to B. N. Putkoff, Operator, Radio Station TUK, University of Tomsk, Tomsk, Siberia, Union of the Socialist Soviet Republics, (not addressed to Russia!)
Spain

"The EAR Association is the Spanish Section of the I. A. R. U. The official address of the EAR Association is Mejia Lequerica 4, Madrid, Spain. Miguel Moya, EAR1 is President of the Association and EAR 10 and EAR 15 are vice-president and Secretary, respectively. The officially licensed transmitting stations have the call letters EAR followed by a number. To date the licenses include the calls EAR 1 to EAR 37 inclusive. Traffic handling by the Spanish hams has been particularly good during the past several months. Especially has this been so in the case of QSR's with Porto Rico, Brazil and other South American countries. QSO has been established with New Zealand, Australia and ships near these countries. The following Spanish amateurs are in more or less regular contact with Europe and America: EAR2, EAR6, EAR13, EAR15, EAR17, EAR18, EAR20, EAR22, EAR24, EAR28 and EAR31. Miguel Moya, President of the EAR negotiates with the government for the official licensing of transmitting amateurs in Spain by virtue of the authorization conceded him by the Director General of Communications.—BAR1.

New Zealand

"Via radio from z2XA through u8GZ comes the following data from New Zealand. "The Brazilian and Argentinian stations are being picked up at noon (New Zealand Time) and a little later the European stations begin to come in. The U. S. West Coast stations are heard from three P.M. and are at a maximum around seven P.M., then fading to QRZ and coming in QSA again at about ten P.M. The first, second, eighth and ninth district stations are heard from six P.M. until midnight. During any of these hours satisfactory QSO can be established. The third and fourth district stations do not come in consistently as they seem to come in at any old time. The best time for QSO is when daylight is just breaking with them. u2UO is remarkably QSA here, his audibility never being less than R6. He can be copied for hours when sending single."—Shrimpton, z2XA.

From z2AC via u9ZT the following has been received: "From August first the call of Indo-China f8QQ will be changed to IC1B, QRH 34 meters with a D.C. note. A new station is being heard regularly. It signs SK1 and is located in Sarawak, British Borneo. The QRH is 38 meters with a rectified A.C. note. The loudest Italian station heard here is i2GW who often is received with an audibility of R9."

Ecuador

u3LD speared a new one when he was QSO a station signing gh1FG. His QRA is Mission Eitaliana, Sione Street, Aliana, Quinto, Ecuador. He was operating on a wavelength of 35 meters, with a D.C. note. At the same time u3LD was QSO this station, u1CNA reports hearing him also. Anyone any further dope?

Metalized High Resistance Units

(Continued from Page 39)

out injury, still higher currents and voltages, but with a correspondingly larger change in resistance.

All the meters used in the manufacture and assembly tests are frequently checked against laboratory standards. Production lots of samples are also tested periodically in a 3-stage amplifier to make certain they are noiseless.

The unit thus manufactured is rugged, permanent and accurate. It has proved its utility wherever high resistance units are required.

Strays

The brass frame around an old electric fan makes a keen inductance for that 5-meter transmitter, according to 9BLE.

"When attempting to use direct current from the house mains for a B-battery eliminator where the commutators and collector rings are indifferently true it often happens that a regular interference results. This may be cured, in most cases by using the secondaries of two audio frequency transformers and two 2 mfd. condensers as shown in the diagram. In my case this made the 120-volt D.C. mains suitable for B-battery supply, while, before the filter was installed nothing but a continual roar could be heard"—o2BN.
Captain Rives Leaves

The Signal School
Fort Monmouth, N. J.

Editor, QST:

It is with real sorrow that I write you to tell you that I have just received orders to attend a course in Communication Engineering at Yale University for the coming session. This will of course, cause my relief as Army Liaison Agent.

While I regret very much that I will not be able to continue my work as Liaison Agent, I leave it knowing it will be capably handled. Captain A. C. Stanford, Signal Corps, U. S. A. will be appointed Army Liaison Agent in my stead. Captain Stanford is a West Point Graduate and has just completed the course at Yale. He is also a graduate of the Company Officers course at the Signal School and is a radio operator. I am sure that the Army-Amateur work will make great progress under his leadership.

The work of the Liaison Agent has reached such proportions that my successor will be allowed more personnel here and will be assigned few other duties. This will enable him to carry out many of the plans which have been made for this work, but which have not been carried out due to lack of time and the pressure of other duties of the Liaison Agent during the past year.

While I will not actively be connected with the work after August 1st, 1926, my personal interest in it is as great as ever and I intend to keep in touch with it and lend a helping hand whenever possible.

It is perhaps needless to say that the policy of the Signal Corps as laid down in the Army-Amateur plan will still remain in effect. Changes in service personnel will not affect that in any way.

I wish to thank you and the other officials of the American Radio Relay League and the thousands of amateurs of the country for the wonderful spirit of co-operation with which you all have entered into this plan. There is no other group of individuals that is so willing to give and that does actually give of its time and resources so unselfishly as do the transmitting amateurs of the country. It is a great pleasure to be associated with them.

—Tom C. Rives, Captain Signal Corps, Liaison Agent.

“QSY 20”

1143 Garfield Street,
Hammond, Indiana

Editor, QST:

It seems to me that the time has come to say something about our 20-meter band. Here we have a perfectly good band for our use and instead of taking advantage of it, and getting out of the 40-meter QRM, we are letting it lie idle. It seems a perfect shame that so few of the gang are down on 20 meters. For the past month I have communicated with only four stations on 20 meters. My station has been running half hour tests, daily, on 21 meters for over a month. I received astonishing reports from New Zealand, Australia, Porto Rico and Honolulu as well as every state in the U. S., but I have discontinued the tests on account of the poor co-operation the fellows have given.

We need some more good work in the 20-meter band. We need a lot of QSO’s. Australia and New Zealand are QRV for 20-meter work. Let’s get down to 20 for DX work and traffic handling, fellows. We are overlooking a darned good bet.

—James Grindle, 9BSK

Breaking-In In China

Ye Ed, QST:

I believe that no one could be more delighted than I to read your editorial in the January number of Q street, and although your promises, as far as I am concerned, are as yet to be fulfilled, I really feel as though I had been taken in out of the cold and planked down in front of a nice cheery fire with lots of coal in the scuttle.

I started as a “home-constructed B. C. L.” a couple of years ago, but being a resident of China where B. C.’ing is not all it might be (for the simple reason that all radio goods are labeled “contraband” here and are considered to be munitions of war) —I found the “home constructed” part of it more interesting than B. C listening.

A year ago I decided to stop looking in through the window you spoke of, and walk in. I cannot help smiling now at my delightful innocence of those days—“to walk in”—Ha! Little did I know what the door was made of! So much for the decision. Yes, I would chuck up all this listening to Chinese Government spark stations on 600
meters, passing on sweet messages from passengers on President boats to folks on shore—I would stop listening to Victrola records being broadcast on 365 meters from local "broadcasting" stations. I would build a transmitter and have converse with the outer world, like I'd been reading about in QST. Delightful prospect.

I will briefly pass over the year that followed. It was a nightmare—the sort of nightmare I should imagine you experts have if you were sick with a fever. You find yourself in some ridiculous position—a 5 watter in one hand and a plate transformer in the other. No matter how you connect the plate transformer, it refuses to give less than 3,000 volts. A moment later you hear you are transferred to another station where lighting mains are 110 volt and all your transformers are made for 220, and you wonder whether it is 5½ phase, or what. After much trouble you obtain the necessary 220 volt items, and when you get to the new station you find the Electric Light Company there, being a Chinese show and having to provide unlimited current free gratis to all officials and military posts for miles around, can at best only push out 150 volts. Moreover, you find that the voltage varies with the wind, the frequency changes every time the Chinese fitter expects, and anyway it isn't 5½ phase, or what.

I could quote a hundred and one problems that I have been up against since that unknowing decision. How to erect an efficient but invisible antenna—how to get DX on the receiver when the E. L. mains are arcing over at six places within a mile of you—how to get that 4 wds. per minute up to 5 when there isn't a soul near to come and buzz at you on your knobless bellow—how to strip 40 feet of bell wire for your low-loss inductance (it took me six hours to do this)—how to make 3½ inch cardboard tubing out of the backs of writing pads, and when you have made it on a coffee tin, how to get it off! What is the correct method of drilling and cutting 12 inch Victrola records for your panel, and how do you resharpen the drills after the holes have been punched through? These things, and more, have I learned by bitter and sad experience.

But to revert to your original metaphor, I bumped my nose hard on the door before realizing it wasn't hard enough to swing open the pearly gates. That got my goat, I sent to England for a sledge-hammer and after three months it arrived. And I smashed in the door with much labor but much satisfaction. But alas, when I got inside the birds had flown. They'd left the 2,000 kc floor and gone higher. Unnerved, shaken, a 15 watter blown, a transformer burned out, but still a tag-along I decided to follow to the 3,000 kc floor. But there is no staircase in this house. Not having wings myself, I sent to America for a ladder. It duly arrived and I mounted, only to be disappointed again—they'd left for the 8,000 kc floor, and higher.

I am still on the 3,000 kc level, tired, fed-up, radiating 10% of my input, struggling with fundamentals and h. f. resistances which I cannot measure, dizzy with parastic oscillations at unknown frequencies, and never worked a soul yet!

You are right—there are lots of us, some on the first floor, some hacking at the door and crowds walking around this house of yours trying to find a door that swings. Some day we all will find the combination and the house will be overflown!

—"Ten Per Cent"

**Good QSO**

San Francisco, Calif.

Editor, QST:

Some weeks ago a resident of Berkeley, California came to my assistance in arranging for her, by radio, a meeting with her friends in Honolulu with whom she was about to visit.

Subsequent to her arrival at Hawaii, there came a need for what amounted finally to a conversation with a financial adviser in San Francisco, concerning some personal business that needed attention.

It was arranged that she went to the rooms of the Radio Club of Hawaii, 6BUC, with one of her friends, who is "RY" of that staff. At the same time her adviser came to my station, 6ZD, read over my shoulder the questions she asked, as transmitted to me by "RY", wrote his replies at the same time, and I immediately transmitted them to 6BUC.

This contact amounted to a real conversation, lasting for an hour and a half, in the course of which she received all the advice necessary to enable her to reach a satisfactory conclusion of her business.

It is this sort of thing that lifts our ordinary two-way communications out of the common-place and gives us the thrill we used to get when transoceanic distances first were covered.

—A. H. Babcock, 6ZD

**Within the Law**

Oberlin College, Oberlin, Ohio

Editor, QST:

I should like to make a plea for the "man within the law". Time and time again the chance of QSO, particularly with foreign stations, is spoiled by a station above or below the band, which being free from QRM,
Continental QRM

"The Whins", Stocksfield-upon-Tyne, England

Editor, QST:

For some time past, complaints have appeared in the British wireless press about European amateurs who are operating their stations on a wavelength between 30 and 40 meters. All the appeals and complaints have been practically without avail, and we still have the European CQ merchant who fears the ether with his terrible raw A.C. and flat tuning. He usually calls CQ for about 10 minutes and then signs once, listens for 2 minutes and starts up again. And all of this right in our DX waveband.

In this connection I would like to suggest to the foreign amateurs, first, that they listen after each QSO for stations calling them, and 2nd, that they listen within the legal bands for U.S. stations, ignoring calls of those who insist on stretching the law.

Incidentally, that might materially improve the serious situation that exists now between 30 and 37.5 meters. Interference with Naval and commercial traffic would be minimized, and our own foreign communication conditions improved.

—Everett W. Thatcher, SZE-8GX

Super DX with Indoor Antenna

Meadowlea, Gerrards Cross, Bucks, England.

Editor, QST:

I think that perhaps some details of experiments I have been carrying out at g2OD on indoor antenna for transmission and reception may be of interest. I have lately completed a new master oscillator transmitter operating on 32.1 meters using standard circuit arrangements. I have carried out a large number of adjustment tests with this, using a large antenna out of doors. These tests have been with a2LM.

Very good and consistent signals were put into Australia by this set over a period of several weeks, a2LM being able to copy g2OD consistently. It was also found possible to maintain a morning schedule with Australia for approximately two hours, using just under 100 watts input to the master oscillator set.

The success of these tests suggested the possibility of establishing contact with a2LM when using an indoor antenna of modest proportions, for both transmission and reception. Numerous types of antennas were tried but the best results were obtained by using a horizontal halfwave Hertz oscillator 16 meters long, placed immediately under the slate roof of the house, and fed from the distant transmitter by a two-wire R.F. transmission line approximately 8 yards long. The Hertz oscillator has a three turn coil at the center, magnetically coupled to a similar coil at the end of the R.F. feeder lines.

The coupling coil in the antenna is split at the point marked A and a radio frequency ammeter was inserted. The tuning of the various driving circuits is adjusted to give the maximum reading on the antenna ammeter. In this particular layout, the ammeter read two amperes when using the input previously mentioned.

In order to avoid any form of coupling likely to effect the true action of the Hertz antenna, the outside antenna was removed entirely during the tests, as it was considered that the mere presence of the outside antenna might materially assist the indoor one.

Using the arrangement outlines it was found possible to maintain consistent daily contact with a2LM, who reported the average signal strength R4. The signal was also reported as being a particularly good one to copy through QRM, etc. This latter characteristic was probably due to the fact that the signal gave a perfectly pure D.C. note of absolute steadiness. Reports were also received from New Zealand stations on these transmissions.

The reception on the indoor antenna was of excellent strength, and there was a marked reduction of the static signal-strength in favor of the desired signal.

—E. J. Simmonds, g2OD
Easy Tuner Design

(Continued from Page 28)

a few of the many people who write to us asking how to pick a coil and condenser to tune over a certain range of wavelengths. We do this thing every once in a while and it always helps, tho the effect wears off after a while. This time it ought to last longer than usual for the curves are unusually convenient, and there's a standard coil to go with them.

—R. S. K.

Grid Condenser Correction

On page 22 of the July issue we said that it was a good idea to use receiving grid capacity at the rate of a microfarad per meter of received wavelength. That was hardly the idea—micromicrofarads were meant.—Tech. Ed.

C A R T E R
New Tip JACK

Heavy contact spring insures positive contact. Requires minimum space. Mounts on standard panels in ¼” hole. Carter quality. See them at your dealers.

New Receptacle Jack

Neat appearance, eliminates wires being all over the place. For aerial and ground “A” battery, etc. Mounts flush on wall or base board.

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New!

Heavy Duty Metallic Resistor

Specially developed for B eliminators and power supply units.

Special features are:

1.—High current-carrying capacity.
2.—Non-inductive. Accurate calibration.
3.—Low temperature coefficient.
4.—Resistance element fused to inside of Lavrock tube.
5.—All standard high resistance sizes.

Ask your dealer for detailed Circular.

List price $1.00; in Canada $1.40

ELECTRAD, Inc.
428 Broadway, New York City

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Heavy Duty Metallic Resistor

Special features are:

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2.—Non-inductive. Accurate calibration.
3.—Low temperature coefficient.
4.—Resistance element fused to inside of Lavrock tube.
5.—All standard high resistance sizes.

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ELECTRAD, Inc.
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And Now!
The Ultimate Achievement
A Live Rubber Socket

The “Sofrubba” Standard Socket 2 1/8” diameter. Lugs are equipped with N.P. binding posts and are drilled and tinned for soldering.

This new shock-absorbing socket is the last word in socket development and positively eliminates all microphonic noises. You can equip your set with this socket with economy and thereby solve V.T. socket problems.

The phase angle and the capacity test show losses almost too small to be measured.

Some of the improvements embodied in this new socket are
- It is a perfect shock-absorber
- It is made of special process soft-live-rubber
- It is unconditionally guaranteed for 5 years, securing that the characteristics will not change
- It is unbreakable
- It is adaptable to top and sub-panel mounting without change
- It aligns itself to warped tubes

This socket is a Strongson creation and is protected by patents pending.

Ask your dealer for the new Sofrubba socket and if he cannot furnish you write us direct.

Attention Department D

Moulded Products Corporation
549 and 551 West 52nd Street
NEW YORK CITY

Pronounced the best transformer made

It thoroughly meets the increasing requirements for finer musical values in radio reception. It is enclosed in a handsomely finished case.

INPUT TYPE No. 27A, Ratio 3 to 1, Primary Inductance, 124 henrys, designed for use between any vacuum tubes. Shielded $7.50, Unshielded $6.00.

Other Types

OUTPUT TYPE No. 27B, Ratio 1 to 1, Inductance 7 henrys. . . . Shielded $7.50, Unshielded $6.00.

CHOKE TYPE No. 29, Inductance 50 henrys and 36 henrys. . . . Shielded $6.50, Unshielded $5.00.

Ask your dealer or write us direct about these and other Pacent Radio essentials

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91 SEVENTH AVENUE NEW YORK CITY

Canadian Licensed Manufacturer:

Manufacturing Licenses for Great Britain and Ireland:
Egret Electric Co., Ltd., London and Bedford, England

Pacent
RADIO ESSENTIALS

SAY YOU SAW IT IN Q ST—IT IDENTIFIES YOU AND HELPS QST
We give it to you after 3 years development

Try the No. 130 REL Short Wave Receiving Kit

It's a worthy companion to the other well-known REL products. Every part has been expressly selected and the entire design made from the actual experience of hundreds of "Hams."

SOME FEATURES

Seven REL small size plug-in coils. Coils are rugged and moistureproof. Special low capacity double spaced variable condensers. Non-metallic friction vernier controls eliminate grinding noises.

Four inch rubber extension handles on both controls positively eliminate body capacity. Large visible scales engraved directly on panel. Very easily assembled and wired. Front panel completely assembled with condensers and vernier controls.

It's a short wave sensation built by the pioneer short wave experts

KIT PRICE $36.00
Ask your dealer or write us

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Every Arctic or Tropical expedition now in action is equipped with the REL inductances. They are the inductances which every efficient short wave station will eventually use.
Type "L"—40-80 and 150 meters Type "S"—20 meters and lower
Single units, with 3 clips Price $5.50
Double units, with 2 glass rods (as illustrated) Price $11.00

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With Neon Tube Indicator

Wavelength range 17 to 550 meters. Individually calibrated with 1% accuracy. Plain and simple reading curve chart. Type "A"—Price $22.00

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Minimum amount of dielectric insures lower losses resulting in stronger signals and sharper tuning.

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Type L—with flashlamp indicator—for 20, 40, 80, meter bands, $15.00; for 20, 40, 80, 200, meter bands, $18.75.

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J. GROSS & CO.,
30 PARK PLACE, NEW YORK CITY

A NEW WAY TO SELL RADIO CABINETS
WHO EVER HEARD OF SUCH A THING BEFORE?

We have placed on the market two NEW STYLES on which we give you choice of stock sizes at the same price. Our "Piedmont" is made of hardwood, fancy nicked hinges, three coats of the new lacquer varnish rubbed to a hard smooth glossy finish, mahogany finish only.

Sizes 7" x 18" x 10", 7" x 21" x 10", 7" x 24" x 10", 7" x 26" x 10"—YOUR CHOICE AT ONLY $2.65 EACH. Cash with order, no C.O.D., L.o.b. Hickory.

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Made for U. S. Army Aeroplanes

This is a tuned spark coil transmitter, with a wave length of 100-300 meters. The set is made of the finest of materials and the essential parts are the spiral tuning inductance, the induction coil, sending condenser and spark gap. Average range about 35 miles or more or less. Just what you want for making a Spark Coil—C.W. transmitter.

Brand new, in original cartons.

ORIGINAL GOVERNMENT COST, $47 EACH
OUR PRICE $4.75 EACH

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21 Warren Street, New York City
SINCE the summer of 1923, when Glenn H. Browning and Frederick H. Drake designed a radio frequency transformer which for the first time gave satisfactory amplification at the broadcast frequencies, the good will of the amateur fraternity and the voiced approval of a hundred-thous -

sand Browning-Drake fans have placed the Browning-Drake Receiver in ever increasing demand.

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For further information address the Browning - Drake Corp., Brighton, Mass.

The Browning-Drake Five

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Made of moulded insulation of exceptionally high resistance. Best quality, tension-spring, bronze contacts. Only upright mounting made.

Single Mounting .................. 50c
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Generator Low Tension: Voltage 10, Amperes 7.
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Why do you fellows want thick crystals for use in the 80 and 40 meter bands. You seem to have been misled. We can grind you a crystal guaranteed to oscillate in the 80 meter band, capable for use in transmitter circuits, giving as high as 18 watts of Crystal-controlled energy in a UX210 tube. The above described crystal can be ground for only $80.00. If you club your orders and order 3 at a time, we can better the price to $25.00 each.

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Crystals ground to your assigned frequency accurate to better than a tenth of 1 kHz for $50.00 each. Prompt deliveries.

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CORBETT’S RADIO CABINETS
Mahogany and Walnut cabinets of all designs. Prices surprisingly low. Excellent workmanship and finish. Write for circular.

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Sharp Tuning can only be accomplished in one way — by using the best. And every amateur knows and uses ~ ~ Cardwell Condensers

Send for booklet on the 2QA Short Wave Receiver—a better set for 40 meters. Also ask for the 36-page handbook-catalogue.

By the way—there's a rank bull in the picture—what is it?

The new Taper Plate type E Receiving Condenser is designed to be practical rather than theoretically perfect, between straight frequency and wavelength. Full size plates, far heavier than ever used before, assure positive permanence of calibration.

The type C gives a modified straight wavelength.

<table>
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<td>5250</td>
<td>15.00</td>
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*Has two insulated stators-capacity of each.
In The New Set
Use an Instrument

When incorporated in the panel of a set an instrument provides an accurate means of watching filament and plate voltages and instantly checking their values besides being an attractive addition to the set. There is certain to be increased pleasure in the knowledge that your set is functioning properly.

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Try Us for prompt and careful attention, immediate delivery and courteous service.
LOWEST PRICES for DRILLED, ENGRAVED or DECORATED PANELS or SUB PANELS for the popular standard circuits, for short wave receivers or transmitters; or specially cut, drilled and engraved TO YOUR OWN SPECIFICATION.

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TRANSMITTING
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7½ WATT TRANSMITTER-KIT Complete for $24.75
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The Elkon Rectifier

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Operates direct from alternating current, 105-120 v. 50-60 cycles.
Charges radio "A" batteries.
(25-40 cycles also available at a slightly higher price)
Charging rate 0 to 0.7 amps.

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The Elkon Rectifier is the only successful development of this principle. This device has fully proved itself, both theoretically, and in every day use; in the hands of the technical man and in the average home, where its service is appreciated, but no attempt is made to understand it.

Its undeniable success under every service condition has brought about entirely new conceptions of the future development of radio power supply.

The Elkon Trickle Charger illustrates the radical and revolutionary change this rectifier has made in "A" battery charging. It contains no liquids of any kind; no tubes, no parts which oscillate or move in any way. It is silent, causes no interference, and does not heat up. It can be operated in any position. Neither jars, jolts, or short circuiting can harm it. It tapers automatically, and when attached to battery and house current requires no further attention of any sort. It is entirely automatic.

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Do away with troublesome, expensive, bulky batteries, with acid, stained carpets, a dead radio just when you want it most. Install the KINGSTON B battery Eliminator and forget your battery troubles forever. Trim, handsomely finished in black and nickel, and guaranteed not only to remove the battery nuisance, but to deliver clearer tone and increased volume. Three different voltages obtainable at same time, each tap adjustable over a wide range, making any desired voltage from 5 to 150 possible and harmonizing perfectly with your own set. The Raytheon tube is used as a rectifier.

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**Price, complete** $37.50

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Price—$2.50

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**Three “E” Straight Line Rheostat**

Perfect Control of Filament Temperature

Gives you a fine, smooth, dependable variation of filament temperature. Tons absolutely, is absolutely NOISELESS, and once set, "stays put". Controls volume smoothly, and without distortion, over the entire range. Equally efficient for short and long wave sets, for all purposes. Write for further particulars and catalogue. Ask Your Dealer to show you. Price $2.50.

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Radio Division

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**Cage Antenna Spreader**

**DIAMETER 7 IN.**

Patented Sept. 8th, 1925

When erecting your Hertz antenna, why not feed into a 4, 6 or 8 wire cage and spread evenly? By using these spreaders, the job can be done with neatness and efficiency. Orders filled promptly. Price $0.90 per dozen. Immediate delivery. 2 per case.

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With "Universal" Features

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Features of the "Universal" models include:
Choice of operating power—either house socket power or batteries.
Choice of apparatus for audio amplification—either internal amplification with UX-112 tubes or UX-171 tubes or external amplification with super-power amplifier.
Choice of pick-up device—either loop or antenna.

No. 602 Art Console (above) American Walnut; space for all operating equipment. 6-tube totally shielded dual control; equipped with volt-meter. Furnished in both "Universal" and "Regular" models.

<table>
<thead>
<tr>
<th>Total Shielded</th>
<th>Totally Shielded</th>
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<tr>
<td>The total enclosure of each of the three radio stages and the detector stage, in separate heavy copper shields, prevents all local pick-up of static, greatly increases selectivity and distance utility, and produces unrivaled tone quality.</td>
<td>The total enclosure of each of the three radio stages and the detector stage, in separate heavy copper shields, prevents all local pick-up of static, greatly increases selectivity and distance utility, and produces unrivaled tone quality.</td>
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<tr>
<th>Description</th>
<th>East of Rockies</th>
<th>West of Rockies</th>
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<tbody>
<tr>
<td>Receiver, Universal with external cone speaker (Loop Extra)</td>
<td>$365.00</td>
<td>$385.00</td>
</tr>
<tr>
<td>Receiver, Regular (built-in speaker and without the Universal Features)</td>
<td>340.00</td>
<td>360.00</td>
</tr>
<tr>
<td>No. 101-A Loop Outfit</td>
<td>22.50</td>
<td>25.00</td>
</tr>
</tbody>
</table>

Receiver prices are less accessories

STROMBERG-CARLSON TELEPHONE MFG. CO.
ROCHESTER, NEW YORK

SAY YOU SAW IT IN QST—IT IDENTIFIES YOU AND HELPS QST
ELECTRAD

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No doubt about that. If you know radio you know how important your Grid Leaks are. Use Electrad Metallic Leaks and Resistors. New —totally different. No carbon, paper, varnish, fiber. The metallic resistance element is fused to the inside of a glass tube. Capped with the exclusive Electrad ferrule. Paraffined under high vacuum. Six points of superiority: Noiseless, Constant, Accurate, Non-hydroscopic, Non-inductive, Unvarying under any weather or working conditions. Great current-carrying capacity without overheating or change of resistance. Make this test—try these leaks in your own set. Hear the improvement in reception. Sizes .1 to 10 megohms.

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Without hesitation we claim the Electrad Certified Six Point Fixed Condenser to be without equal. Here is why: Uniform pressure insured by rigid binding at six points. Sheet copper, not tinfoil. Soldering iron can't hurt it. Certified electrically and mechanically. Guaranteed to remain within 10% of calibration. Standard capacities. All types. Prices: U.S., 30c to 75c; Canada, 45c to $1.50. In sealed packages at all good radio stores.

For perfect control of tone and volume use the Electrad 500,000-ohm compensator. For free booklet write 428 Broadway, New York City.

Amateurs All Over the World prefer

The ADVANCE “Sync” RECTIFIER

1. The ADVANCE Sine Rectifier actually does what any other rectifier claims to do.
2. Can be easily and quickly filtered.
3. Meets all requirements for heaviest duty.
4. Speedy starting because of Advance Bakelite wheel.
5. Requires no attention—always ready.

Its prevailing use in international transmitting is evidence that, although lower in price, the advance Sine Rectifier is superior in quality. Revolving disk is molded bakelite six inches in diameter. Nickel plated brush holders with adjustable flexible copper brushes. Convenient control handle. Disk, aluminum brush arm support and brush holders perfectly insulated.

Price complete with Westinghouse 1/8 H.P. Synchronous Motor .... $40 Rectifying wheel with complete brush assembly and mounting ring to fit your own motor .... $15

We Pay All Transportation Charges in U. S. A.

ADVANCE ELECTRIC COMPANY
1280-1282 West Second St., Los Angeles, Calif.

SAY YOU SAW IT IN Q S T—IT IDENTIFIES YOU AND HELPS Q S T
Three-stage radio frequency amplifier operating at a fixed high frequency.

The No. 700 Infradyne Amplifier is a product worthy of the name "Remler," which, since the early days of Amateur Radio, has been recognized as symbolic of quality. Its design and manufacture are the result of careful experimentation and are in strict accord with the best engineering practice.

New Fields Opened

The development of the Infradyne Amplifier has opened up new fields in radio broadcast reception. The "impossible" has been accomplished. Efficient amplification and perfect control of stability at short wave lengths have been realized and the use of the "sum frequency principle" has been made possible. Because of the characteristics of circuits operating at these frequencies a reduction of background noise and maximum selectivity with complete response to the full range of voice and music frequencies have been obtained. Quieter and more enjoyable reception together with improved quality of reproduction are therefore made possible.

Exact Requirements Met

All parts used in the Remler Infradyne Amplifier have been designed and are constructed in our own laboratories and factory to meet exactly the requirements of the circuit. The Infradyne Amplifier is adapted to use with many broadcast receivers of the conventional tuned radio frequency type and when it is so employed quieter operation and improved selectivity are obtained; it has been specified by Mr. Sargent as an essential part of the Sargent Infradyne Receiver described in "Radio" for August 1926.

Reprints of this article will be furnished free upon request.

6 Remler Reasons Why

1. No direct pick-up in the amplifier circuit of long-wave signals or arc "noise".
2. Amplification at 86 meters does away with crowding of dial due to locally generated harmonics.
3. Quieter operation through reduction of the noise level.
4. Extraordinary selectivity.
5. Complete response to the full range of voice and music frequencies and, therefore, improved quality of reproduction.
6. Readily adapted to any standard radio-frequency circuit.
20,000 CONSULTING RADIO ENGINEERS

Each one of you 20,000 members of the American Radio Relay League is looked up to in his or her community as a Radio authority.

Each one of you is called upon for opinions as to Radio performance, Radio set construction, Radio set components—coils, condensers, dials, audio amplifiers.

And we know that the opinions and advice given are invariably conscientious, unprejudiced and helpful.

Good Radio owes a never-to-be-repaid debt to you, members of the A.R.R.L. It should be the goal of every radio manufacturer to produce material worthy of your recommendation and praise.

NATIONAL Radio-Set Essentials

The new NATIONAL tuning units, with their space-wound Browning-Drake Radio-frequency transformers, their light, rigid Equicycle condensers, their nationally known, NATIONAL Velvet-Vernier Dials, make a Radio set foundation, dependable, solid and true. After these, the NATIONAL Impedance for faithful audio amplification, and the necessary sockets, rheostats, panels and accessories; to make a broadcast receiver easily constructed, selective and sensitive, easy to operate, and oh! how easy to listen to!

Send for pamphlet 110-Q

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First there was Harmonik
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NOW Karas announces Equamatic
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1. The Equamatic System gives maximum and equal sensitivity and amplification of any wavelength—long, short or intermediate.
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Tunes accurately to 1/1000th of an inch with a ratio of 63 to 1 and can never develop back-lash. Turns instantly in either direction at lightest touch on vernier knob; rough tuning is done with larger knob. Dial markings and numerals are gold inlay. Available in 180 or 360 degree rotation—clockwise or counter-clockwise. Diameter 4 1/4" and all Bakelite.

Karas Micrometric Dials are stocked by good parts dealers in most cities. Orders will be filled direct if dealer cannot supply you.

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Resistors are made in small units so you can try different combinations to find the amount of resistance that gives best results in your circuit.

Useful for other radio experimenting.

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$8.90
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Faradon
CONDENSER BLOCK

Model WS-3750

The FARADON "UNIVERSAL" Filter Condenser Block of 14.2 Mfd. in one container, is for operation in connection with the most sensitive used Battery Eliminator circuits. It contains important features not heretofore found in grouped filter condensers.

The total capacitance is connected to fixed terminals in convenient units, permitting ready wiring. The units to be connected in the circuit where possible high potential surges may occur are prewired to withstand a higher voltage than is usually required. Convenience, safety and continued satisfactory operation are combined in the FARADON Filter Block.

FARADON FILTER CONDENSERS
are also available in individual units of 1/10, 1/2, 1, 2, 3, and 4 Mfd. in two voltage classes - Class A, Flash Test 600 V.D.C. and Class B, Flash Test 1500 V.D.C. Also a complete line of Condensers in units and gangs for all by-pass and blocking applications.

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FROST-RADIO
Type 880 Super Variable Resistance

These new non-inductive, variable high resistance units are precision instruments which operate smoothly and non-intermittently from zero to maximum rating. Have low temperature coefficient. Lever makes positive rolling contact with resistance element with absolutely no wear. Designed for use as tone and volume control, for resistance coupled amplification, in control registration, and as a stabilizer. Furnished in following resistances: 50,000, 100,000, 200,000, and 500,000 ohms. Unit: $1.25.

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THese Tubes are the GENUINE R.C.A. Kenotron Rectifying tubes. Filament voltage 7 1/2 volts and will safely stand A.C. input of 50 volts. Four of these tubes will run a 50 wattter.

These Rectifying tubes will pass plenty of current and voltage for your TRANSMITTER and are very efficient for use in "B" ELIMINATORS.

STANDARD BASE. EVERY TUBE BRAND NEW AND PACKED IN ORIGINAL CARTONS.

List price $7.50 ea.—Extra Special $1.85 ea.

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For Transmitting as well as Receiving

Ray-O-Vac Radio Batteries Give a Steady, Uniform Voltage and Have Exceedingly Low Internal Resistance.

Transmitting makes rigid demands on the current supply. Any diminution or unevenness in current affects the beat of your wave and lowers your chances of having your call picked up.

That's why so many amateur transmitters use Ray-O-Vac batteries. These batteries deliver a steady, uniform voltage that makes better transmission possible. Because they have low internal resistance, they deliver signals free from distortion.

And Ray-O-Vacs have staying power in this work, too. It is not unusual for a Ray-O-Vac 22½ volt B battery to wear down to 17 volts without distortions. Other sizes and types are equally long-lived.

No less a radio authority than Dr. Lee de Forest—the father of radio broadcasting—uses Ray-O-Vacs in all his experimental work.

At the 2nd Radio World's Fair at Chicago all the amateur radiograms that were sent out were by transmitters using 540 volts of Ray-O-Vac No. 9303 B batteries. After six days of practically continuous use from 2:00 to 11:00 P. M. each day, none of these 12 batteries showed a drop in voltage of over 1½ volts.

Keep your apparatus equipped with Ray-O-Vacs for all plate and grid batteries. They give you a new degree of battery longevity.

If the stores where you ordinarily buy do not have Ray-O-Vac radio batteries, write us for the name of the nearest dealer or jobber who can supply you.

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Ray-O-Vac "A" batteries recuperate during rest periods, lasting longer and giving excellent reception.

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Makes any Set
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FREE
We have prepared a most comprehensive booklet on tuning. It is written in simple language and tells all you want to know about condensers. Write for a copy today.

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In two stages, AmerTran De Luxe Audio Transformers are famous for the natural tones developed over the entire audible range. Whatever else a set may have—if it is good, the use of these transformers will make it better. You may pay a little more but you will get a great deal more.

Write today for interesting free booklet—"Improving the Audio Amplifier"—and price list.

AmerTran Products Are Sold Only at Authorized AmerTran Dealers

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The General Radio Type 358 Wavemeter

The type 358 wavemeter is designed particularly for experimental use. As it covers a wavelength range of 15 to 225 meters, it covers all the amateur bands in common use. The wavemeter consists of a set of four mechanically rugged coils of low loss construction mounting interchangeably on the binding posts of a shielded condenser of 125 MMF capacity. A resonance indicator lamp is connected in series with the condenser and coil. When the lamp is removed the socket in which the lamp is mounted becomes short circuited.

The wavemeter is equipped with the following coils calibrated with an accuracy of within 1%:

- **Coil A**: 15 to 30 meters
- **Coil B**: 25 to 60 meters
- **Coil C**: 50 to 115 meters
- **Coil D**: 100 to 225 meters

Coils A, B and C are space wound on threaded bakelite form to maintain accurate calibration.

Ask your dealer or write for our descriptive folder 358-Q.

Price of wavemeter complete in wooden carrying case $22.00.

GENERAL RADIO CO.,
Cambridge, Mass.
CONDENSERS are the entrances that make or mar a good performance. A good condenser stores up tone impulses, to be released at the instant they reach full-rounded perfection. An inaccurate condenser lets only a distorted part of the tone trickle through, and cuts down the receiving range of your set by putting it out of electrical balance. You'll realize the importance of accurate condensers the day you equip your set with Sangamo Mica Condensers.

SANGAMO Mica Condensers

Being solidly molded in bakelite, Sangamo Condensers are accurate forever. All edges are sealed tight against moisture, the worst enemy of condenser accuracy. Ribs of bakelite give mechanical strength and prevent a change in pressure on the delicate mica inside, which would also change the condenser capacity. All edges are rounded to prevent chipping.

A range of 35 capacities makes it possible to get exactly the right capacity for your circuit.

Sangamo By-pass Condensers are now available in 1/10, 1/4, 1/2 and 1 mfd. capacities.

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Designed for Reliable Long Distance Communication on 1 Meter to 200 Meters

INPUT RATING 150 WATTS
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Cushioned to stop vibration—
that's why the Cushion Base Tube makes such a wonderful improvement in reception...

EQUIP YOUR SET WITH VAN HORNE CUSHION BASE TUBES AND NOTE THE SURPRISING SOFTNESS AND FULLNESS OF TONE OF RECEPTION THAT FOLLOWS THE ELIMINATION OF VIBRATION. ORDER YOUR SET FROM YOUR DEALER TODAY.

OF SPECIAL DESIGN
A POPULAR SHORT WAVE LOW POWER TRANSMITTER

The Van Horne SE-5 VC 5 watt 45 anode tube is being used by a great number of amateurs with promising results. Having a double filament and a lower than average plate resistance it has proven ideal for low power short wave transmitting work. Will withstand maximum plate voltage of 250 without breakdown.

ADAPTATED MOGUL 5 VCX POWER TUBE

Identical to the SVC in construction and the construction of the Adapted Mogul 5 VCX Power tube is designed for use in the last audio stage of receiving sets. This tube is equipped with a patented anode used in which additional voltages are added making no change in set wiring necessary.

These tubes are two of a complete line of Van Horne Selected and Certified tubes manufactured under patents pending to J. S. Van Horne. Amateurs are urged to acquaint themselves with the superiority of Van Horne products.

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LEARN THE CODE—
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Built complete with key, tone adjustable high pitch buzzer and code plate. Write us today.

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SEE THAT SCREW

A screw driver is adjusted an - XL in crowded places.

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Results in easier tuning, more distance, volume and clarity—greater stability. Indorsed by leading radio authorities.

Model "N" A slight turn obtains correct tube oscillation on all tuned radio frequency circuits. Neutrodyne, Roberts two tube, Browning-Drake, McMurdo Silver's Knockout, etc., capacity range 1/4 to 30 micro-micromics. Price

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6.5 to 300 milli.

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Push it down with your thumb, insert wire or remove pressure and snap in arm. Recluse instantly. Also furnished mounted on strips. Price 15c.

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You hear all the tones

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ALL-AMERICAN
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An All-American Quality Product

A good speaker is the only kind worth having. A poor one will ruin otherwise good reception.

We're making a good one for you—the Lorel Reproducer; a cone type correctly balanced with sounding-board and sounding-chamber, to give you that purity of all tones, which you desire.

This remarkable unit combines the good features of both cone and sounding-chamber types of speaker; and eliminates their inherent weaknesses. You can hear all the high and low tones with the Lorel; clear and full.

Ask your dealer for a demonstration of the Lorel. You'll find it a real improvement in radio reception.

Price $25 per unit.

ALL-AMERICAN RADIO CORPORATION
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A Remarkable Improvement in Audio Amplification

A development by All-American laboratories—the Rauland-Lyric-Trio. You know the Rauland Lyric Transformer, famous among music critics for its exceptional tone perfection. It is now combined with two Rauland Trio impedance units; retaining the advantages and eliminating the weaknesses of the two leading systems of audio amplification. The result is the last word in audio amplification. Free book, "Modern Audio Amplification," tells more about this interesting development. Write for handbook "B-10."

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Only the Best Radio Parts are good enough for a Good Set

True-to-life reproduction depends upon quality radio parts. There must be no flaws—all parts must synchronize. Benjamin Radio Products increase sensitivity, selectivity and volume. Their use throughout the world—by authorities and amateurs—endorse Benjamin quality and preciseness.

Improved Tuned Radio Frequency Transformers
Complete tests prove this the most efficient coil for modern sets. Space wound, Basket Weave, Cylindrical. Highest practical air dielectric. Gives sharper tuning, greater volume and purer tone.


Straight Line Frequency Condensers

Push Type Cle-Ra-Tone Sockets
Spring Supported. Shock Absorbing. Stop Tube Noise. The greatest aid to non-noisy operation. Contacts always clean. 75 cents each.

"Leakless" Transformers
Uniform high inductance, low distributed capacity and low resistance. Slight external field permits placing coils close together without appreciable interaction. Single Transformer, $2.50.

Brackets
Simplify set construction. Support sub-panel, with room underneath for accessories and wiring. Plain and adjustable. Plain, 70 cents per pair; adjustable, $1.25 per pair.

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Quick, positive, clean-cut make and break. When it’s "in" it’s "off"—no wasteful use of battery. 30 cents each.

If your dealer cannot furnish you with Benjamin Radio Products send amount direct to our nearest sales office with his name and we will see that you are promptly supplied.

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Enameled Wire in Radio

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While all sizes from No. 10 to No. 48 are enameled, Dudlo is especially fitted to produce the finer sizes—from 36 to 46—used so extensively in Radio.

Dudlo enameled wire is generally specified as standard because of its absolute uniformity and dependability.

The majority of Radio manufacturers are now using Dudlo wire and coils. If you are one of the few who are not, we invite your inquiries. Send for the new illustrated folder on "Wire and Windings" which is now ready for you.
The "Gold" Bug for the "Gang"

Here it is, the key that's being used all over the world, just the thing for the "gang." Simple in operation and easy to adjust. Made, guaranteed and sold on a money-back basis by an organization with over 40 years of experience in manufacturing transmitting apparatus.

You'll also be interested in a line of Jewell, Dubilier, Thordason, Hammerlund and other nationally known equipment.

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with cord and plug.
Carrying Case, $3.50 extra.

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A. R. R. L. Members -- What about your friends?

You must have a friend or two who ought to be members of our A.R.R.L., but aren't. Will you give us their names, so that we may write to them and tell them about the League and bring them in with the rest of us? The A.R.R.L. needs every eligible radio enthusiast within its ranks, and you will be doing your part to help bring this about by recommending some friends to us. Many thanks.

American Radio Relay League,
Hartford, Conn.

I wish to propose

Mr. ...................................... of ...................................... .

Mr. ...................................... of ...................................... .

Street & No. Place State

for membership in the A.R.R.L. I believe they would make good members. Please tell them the story.

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AIRGAP will help rid any set of those squawks, howls and frying noises due to socket capacity; they keep the grids negative, stabilizing the circuit, causing tube to go into oscillations more smoothly and not "spill over" until maximum results are attained.

THEY HELP PREVENT closed circuit, absorption of current, intercoupling of circuits, feedback and undesirable capacity; they make any circuit more stable and sharpen tuning, resulting in purer and clearer tones with more volume on local and distant stations.

AIRGAP PRODUCTS CO., MFR.
13 Campbell Street, Newark, New Jersey
Make your fist readable at higher speed with
THE CRICKET KEYS
Absolutely new principle. So simple they look foolish.
Reports of "Fist F.B." from Chile, New Zealand, Australia, Canada, and all U.S. for months.
The only key for beginners. The best key for old Hams.
NO BUM FISTS. NO GLASS ARMS.
How about a portable CRICKET for that portable set?
We recommend desk CRICKET for beginners.
A "Jam Up" key for moderate price.
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Write F. F. Mace & Son, 132 Sunset Ave., Dallas, Texas

To Our Readers Who Are Not A. R. R. L. Members

Wouldn't you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only amateur association that does things. From your reading of QST you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on page 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 the membership edition of QST delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

American Radio Relay League,
Hartford, Conn., U. S. A.

Being genuinely interested in Amateur Radio, I hereby apply for membership in the American Radio Relay League, and enclose $2.50 ($3 in foreign countries) in payment of one year's dues. This entitles me to receive QST for the same period. Please begin my subscription with the .................. issue. Mail my Certificate of Membership and send QST to the following name and address.

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 him about the League? ...........................................

Thanks!

86  SAY YOU SAW IT IN QST—IT IDENTIFIES YOU AND HELPS QST
WESTON "Pin-Jack Voltmeter" with HIGH RANGE STAND

The advantage of a Weston Voltmeter for positive set control is well known. Here is a new combination—two instruments in one—a Pin-Jack Voltmeter and a High Range Stand. Simply plug the Pin-Jack Voltmeter into the filament Pin-Jacks on the panel and you measure tube filament voltage—remove it and plug it into the High Range Stand and you can measure battery voltages up to 160 volts.

The results — tube economy, longer battery life, better all-around set operation. The new Weston Pin-Jack Voltmeter and High Range Stand is a typical Weston product designed especially for the Radio Expert and Enthusiast.

For complete information write us for Bulletin "O".

WESTON ELECTRICAL INSTRUMENT CORPORATION
158 Weston Avenue, Newark, N. J.

STANDARD THE WORLD OVER

WESTON
Pioneers since 1888

"Pyrex" insulation


The power loss of Pyrex insulators at 500,000 cycles ($P = K \times X^0$) is .48.

The use of Pyrex in short wave transmitters and receivers eliminates leakage and eddy losses.

Pyrex sockets for UX tubes are now available, and a receiver with these sockets, Pyrex insulated condensers and an antenna properly insulated with Pyrex, represents real short wave reception efficiency.

Fifty broadcasting stations (including several super-powers) depend on Pyrex insulation.

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The World's Greatest Bug
Improved Martin
VIBROPLEX
Reg. Trade Marks
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Lightning Bug

For Continental,
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Codes

Japanned Base, $17
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Adjustable
To Any
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Speed

Over 100,000 operators use the Improved Vibroplex because it is EASIER, QUICKER and MORE ACCURATE than the old key.

It transmits with amazing ease. CLEAR, CLEAN-CUT signals at any desired speed. Saves the arm. Prevents cramp, and enables any operator to send with the skill of an expert.

Special Radio Model
Equipped with Large Specially Constructed $25
Contact Points. Requires no relay
Every amateur needs this bug. Easy to learn. Sent on receipt of price. Money order or registered mail. Liberal allowance on your old (Martin) Bug. Order Now!

THE VIBROPLEX CO., Inc.,
825 Broadway, New York

An Apology

We knew when we offered the TECO short wave receiver that it would be immediately recognized as the best short wave value on the amateur market. But we hardly expected the great avalanche of orders that followed the announcement. We have arranged for increased production. Delivery of your order may be delayed, but we ask that you bear with us.

The parts used in the TECO Short Wave Receiving set—Cardwell condensers, G. E. UV 712 audio transformers, TECO Plug in coils, vernier dials and a bakelite panel engraved with your call letters—would cost you more to buy than we are charging for the complete set.

TECO Type A SW Receiver $27.50
Type B (in cabinet) $32.50

10% deposit with order.
Write for literature

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EAGLE

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Radio Equipment Write for Illustrated Catalog
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for Distortionless Amplification

Dual resistance for DeForest "H" tube $3.50. Consists of two units mounted on bakelite and connected in parallel.

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Famous BH Transformers Transmitting Transformers

Our transformers are ideal for low wave transmission. Write for "BH" Announcement.

Benjamin Hughes Electric Company
259 LaGuerriere St. W., Montreal, Can.
Transformer Builders Since 1911

MASS. RADIO SCHOOL
18 Boylston St., Boston, Mass.
FALL TERM SEPT. 13
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YOU NEED THESE PLUG-IN COILS

Note the many advantages of these better and different coils listed below and try to do without them.

1. Positive contact is secured through General Radio plugs and jacks, and not through a condenser. Secondary coils are specially constructed so that setting of primary coil does not need to be changed when secondaries are exchanged.

2. With 3 Coils, continuous, gapless range is secured from 140 to 16 meters. One of the 20-40-80 meters amateur bands is located in the middle of the tuning range of each of the 3 coils. (For this a SFL Condenser, 1.40 mmfd. max. cap. is essential.)

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4. Antenna coupling is adjustable; by a primary coil

5. Coils are space-wound solenoids on skeleton frames.

6. Both tickler and antenna coil are at filament end of the secondary.

7. These coils cover the 3 U. S. Amateur Bands, all European Amateur Bands, Short-Wave Broadcast, U. S. Naval and Commercial Short-Wave Stations, etc.

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PRICE $75.00 F. O. B. ST. LOUIS

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"A Better Resistor"

The new Resistor in a glass tube which is pumped out to a high vacuum and sealed. Look for the sealing TIP-ON-TIP and the glass body of the vacuum within. No moisture can reach it. No oxidation can take place. Silver plated tips can be soldered into the leads with no fear of damage.

In all sizes from 10,000 to 10,000,000 ohms, permanent and noiseless. Sold in individual sealed, buffer packages as a quality product.

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Exact Size

We have tried to make it possible for you to get "TIP-ON-TIP" apparatus at your dealer's. Ask him first, if it happens that he is not yet stocked, we will be glad to forward your order on receipt of check or money order.

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Engineers and Manufacturers of Technical Apparatus
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List Price $3.50
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3 Condenser gang
each .00035 MFD
Plates tapered like the new Cardell. Its efficient operation assures satisfaction.

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MICA TRANSMITTING CONDENSERS

.002—6000 VOLTS

Manufactured by Connecticut Telephone & Electric Co.
Used As Grid, Radio Frequency
By-Pass and Plate Blocking Condenser

EXTRA SPECIAL PRICE $2.00 Each

AMERICAN SALES CO.
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Springs may prevent shocks but the vibrations which follow must also be prevented.
The shock absorbing material between the base and the tube holder acts like a snubber on an automobile.
The vibrations are damped out, "microphonics" disappear and your tubes last longer.
An examination will win you!
If your dealer cannot supply you we will ship post-paid on receipt of list price.

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JEWELL meters 25%, discount to amateurs on receiving parts. No sets. Over two pounds data, circuits catalog 25c prepaid. Also exchange new receiving parts you want for new parts you have. Weekly data bulletin $2.50 yearly, trial 25 weeks $1.00. Fred Luther Kline, Kent, Ohio.

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SEND for your copy of the new "ham-list." New edition includes latest transmitting circuits, parts, etc., Price 4c (to cover postage, etc.). Thorndarson 650-volt power-filament transformers for 8-watters $6.00. Curtis-Griffith 250-volt power-filament transformers $5.00 each side. AEXY transformer, 250 volt 2-turn, 1500 coil, 15 cent, 12 turns, $6.50. Edison transformer, 100 volt 8-turner, 1 cent, 12 turns, $6.50. Edgewater copper strip 6-inch wide, 1 cent turn, 15 turn, $6.50. Lead square foot 85c. Jewell 0-AC volt meters 750, 0-500 Milliameters 75c. Power gridsides $1.00, "Ham-list" 4c. Service: That's me, JImmy Radio Curtis, 8-A-Q-C, 1109 Eighth Avenue, Fort Worth, Texas.

NEW 120 watt generators 275 volt, will give up to $5.00, $8.00, $200.00, and $500.00. Battery charging generators, charges 6 volley battery at 12 amp., speed 1700, new $8. Hot-wire ammeters 0 to 5 $1.00, 10 $1.50, 15 $2.00, 20 $2.50. Hams: Get our Samples and Price List on your requirements. Oliver Kirschner, Caribou, Idaho.

HAMS: Get our Samples and Price List on your requirements. Oliver Kirschner, Caribou, Idaho.

LOTS of RCA UV302 lights, guaranteed brand new, genuine and perfect, $2.50, postage extra. How many OY? Give us your address.

JEWELL meters 25%, discount to amateurs on receiving parts. No sets. Over two pounds data, circuits catalog 25c prepaid. Also exchange new receiving parts you want for new parts you have. Weekly data bulletin $2.50 yearly, trial 25 weeks $1.00. Fred Luther Kline, Kent, Ohio.
FOR sale—Robins & Myers 500 volt motor generator. Write for particulars. Geo. H. Smith, Charlevoix, Pa., SANC.

A.R.R.L. member's call signs should be worn by all members. They are of the highest value but yellow felt, 5" x 8" diamond.

WANTED—Several "S" tubes or Kenetrons in good condition for use with 50 watters. H. S. Weber, 313 Factory Street, Dover, Ohio.

For Sale New Westinghouse double commutator 750 V. 200 W. D. C. generators directly connected to 110 V. 60 cycle A. C. Motor $14.00. Field rheostat $4.50 each extra, 25% with order, balance C. O. D. Express inspection allowed. Also other voltages and capacities. James J. Smat, 1734 Grand Ave., Chicago, Ill.

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COMMERCIAL ammonium phosphat, factory sealed round cartons, $5.60. Chemically pure aluminum square foot .50c. Lead .75c. Size 32" enamel antenna wire hundred feet $1.00. You pay postage on orders less than $1.00.

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A.R.R.L. member's call signs should be worn by all members. They are of the highest value but yellow felt, 5" x 8" diamond.

WANTED—Several "S" tubes or Kenetrons in good condition for use with 50 watters. H. S. Weber, 313 Factory Street, Dover, Ohio.
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Rheostat

AIR COOLED

Designed and Constructed to meet the requirements of modern radio. You will immediately notice the accuracy and extremely fine adjustment that does away with the necessity for vernier attachments.

The coil is air-cooled on all four sides of the winding. Many turns in the coil with an unusually long contact surface, permit filament voltage to be built up slowly and held at just the right point to facilitate easy tuning and develop perfect reproduction. Bakelite base.

Made in 2, 3, 6, 10, 15, 20, 25, 30, 40 and 100 ohm sizes, each complete with a Bakelite knob $1.35

Potentiometer—Same construction as Rheostat—200 and 400 ohms, with knob $1.75—100 ohms $2.00

Order from your dealer or jobber or send his name with your order to

Yaxley Mfg. Co.

Dept. S, 9 So. Clinton St.
Chicago

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SAY YOU SAW IT IN QST—IT IDENTIFIES YOU AND HELPS QST
Perhaps you, too, can cut your "B" battery costs in half

Just follow the chart. It gives you the secret of "B" battery economy.

Thousands of people have made the discovery that Eveready "B" Batteries, when used in the proper size, and on sets equipped with a "C" battery*, are a most economical, reliable and satisfactory source of radio current.

Here is the secret of "B" battery economy, reliability and satisfaction:

On all but single tube sets—Connect a "C" battery*. The length of service given below is based on its use.

On 1 to 3 tubes—Use Eveready No. 772. Listening in on the average of 2 hours daily, it will last a year or more.

On 4 or more tubes—Use the Heavy-Duty "B" Batteries, either No. 770 or the even longer-lived Eveready Layerbilt No. 486. Used on the average of 2 hours daily, these will last 8 months or longer.

These figures are based on the average use of receivers, which a country-wide survey has shown to be two hours daily throughout the year. If you listen longer, of course, your batteries will have a somewhat shorter life, and if you listen less, they will last longer.

Evereadys give you their remarkable service to the full only when they are correctly matched in capacity to the demands made upon them by your receiver. It is wasteful to buy batteries that are too small. Follow the chart.

In addition to the batteries illustrated, which fit practically all the receivers in use, we also make a number of other types for special purposes. There is an Eveready Radio Battery for every radio use. To learn more about the entire Eveready line, write for the booklet, "Choosing and Using the Right Radio Batteries," which we will be glad to send you on request. There is an Eveready dealer nearby.

Manufactured and guaranteed by

NATIONAL CARBON COMPANY, INC.
New York San Francisco

Canadian National Carbon Co., Limited, Toronto, Ontario

*Note: A "C" battery greatly increases the life of your "B" batteries and gives a quality of reception unobtainable without it. Radio sets may easily be changed by any competent radio service man to permit the use of a "C" battery.

Tuesday night means Eveready Hour—9 P. M., Eastern Standard Time, through the following stations:

WJZ-Philadelphia WJZ-Detroit
WOR-New York WOR-Loisville
WABC-New York WOR-Detroit
WNL-Boston WWJ-Detroit
WJZ-Worlcllll w-1 Chicago
WJZ-Philadelphia WWJ-Davenport
WJZ-Buffalo WWJ-Minneapolis
WJZ-Pittsburgh WJZ-St. Paul
WJZ-St. Louis

SAY YOU SAW IT IN QST—IT IDENTIFIES YOU AND HELPS QST
from the light circuit-

THORDARSON
POWER AMPLIFICATION
and
B-SUPPLY

Force a car up a steep hill and the engine knocks. Force a radio set and the quality becomes ragged and the reproduction distorted.

The Power Amplifier built with Thordarson transformers and chokes operates from the light circuit. It uses larger capacity tubes, and reproduces the broadcast programs with an amazing richness and freedom from distortion—at any desired volume.

In addition, this amplifier supplies the B-voltage for the entire receiver with sufficient current for any instrument.

Write for circular “Power from the light circuit.”

THORDARSON ELECTRIC MANUFACTURING CO.
Transformer specialists since 1895
WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS
Chicago, U.S.A.
NEW!

A GOOD BINDER FOR YOUR QST's

Never before have we had a satisfactory binder but here is one we are proud of.

Maroon Buckram with title stamped in pure gold
Just fits twelve issues of QST

SENT POSTPAID

150 ea.

Note the wire fasteners. Unnecessary to mutilate copies. Opens and lies flat in any position.

Get a set to hold all your back issues of QST—you know they deserve permanent preservation.

QST
1711 PARK ST.,
HARTFORD, CONN.
Echoes of Byrd's Flight Over the Pole

E. S. Strout, Jr., 2N.Z. who worked KEGK, the S.S. Chantier, before and after Byrd's successful flight over the Pole.

Photograph of Radiogram from Commander Byrd on board the "Chantier" to Fred Schnell of the Burgess Laboratories in reply to his question as to whether Burgess Batteries were used during the expedition.

BURGESS BATTERY COMPANY
GENERAL SALES OFFICE: CHICAGO
CANADIAN FACTORIES AND OFFICES: NIAGARA FALLS AND WINNIPEG
In United States: Offices and Warehouses in Principal Cities
Contact with Expeditions

A NUMBER of stations have reported contact with the Schoneer Morrissey of the American Greenland Expedition (VOQ). Probably Mr. J. R. Miller, 9CP, of Hammond, Ind. has thus far handled fully as much traffic as anyone since getting on the Morrissey reports the weather fine and the nights missed were when the Morrissey was getting oil for two days. 9AA copied VOQ telling messages have been handled thru 9CP. 1500 words in about 30 minutes has been the average time. Many others have reported contact with VOQ for the months of August and September, including 9AFJK, 2UO, 2FY, 2US, 3~AK, 5~AA, 6VOQ, 6X0Y, 7CP, 7ST, 8CP, 8F, 9AFJK, 9E, 9I, 9RJ, 9T, 9W, 9X, 9Y, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, and 100. The base station will be located on some plateau in Greenland. The Army Transport Chateau Thierry, WXF, completed the 17-day trip through the Panama Canal and will test with amateurs. 6AKY worked regularly on schedule through tropical conditions.
The night next 311 words were received on schedule from 9AAW for WNP and this traffic was put through early on the 13th. 9AAW worked WNP direct consistently until July 10 when WNP lowered his wavelength. Late on the 13th the 9AAW-1AAY schedule again cleared several messages each way. WNP messages were cleared on the 14th. July 17, Gold pulled down the set at Cambridge shipping it to Holyoke. After erecting an antenna and rebuilding the receiver 1AAY was again in contact with WNP on July 22. At first the two worked with about 275 watts and overheating badly. After a considerable reduction of power WNP reported a stronger and steadier signal. Receiving this news, 1AAY cleared of four messages. August 1st 1AAY took five messages totaling 200 words. On account of unusual bad radio conditions these had to be forwarded by telegram and air mail. During the same period messages totaling 900 words were sent to WNP from 1AAY and one message was taken from the expedition. Most of the north-bound traffic came to WNP from 1FL and 2GY. Sixty three messages have thus far been handled thru 1AAY.

1AAY was QSO several times. On July 3 6BQT (San Francisco) worked WNP through severe QRN. 1ADM hooked up first on July 12 making a daily schedule. One UX210 has done the same work at 1ADM that bigger tubes had earlier at contact points. 8BHY worked WNP when he was at Fort Mann, Labrador on July 17, taking one message. 2BKR took a few hundred words for the Museum at Chicago on July 21st. The signals were very loud but falling all over the dial and extremely hard to copy. On 1CNP got QSO on the 22nd. IAPP tried to make a message on the 23rd. 1BEI worked WNP on Aug. 8th. July 30th 1PX worked McGee giving him the correct time. 1AAP copied the signs receiving them somewhat weakly. 2BKR-MH and 1AAY copied him on the 8th and 9th but the signals wavered due to the shaking of the ship from bumping seas. 2AAM-1AAY connected when WNP was at Indian Harbor, Labrador. 2AC copied WNP on July 31st reporting through 9ZT that the signals were not loud enough to make contact properly.

Army-Amateur Notes

2ND CORPS AREA—An "Army-Amateur Auxiliary Radio Net" for each separate state in this Corps Area is under way. Such nets consists of only those qualified amateurs selected by the A.R.R.L., who, because of geographical locations could not be assigned to a military unit, or because assignments to military organizations in their vicinity have already been made. Amateurs assigned to the auxiliary radio nets will receive their instructions from the Corps Area NCS, Station 2SC.

The New Jersey net has been almost all organized. 2WF is net control station and 2QV his alternate. The organization of the New York State Net has begun and the appointments will be announced in QST later. Members of the 15th Division Net have been meeting in the Globe Indemnity Building, Newark, N. J. once a month to discuss progress with army officials and to arrange schedules. Two or more stations are needed in the following New York State towns: Saranac Lake, Oneonta, Glens Falls, Saratoga, Hoosick Falls, Tonawanda, Walton, Mohawk, Oneida, Whithall, Olean, and Binghampton. Amateurs at these points are requested to write David Talley, 2PF, 222 Avenue O, Brooklyn, N. Y. for application blanks and details regarding appointment in 2PF.

This will complete the organization of the New York State Net after which some interesting activities are planned for everyone who has accepted appointment.

3RD CORPS AREA—Two nets are still being considered with A.R.R.L. operators in the Third Corps Area. Letters have been mailed to A.R.R.L. members in certain parts of this Corps Area where yet no volunteers have been received. When A.R.R.L. stations have been obtained for Annapolis, Md., Richmond, Va., and Baltimore, Maryland, permanent outfits will be established. Some interesting tests have been held between 3BN at Fort Howard and amateurs in the area. Data collected from these tests will be used in studying the character and strength of various short wavelengths as they show up in different localities.

4TH CORPS AREA—Organization of Nets in several states of this Corps Area is now in progress. 4RM, who has been handling details of the Net for Georgia, has moved to Florida. Detailed plans for the NG and Governor's Nets for Georgia are prap...
Finding a Concealed Transmitter

A Suggestion for Your Club Activities in September

DURING the winter most clubs are obliged to limit their operations to theoretical discussions of radio principles, to station operation, and to business meetings and indoor technical sessions with occasional social activities.

In the Wireless World for July 21st is given an interesting account of the field day held one Sunday by the Sheffield and District Wireless Society in the hills and dales of the Peak district of Derbyshire. The club planned a fascinating and successful field day with plenty of excitement to go around, and a wealth of practical experience for everyone connected with the hunt for the carefully concealed transmitting set.

As the article suggests, a field day devoted to direction finding work will open many further problems for investigation and furnish ample material for discussion during the following winter months. Besides the excitement and intense interest that prevails during such a field day, the practical experience in building and operating the apparatus, in plotting polar charts and in noting the interesting variations in the results brought about by defraction and spherical waves, are its chief values.

The Sheffield Society placed a C.W. transmitter in charge of three members of the club, these members being sworn to secrecy regarding the location of the outfit to be assumed. The transmitter in this case was taken from Sheffield to its new location sometime before the "hunt" opened. A generator driven from the tower supporting the antenna of portable 6SV and the club ice cream stand is also shown. This live club has many activities worthy of adoption by other organizations who want to realize a substantial sum.
for a club station or other enterprise. This Association is getting ready for the big Pacific Division A.R.R.L. Convention to be held at San Jose Oct. 15-16-17.

The Los Angeles Radio Club put on their first ham picnic Sunday Aug. 1. The gang started frying in early morning. Everyone took their lunch and whistle. The stunts and a feed of hot dogs and marshmallows were enjoyed by all. KST and 6HXA were there!

COLORADO—At the first meeting of The Associated Radio Operators of Denver, 9CA, 9BJN, and 9CAW were elected as officers. SAX's talk was well appreciated by the club. Two subscriptions to QST, one to go to the high traffic man during August, the other for the high man in September. We look forward to some hot competition.

The Illinois Radio Traffic Association had the regular meeting in July. Bill Schaeffer gave the gang a fine account of his trip around the world. The gang was out in force for the "Ham Relations" July-August, 7-8. This was the first state-wide meeting marking the beginning of a live Illinois traffic organization. July 17, the Chicago amateurs won an indoor baseball game from the suburban amateurs by a score of 29-18. Athletics certainly are the activities that keep the gang together in summer.

The Crane Radio Club, Crane Technical High School 9CL (Chicago) has just elected new officers for the coming semester.

JAMAICA—Three of the Queen City Radio Club reports that the fellows are all out for the Maine trophy for handling most messages through a given station during the period July 26-Oct. 26. He says the members have to go to some extent to keep up with SCM Best but that there are a few who will give him good competition.

MANITOBA—The Winnipeg Radio Traffic Association published a booklet in monthly issues, and the paper has just recently been doubled in size. The Association has just placed a message collection box in the offices of the local tourist bureau and considerable good traffic is resulting from the new source. The Association expects to put up a cup for the station in the Prairie Division having the most reliable, orderly and regular station and turning in the best traffic reports. The editorsials to stir up ham spirit, the traffic notes and live news in the WRTA Bulletin are published in the name of Amateur Radio policy and recommend the paper to your attention. We look forward to having a report on the summer stunts put on by the club.

MASSACHUSETTS—The North High Radio Club of Worcester had its annual banquet at Hotel Warren June 17. Mr. Green, 1ASU, spoke on the history of the A.R.R.L. and amateur radio today. Giving advice for selection of the Physics instructor discussed the relation of science in general to radio in particular. The new and retiring officers made their respective reports. The new officers was elected on the recommendation of Mr. Kruse's visit to the section. Attendance was good and visitors were present from Toneka, Olafite, and St. Joseph. 9AWJ came the furthest distance. 9RY won the trophy for the longest O. T. set of whiskeys. 9KW (guess who) and 9RR followed suit.

MONTANA—The Anaconda Radio Club has been holding regular bi-weekly meetings. A number of members are interested in getting on the air. Talks on amateur and RCL subjects hold the interest of the 50 members here and draw in between fifteen and seventy-five visitors at the meetings. This club has taken the first steps toward affiliation with the A. R. R. L.

NEW JERSEY—All hams are invited to the Grand Banquet Saturday evening Oct. 16 at St. Francis Hotel, Newark. The Amateur Radio Association of Essex County will hold a hamfest and winter activities. Prominent speakers will be there. Plenty of "eats" and humorous as well as educational programs are planned. The banquet committee are working hard to put over the best banquet yet. Please don't forget your two bucks. Come and have the best time ever had at a hamfest.

NEW YORK—The Radio Club of Rochester is going to give two exhibits, one at the Rochester Exposition Sept. 5 to 11, the other at the Rochester Radio Show Oct. 11 to 15. Two complete stations will be operated simultaneously at the exposition. A 50 wattter will be used on 40 meters and a DX210 on eighty meters. Two receivers will make it possible to use both sets at once and to clear the traffic filed more rapidly. Some special radio communication stunts are planned in addition to the traffic work mentioned. The call 8P2 has been selected for the station if available in September. Please listen for 8P2!

OHIO—Detroit, Toledo, and Findlay amateurs with many visitors from surrounding cities had a hamfest and chicken dinner July 25th. A good time was enjoyed by all.

ONTARIO—Stations 8GY, 3IA, 3CM, and 8DOH are going to handle contacts of all kinds during the Summer Fair, London, Ontario during September under the auspices of the Ontario Amateur Radio Association. All amateurs are requested to be on the lookout for this traffic from these stations, so that it may be QSOed and delivered promptly.

PENNSYLVANIA—The Amateur Transmitters Association of Western Pennsylvania sponsored a ham basket picnic at Camp Fineview, Sunday, July 25. The fellows drove to the camp and enjoyed a real outdoor hamfest. After the swimming and athletic contests a number of prizes was distributed to the winners. Mr. Aiken of KDKA addressed a technical meeting held August 6 on the subject "Transmitting Audible Frequencies over Metallic Circuits".

WEST VIRGINIA—The Delta Chapter of the Pi Alpha Tau radio fraternity was organized at Wheeling during July. 8ASB, 8HSU, 8CDV, and 8DOH were admitted as charter members of the chapter.

The number of members in each chapter of this national society of hams is limited and no amateur can join without a recommendation from a member. The principles of the new organization were to foster a brotherhood among operators, to encourage expeditions traffic handling, and to act in all radio matters in accordance with A.R.R.L. standards and policy. Ask the candidates how they came through the initiation.

NOTICE!

Nominating petitions for Section Communications Manager are hereby solicited from the following Sections:

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Robert E. Harris—5TW

709 W. Duke St.
Hugo, Oklahoma

Orig. 99, Del. 301, Rel. 192, Total 583

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Traffic Briefs

7BH is the portable transmitter of the Alaskan Aerial Survey Expedition, base No. 1, Ketchikan, Alaska. 6HJ has been consistently QSO operators Wescott and Gallagher. The wife of a member of the expedition had an hour and a half chat with her husband recently through 6HJ at Los Angeles. Good work, OM.

6BYJ was the first U. S. amateur to work 9GD at Dav, Alaska. 7KK is located at a cannery belonging to the Alaska-Portland Packers in the extreme northern part of Alaska. The time there is 2½ hours earlier than Pacific Standard Time.

3XE has been keeping three schedules per week with 1BIG sending strings of messages SINGLE and solid at good speed. About 1,000 words per week have been handled right along. Fred Best says that Lee's steady crystal-controlled note makes it easy to handle traffic through the summer QRN. Lee insists that the credit should go to 1BIG's splendid operation and wonderful low power station (11.4 watts plate input to 2 UX210s). Listen on the upper edge of the 10-meter wavelength band some night. Hear for yourself how real traffic is handled between the extremes of the 1700 mile Atlantic Coast circuit. Steady, clean-cut, well-spaced signals and a thorough understanding of operating procedure count for a lot in communication work. Let's all try to boost useful traffic work and make our own sending the kind that will make others want to work us more than once, the kind that will make our signals envied and talked about by the gang, too.

8DJH is the portable transmitter of 5AGQ-SCOE. It has been installed on the Steamer Princess, an excursion boat running on the Ohio river. A free message service is offered the passengers by Keister of 5AGQ who operates regularly keeping a schedule with 5SCOE to deliver the traffic which is mostly for local points. FB, OMs!

2AKV is on 38 meters daily for at least three hours, usually between midnight and 5 am. Schedules are kept with several stations to clear traffic promptly to western points. FXJ recently handled 2AKV eight messages in a row. Let's have more stations who can turn in a report like this. Line 'em up for Official Relay Station appointments, OMs.

By the time this QST is in print there will be a goodly number of stations rag-chewing and handling traffic locally on 150-200 meters. 5KD, 5DDJ, and 2CXE have a bunch lined up for scheduled work on these waves in the New York City area and it's a pleasure to hear 'em after listening to some of the very nice notes of the shorter wavelength bands. Come on up and get in the swim yourself, OM.

Just to prove that the C. R. T. A. message service is functioning nicely and that the message delivery in New Zealand is 100%, Mr. R. G. Black of Wellington, N. Z. sends us the acknowledgement letter from a well-satisfied recipient of a packet radiogram. Message number 113 originated by 9GD (Chicago) travelled thru 9EAM, 7EO, and 2BH and was delivered very promptly to a very delighted young lady. Why not try to improve our local message delivery figures? There is plenty of room for improvement. It is the duty of every station-owner who accepts a message to pass it along promptly toward its destination or to deliver at once by phone, in person or by mail. A little personal responsibility on your part in giving 48 hour service to messages will boost us toward that 100% mark. How about it?

5AJ is located at Pond's Inlet at the extreme northern end of Baffinland, the furthest North habitation of the Eskimos in the Canadian archipelago. This call is assigned to Constable Timbury of the Royal Canadian Mounted Police. The portable short wave transmitter operated from dry cell batteries is shown in the photograph which we reproduce here courtesy of Mr. G. A. Wendt, Canadian Westinghouse Co., Montreal, Canada.

pilAU recently pulled off an all night chess game by amateur radio between the Filipino chess champions in Manila and Chinese chess champions in China. He says its no joke working all night at the key. Besides, the Chinese champs won the same! IAU is now making arrangements for a game with the States. We want to hear how that comes out.
pilCW (Sgt. C. W. DeRemer, Manila Bay, Corroso,-tor, P. I.) was laid low with malaria just as he was hitting full stride in making a record for handling "most messages" with many different countries from one station. We are advised that he is returning to the states and can be expected to put out a mean wallap from his new address at 488 South 4th East, Salt Lake City, Utah.

Members of the Naval Reserve who own and operate amateur stations will receive a certificate similar to the one shown herewith signed by the Secretary of the Navy and sealed with the Navy Department seal.

THE SECRETARY OF THE NAVY

WASHINGTON

This is to certify that

JOHN DIX, Radioman 2d, U.S.N.R.

who operates station "I" is licensed by the Department of Commerce as a member of the United States Naval Reserve Amateur Net of the Naval District and is hereby authorized to participate in Naval Reserve radio activities.

Secretary of the Navy.

Certain stations in each Naval district are designated "Master" Naval Reserve amateur stations, selected for leadership and to call and assign Navy calls for official work in addition to the amateur call letters. Under certain conditions these master stations are authorized to use Navy frequencies.

The first two such master stations have been assigned to Lt-Comdr. F. H. Schell, USNR, Madison, Wisconsin, Station 9EK-9XH, Naval Call NRRG, and to Lt-Comdr. Wm. Justice Lee, USNR, Winter Park, Fla., Station 4NKF, Naval Call NRRG.

Philippine Progress

By F. Johnson Elser, pilZA

UNTIL a short time ago, the name "Philippines" had little use in the radio amateur's lexicon. Today, due to the efforts of a small but determined band of workers it is a by-word in every radio station in the world. The great distance from other amateurs and the impossibility of getting supplies opposed the efforts of workers in the Philippines from the very start. The true ham spirit, however, kept them working until actual communication with the rest of the world was a fact. There have been Philippine amateurs almost as long as there have been U. S. amateurs.

I2A was first to copy a distant amateur when he heard 95W on 280 meters late in 1923. Next year I2A's 260-meter transmitter was copied in China and New Zealand. In April 1925 I2A heard several Pacific coast stations using 80 meters. In early June of the same year, Lieut. Roberts, pilHR, and Lieut. Johnson Elser, pilZA, erected a 40-meter transmitter (the first in the islands) and began reaching out. This station has been followed by a number of others whose calls are more or less familiar in Japan and in other places following the "pi" intermediate: IAR, IAT, 1AU, 1BD (ex CDS), 1CW, 1DL, 1DR, 1FR, 1HR, and 3AA. Most of these station owners are members of the Radio Club of the Philippines, live organization of about 40 members holding meetings every other Thursday. The Club Secretary, Mr. Al DeLange, pilDL, 283 S. 15th Street, Manila, P. I. will appreciate any cards sent him for Philippine amateurs. There are now about 125 licensed amateur stations in the Philippine Islands.

Perhaps it is the difficulty in securing parts and supplies that does it, but no Philippine amateurs operate their tubes overloaded so they become red. All apparatus at every station is put together neatly and with thought. The result is a bunch of stations that get out at all times.

You men who complain about a fifty watt arriving from New York with a broken filament should try living in the Philippines for a change. Think how a transmitting tube looks after it has come 11,000 miles.

Lieut. Roberts, pilHR, in addition to putting up the first short-wave station, was instrumental in organizing the Radio Club of the Philippines, contacting all the interested amateurs. Reports indicate that over half the fellows attending the club meetings will have active transmitting stations this fall.

Although Lieut. Roberts is leaving the Philippines September 1st for New York via Shanghai, China, Japan, San Francisco, California, and Panama arriving there about Nov. 9, pilHR will continue on the air manned by native ops. pilHR has a very complete compliment of operators and is on the job keeping traffic schedules daily from 5 pm to midnight. Manila time, including even Sundays and holidays. pilHR uses two 50 watters and has a D.C. generator for plate supply. Among many schedules, the daily one with 6BJX kept to handle traffic over 7,000 miles of Pacific ocean and now in regular operation for over six months is the most noteworthy. Extra credit for this work goes to 6BJX who handles his station alone. pilHR has been operated on a length of 37 meters for many months in order that every scheduled station will know where pilHR's dependable signals can be found. In emergencies some Signal Corps traffic is handled in the Philippine Islands in addition to the regular amateur work.

The volume of traffic handled by the most active traffic stations (IAN, 1AU, 1DL, 1HR, IAT, 1CW, 3AA and 1BD) is rapidly increasing, many hundreds of messages per month are handled through these stations at the present time. A large percentage of the traffic goes to the States and back and his signals will be missed by many USA hams as well as by those in other parts of the world. 1AU is on a large part of the twenty-four hours of every day keeping schedules with 6JSY, 6AKM, and 6CUT. If there was a Hoover cup for the Philippines it would doubtless go to IAU. The apparatus at this up-and-doing station is mostly homemade which in the Philippines does not mean that the station was assembled from standard parts as it does in the United States. IAT was a little late in dropping to short waves with his 50 watter but is making up lost time in handling his share of traffic. IAT is an old timer who helped keep things going when amateur radio in the Philippines threatened to die of inertia. The ops at 1BD are numerous, though one of the newest stations it is 100% reliable and has made a name for itself already. Like I1HR it is at an Army post. One 250 watter is used at 1BD. 1DL is the station of the hard-working club secretary. Using one 50 watter schedules have been kept with 6BQ until now.

It will be seen from the foregoing that the Philippine states are not watt burners but they certainly are ether busters. Many American stations operated under more fortuitous conditions, can hang it up at a head in shame. The Philippines are the farthest point from the United States where the American Radio Places and this fact alone should make you determined than ever to hook one of the "pi" stations when they are heard at your station. They are certainly doing their part!
Traffic Summary By Sections

The percent of all the Official Relay Stations under each officer and the percent of TOTAL messages handled by each section are included in the summary of this month’s work. By comparing the two columns showing these percentage figures the stand-

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ATLANTIC DIVISION

EASTERN PENNSYLVANIA—H. M. Wallace, SBQ
SCM—A last warning is issued to non-reporting stations that have not reported for two months or more. One station in operation last month, 8BZU, blew another 50 watts and is going again. SCM handled traffic as usual. 8ADE worked Tasmania and SBQZ, and RCPF are doing good work. 8BCW is on air now with 50 with 1CW eye on 80 meters. 8ARG 8CNX will be on after September 15. Mr. Liddbury of 8DAJ just returned from Europe and states 8KW was heard all the way over and back with his new meter set in the light. 8SBF is acting SCM in the absence of RPF. ORS have been issued to several this month and another September. Western New York will have quite a few more.

8BCW is rebuilding his station for 40 and 80 meter work. 8DBQ has completed his new station. SCZP is now working a GQD and listening for the CQer. ORS is supposed to handle traffic to live up to the hopes set. ORS is gone out west on a vacation and will be back on 80 busting out traffic. Any report for this section that does not list the QTH and 80 must be forwarded to SCM. 8BDC is rebuilding his station for 40 and 60 meters. 8CMM reports his Kiog signals coming in fine. 8GI, 8CVR and 8GK report too much heat and QHN is on a trip. 8AJS is not on the air. 8DNO 11, 8DSI 12, 8ADE 5, 8SBQ 5, 8CZP 5, 8CRR 4, 8SHJ 4, 8CKT 4, 8SF 4, 8ARG 2.

WESTERN PENNSYLVANIA—SCM, L. G. Crossley, 8XE—The traffic report for this section is lighter than it should be, considering the number of ORS here. 3BSS has again asked for another ORS for two months or more as long as the SCM has been on the job. The SCM believes there are plenty of good stations not reporting the ORS and some are transmitting without a certificate. 3BSS has not sent in a traffic report for two consecutive months and their ORS subject to cancellation. The 38 stations mentioned have not reported for two consecutive months have their ORS subject to cancellation. This necessary action will follow without war or favor with the missing of a third report to give us a 100% list Section. 3CVH and 8GK report too much heat and QRN for good work. 8BBL has taken down his Hertz antenna and is now back on the air. 8BKL and 8CES report off duty, due to too much heat. 8BFE saw shades of a fading ORS and is ranging through the thunderstorm in a 20 meter set.

Official broadcasting by 8PK and 8ABX is outbound; 8PK and 8ABX are pouting out exceptionally good. 8DHIS handles messages for VOQ and relayed same in 8 minutes to 8DPY. Buffalo, N. Y. 8UL still keeps traffic going from his station. 8GB handles traffic with 8CD at Vera Cruz—also hears ORS. 8CML and 8KF handles other traffic. 8CDR works 20 meter band successfully in daylight, also handles traffic. 8CRR still handles traffic and is rebuilding his station. 8BZU blew another 50 watt and is going to increase to 100 watts. He reports 8SAP, 8BCW, 8AOZ, and 8CRR are doing good work. 8BCW is on now with 50 with ICW eye on 80 meters. 8ARG got his first card from Australia. 8DPK is off the air. 8NT handles traffic and has gone out west on a vacation trip. 8STL is at camp and 8SHJ handled traffic as usual. 8ADE worked Tasmania—he says his new location in wilderness is much better. He has heard up and is going to build a new rectifier and erecting a Hertz antenna. 8AVJ handles some traffic but is off at present. 8DKK works 6AC, F, G, GB, HR, MA, and 6CFP for 2 days and is on vacation. 8CRR works 6's and Porto Rico and just finished a new transmitter. 8SCZ handles traffic to the wild west and hands at present. 8CNX will be on after September 1st, on 20, 40 and 80 meters. 3AEA has taken the rest cure at Watkins Glen after attending the Buffalo Convention.

8DDL is handling traffic with 8AIG. 18BIV and 9DAY, a member of the RCG, says he is QSO 8GZ many of the fellows he met this summer and 8GZ has been taken over by U. S. Army for communication purposes with Geo. McGarret of 1YB as operator. 8DPY, 8CRR, and 8BBQ are heard across USNRF. 8BBF will be 8SO again after Sept. 1. Mr. Liddbury of 8DAJ just returned from Europe and states 8KW was heard all the way over and back with his new meter set in the light. 8SBF is acting SCM in the absence of RPF. ORS have been issued to several this month and another September. Western New York will have quite a few more ORS.

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3AEA reports his station has been inactive due to various mannerisms. He has bought an 80 meter code card, but the air service won't let him use it. 80B7U sets his report from on board the USS Utah at Phila, Pa. ND as at all other stations, the same luck on Utah, call NVE as planned. Permission to operate during high frequency set revoked at last minute. Only a receiver is working. 3APF attended the Atlantic Convention at Buffalo.

Traffic: 3AIS 6, 3APV 11.

DISTRICT OF COLUMBIA—SCM, A. B. Goodall, 9AB—8'8BT, who has taken a much deserved vacation during the last month, is back again on 40 meters and is running up the 80 meter transmitter. The fellows can look for the old traffic hound as had planned. Permission for operating high frequency work with the Army chain of stations. He is finding 40 meters hurts his traffic totals and will soon start working on 80 meters. 9BZD is finally busting through the city wall and is QSO all directions. For volume of stations especially 9AAW and 9PU. 9AYB is on regularly but the heat is terrible—why not take a trip with WNP next year.

9EC will be on the air in about a month and reports all the stations are off the air in his region until fall. 9DWH tried kenetrons but has found a good rectifier better. 9DLT is trying to get two transmitters going, one 10 and 100 watts and the other 500 watts on 40 meters. 9DVP is rebuilding the transmitter for 40 meters. 9AWT reports ND this month. 9AAM is vacationing but promises to be going full blast by fall. 9VJ is on the air again with a 50 watt transmitter for 6 meters. The Chicks have taken over the Sherman Hotel and are getting quite a few messages. 9ALF was entertained by 9CCE and a gang on the eve of his departure to England several times recently. 9DZQ is on regularly.
Building for fall. 9/EB just installed a Marlo filter he can instantly QSY from 80 and 90. CMTC is operating regularly and getting good reports. 9GAU is good on three 75 watters on 80. 9ABP is reporting again with a new rule. 9DSC works the lots of DX. He loses more sleep and works more nil on the note and is getting out good. 9CLO has his outfit (QR 8. 9CAP 8, 9RRG 7, 9CRV 7, 9CLO 6, 9DHJ 6, 9ZH works practically all on schedules. 8CEP uses traffic filtration now. 9AXH, who is in Canada, is breaking using no antenna for receiving. He TKey's going to try. QN still operating NEU. They say that they be held often. Dinner was served at Park Hotel. BRYN reports much power a note total for a few days work. 8-BPL installed a good scheduled station. Others, please take notice.

Traffic: 8DBM 302, 8RY 138, 9GZ 125, 8BYN 38, 9DIA 38, 9DRX 2, 8AZU 22, 9FLP 20, 9CFQ 18, 8FL 18, 8ANB 16, 8HNA 11, 9DBX 7, 9ADA 3, 8BRM 3, 8GBI 3, 8AWH 2, 9DSY 2, 9CLR 2.

DAKOTA DIVISION

SOUTH DAKOTA—SCM, F. J. Beck, 9BDW—Various summer activities, commercial operating and YLs claimed most of the gang this month. Most of the 5 watts was a result of advantage of the opportunity of inspecting 8XBR and admiring the big bottles. 9BBK blew his H tube and had to look for another one. 9CLO has had to go from 40 to 60 watt rectifier and gets battery QSB now. 9DBP is the best traffic station in the state. 9AMZ is going to put in 50 watts, although he is getting out good on a UX210—uses a 2BY on 80, 9DBM in good signal 7.5 meters on 80, 9ABP rebuilding for fall. 9AEF installed a Marlo Super Synk. 9EF is reliable for the east coast but unit 92Q was not to his liking. Just rebuilt and is getting out fine now. 9CMG has put in a new filter. 9BYI has raised his plate volts to a better audio level. 9CMG has worked out 80 to 60 watt rectifier and gets battery QSB now. 9DPJ is the best traffic station in the state. 9AMZ is a new station at Fort Wayne on 80 meters.

Traffic: 9DPJ 210, 9EJI 90, 9BCT 87, 9HKJ 84, 9BK 43, 9BNP 24, 9CST 23, 9RCM 20, 9CP 18, 9DYT 14, 9BYI 12, 9CXG 11, 9DJL 11, 9DKD 10, 9CQA 9, 9CMG 7, 9CLO 6, 9DBM 8, 9AMJ 6, 9DRS 5, 9JEU 5, 9AXH 5, 9DSC 5, 9ARP 4, 9CUD 3, 9DDZ 2, 9AEF 1.

MICHIGAN—SCM, C. E. Darr, 8ZZ—8AZB is having trouble on 40 meters and is going back to 80. 8ZM works practically all on schedules. 8CEP uses both 40 and 80 meters and expects to get it FR. 8SQ still operating NEU—handling amateur traffic too. 8AMS has a new 1000 watt generator and is going up to a 1000 watter. 8CMG is handling a 40 meter system. 8PF has been off the air on account of a long vacation. On July 24, hams from Detroit, Toledo and adjoining cities held a hamfest at Monroe, Mich. In the weather meeting we have had and it was enjoyed so much as it was proposed that they be held often. Dinner was served at Park Hotel and time was spent by all.

The City of the Straits Radio Club of Detroit are preparing for the 1926 ARRL state Convention. It is going to be a "WOW!"

Traffic: 8CEP 48, 9QN 20, 8ZH 11, 8AZB 7, 8ZZ 6.

OHIO—SCM, H. C. Storeck, 8BYN—This is the SCM's first report since the new station and little reports have been straggling in since the 18th of July, he hopes next month's reports will return to normal. He wishes to thank all the Ohio gang for their cooperation and hopes to be able to handle his office to every one's satisfaction.

8BBM leads the list of traffic handling. He's a good schedule station. Others, please take notice of the good schedule station. 8BBM suggests the use of GMT for messages and station logs. Good idea. 8SZ mostly handles press for ARRL from Aussies and Dealers. 8BYN reports much power to the west coast and that DX is bad from there. Great believer in DC notes and now has one. 8CQA works hard for traffic but says its scarce. On checking in, 8SAU finds he worked 727 of all stations called. 8AZU is going to CMTO camp, but turns in a nice total for a few days work. 8BPL installed a new SCM, but had bad luck with crystals but has one now that is holding up. 8SANB is on with a 250 watter and looking for more traffic. 8CMG is working smoothly in the summer and has little time for radio. 8DXR has trouble with absorption from trees. 8ADA is keeping PFR schedules thru the summer. 8BBM and 8DWM are on at DC heights and will build up this fall, in order to experiment and get on. Then he says he'll go to it. 8CLR reports having trouble with his set and has 8CQA for SCM, he says the lat is and 8CMG is operating KFNO. 8BBH is a proud papa now. Congratulations, OM. 8DWM is at 9CYW and handles the traffic thru the summer. 8SAU will AXI in September with a new set and rectifier. 8SAO is now on the air with crystal control. 8BCE is mostly after DX. Worked O-ISR at Salisbury, Rhodea, FR, 8MO, but mostly in another part of the country. 8CMG is on the air with time with crystal control. Has also had touch luck with them, but OK now. The SCM wishes more stations would get the schedule habit. All the high total stations are good schedule stations. There are less fellows on in the summer, hence we ought to be able to handle all right but get to keep schedules once, and you will find a real "WOW!" if you have made a note of it so far. It was a good DX work. Reports on traffic handling thru schedules are solicited.

Traffic: 8DBM 302, 8RY 138, 9GZ 125, 8BYN 38, 9DIA 38, 9DRX 2, 8AZU 22, 9FLP 20, 9CFQ 18, 8FL 18, 8ANB 16, 8HNA 11, 9DBX 7, 9ADA 3, 8BRM 3, 8GBI 3, 8AWH 2, 9DSY 2, 9CLR 2.

MINNESOTA—SCM, C. L. Barker, 8KGU, (pro tem)—The attention of the Minnesota gang is again called to the fact that under the new SCM system, the rules and regulations regarding the cancellation of Official Relay Station appointments will be very strictly adhered to and it behoves a great many of our stations to be careful about reporting, otherwise—well, that's all.

9DYZ did not have time to be on the air much but handled some important traffic for the Warner Bros. portable station, 8XBR. He is now back and has been working with a new circuit, like G01 and is getting ready for heavy fall work. 9CWA is on the air on 80 and 40 meters with 50 watts and has a new 50 watt rectifier and is turning 8BCs into hams. FR. 9DHP has rebuilt, using a 7½ watt tube with 9EQM. 9DWA is using B grid exciter, but the traffic is on 40 meters. 9DWO works out well. 9DOM is setting out very well with a new antenna and 19 watts and has worked to and from Honolulu. 9EDG is finding it hard to get out now, working on 40 and 20 meters. 9UVC has lots of trouble with fluctuations in the power lines on the farm and it is hard to read. 8EIO has started up with a Ford spark coil for plate supply and gets out fairly well. 8BYX almost lost his license but got it back by quick work. Now uses a Zeppelin antenna with fine results. 9DEQ
MISISSIPPI—SCM, J. W. Gulleat, 5AKP, 5QZ has a 250 watt rig on the air now with a 50 watt as an auxiliary transmitter. 5QZ is building a 50 watt for Fall work and is planning to have it ready on the 40 meter band soon. 5AQV is installing two H tubes in a self-rect. circuit and hopes to work good DX. 5AGQ is operating 80 and 40. which is the Meridian Amateur Radio Club’s portable transmitter at the Summer Boy Scout Camp. 5AKP is installing a 50 watt.

Traffic: 5AKP 24, 5QZ 28, 5AGQ 15, 5AQV 13, 5AR-5ALZ 7.

HUDSON DIVISION

EASTERN NEW YORK—SCM—Earle Peacock, 2ADH—A general clean-up has been undertaken by all. 2ADH wld 22ZCQ on a wld with 2000 volts and also reinstalled all the radios. 2AQW, 2ARM and 2AVB who are making good progress. 2AQW recently made the BPL. 2ALD is working, namely: 2CLA, 2BRB, 2MU, 2WC and 2UD with several more under construction. Doc Dunn has a new 250 watt rig which he will have operating by Fall. He is on 80 meters but expects to be on 40 soon. 2BSD recently visited Brooklyn and was made to feel at home. 2BC has worked every DX station and has recently copied 600 words of press from him. Keep it up, OM. 2AEV also QSO 20Y. 2FY is a new station in L. I. 2GP is trying out 30 meters. 2ATQ is operating set and is getting ready for a big traffic season. 2AQW recently worked with EClFG in Spanish for 21 hours. 2BRB is busy making three amplifiers. 2APD is closed down for the summer. He has loaned his apparatus to 2CRB and 2AMV who are making good use of it. 2CF can be heard punching holes in the air almost every night. He expects to put in a crystal controlled set in 2BRB soon. 2JK has moved into Brooklyn and will soon be bright on the air again. The SUD has just returned from Canada and as soon as the effects are worn off, he will be heard on his crystal set.


NORTHERN NEW JERSEY—SCM, A. C. Wester, 2W—The new SCM wishes to extend his thanks to all the traffic officials for their fine cooperation to him as ADM for the past two years. 2BBH, because of lack of time, desires his 8RS cancelled. 2APA, the portable set of 2CWH, in operation until the new set is installed. 2BQQ has installed a new Hertz antenna. 2ALW, while away on a vacation, is operating at 2SDS. 2ARH has his Portable set on at home in New Jersey, with Holland and England during the summer. 2KCA not married and is located now at Irvington, N. J. (Congrats, OM—SCM! 2GV has been QSO 4AM with some une station shows up with a 250 watt power, voice and is well known around the region. 208A and has a QSO with 20, 40 and 80 meters. 2APD is closed down for the summer. He has loaned his apparatus to 2CRB, 2AMV and 2AVB who are making good use of it. 2CF can be heard punching holes in the air almost every night. He expects to put in a crystal controlled set in 2BRB soon. 2JK has moved into Brooklyn and will soon be bright on the air again. The SUD has just returned from Canada and as soon as the effects are worn off, he will be heard on his crystal set.

Traffic:—2CF 68, 2ALM 54, 2AU 22, 2AOB 15, 2CRH 12, 2AHK10, 2GK 10, 2CDG 6, 2DXA 6, 2KAJ 5, 2SW 5, 2AWL 5, 2ADV 5, 2AER 4, 2QI 3, 2CYV 3, 2BQQ 2.
MIDWEST DIVISION

IOWA—SCM, L. E. Huber, 9DOA—Regular traffic routes will be established over Iowa this winter and schedules will be charged to 9SOQ (Chief RM) and 9CZC (Asst. RM). Only bona-fide Traffic men will participate as the system will be of a high order, and not at all. More ORS are needed and your application for permission for you to be a Traffic man, Don't be bashful-write to your SCM—he has the reputation of being the surest-fire-letter-writer in the Division.

Every holder of an ORS ticket is expected to handle traffic and report each month. The "SOM"Your "Summary by Sections" section must be kept larger than the "ORS" if Iowa is to get near the top of the ladder. The Bigger "ORS" means the closer we will be to the top. Regular schedules is the answer. What about this line, QM?

9CQY and 9CZC keep summer schedules on 80 regularly. 9CQY hits the ball on 80 and 40. 9DSL snubbed a new outfit on 80 and 40 and got well and was appointed Chief RM for the good work he did last winter. Give him your cooperation in every way, fellows. At present, he is simply finding out who is who for the work this winter.

Traffic: 9EFS 41, 9CQY 39, 9BWN 20, 9BKV 15, 9DSL 14, 9CQY 14, 9DMS 4, 9BOS 3, 9CS 2, 9AXQ 2.

NEBRASKA—SCM, C. B. Diehl, 9BYG—Traffic was light this month and on account of extreme hot weather QRN and QRM will be established over Iowa this winter and summer schedules will be charged to 9SOQ (Chief RM) and 9CZC (Asst. RM). 9CJT is on vacation. 9AWS is busy with Army-amateur work. 9NL has 1200 volts on a 1KW FM station and is experimenting with a magnetic amplifer. 9DR and 9EHF report no activity there.

9DUO is on a USNR cruise. 9BBS is busy with his railroad. 9AGD is rebuilding. 9EWE sends in reports from his station. Cheer up, OM! 9DR has applied for an ORS. 9DLK says "ND" like a grave-yard on 180 M. Slim at 9EEL reports fair traffic. HDXY is working on his railroad this month.

9DXY was very busy with his work and so not on as much as he would like. July 26th, 9CQS was operating 24 hours a day. 9AWS is annoyed and will not originate traffic until fall with QRM. 9DUH swapped his MG for a pair of 8 tubes. 9EEW craves traffic. 9EWF is QRM with summer work.


MISSOURI—SCM, L. B. Leisure, 9DR—Dist. 2—The SCM wishes to congratulate the old reliables in the Section on their quick operation in sending in reports according to the new system for the very first time. 9CQY and 9CKS combined for the summer. 9CKS has 800 meters, 100 watt fone and CW, 9CQY, 60 miles, 40 meters. 9CQY advises that his uncle has become a ham with his assistance and has a 30 watt RCA transmitter at WDC. 9AO is to be on the air occasionally but not enough to handle traffic this month. A new station, 9BIE, is reported from Charleston using a 5 watt transmitter.

Dist. 4—Little traffic has been handled here due to QRN but club activity has been excellent.

Traffic: 9ARA 29, 9CQF 17, 9BQV 10, 9BDE 7, 9RR 4, 9DVP 2, 9AOB 2.

NEW ENGLAND DIVISION

WESTERN MASS.—SCM, A. H. Carr, 1AB—We welcome three new Official Relay Stations to our section—1AJM and 1 BAL of Lenoxiater and 1AZW of Pittsfield. 1AAE says he had a card from a Ham in Australia who heard him the long but good. Hi. He also worked VIS of the Australian Air Force at Pt. Cook, Victoria, Australia. 1AMZ says a traffic total of 60 is low for him but it looks good to most of us for summer. 1APL is keeping scheduled with 2AKH three times a week—that means good traffic—and is now handling 1AZW who is up raw AG. 1AKZ has a schedule with KGBR and delivered 10 messages from that ship, thus making his station useful. 1AAL is using harmonic transmission and is sending the WNS brief notice. 1AMZ says that the blanketly blank 7's never send cards and, I hope that they read this. 1BVR has reduced his tube output to less than 100 watts to make a new system to make up for it. 1AQM has a broken leg as the result of a July 4th ball game and therefore 9CPW is his key carrier. 1AAL is recuperating from the strenuous job of DM, at Westbrook, Conn. He is to swim, fish, and study (?) until Labor Day. He caught and not originated any traffic this month. 1BVR has been informed that the tree at Rangeley is to be cut down to make room to count them in his traffic total. Hi. 1AQMZ has a bad disease for a new Official Relay Station. It is his but he has put up a new Hertz (He?!) 

We are on the road to be a lively Section and will soon be ready to compete with the best of them.

Traffic: 1AQMZ 60, 1AAE 50, 1APL 21, 1AU 19, 1AKZ 11, 1AZW 11, 1AAL 8, 1AB 7, 1AOM 5, 1BVR 5, 1BVS 2, 1AQM 3, 1A3W 3, 1AZW 2.

MAINE—SCM, Frederick Best, 1BIG—At last the Queen City Radio Club has started something that is going to make a splash in Maine. They have entered a lamp cup for the Maine ham who handles the greatest amount of traffic for the period July 26 to October 26, 1926. This traffic must be handled in accordanc, with A.R.R.L. practices and empty cards are not available for inspection by the judges, who will be the members of the Queen City Radio Club of Bangor.

1AIF is working hard trying to make up for the above-mentioned cup. He maintains a system of message boxes and has a total score of 1200 Green River Point has power now and is putting in a fiver. 1AFO, 1BIG and 1AYJ have been appointed Official Broadcast Stations. Two other appointments of power supply are pending. The summer slump has hit us, but the effect is not nearly as noticeable as in years past.

Traffic: 1BIG 450, 1AUF 254, 1BFZ 106, 1AV 46, 1BUF 48, 1JOY 10, 1HUB 9, 1AQM 15, 1ADI 10, 1AUC 8, 1EP 5, 1BLN 2, 1ADB 1.

RHODE ISLAND—SCM, D. B. Fisher, 1BV—Not much activity in this state this month due to the hot weather, rebuilding and vacations.

Dist. 1—1AID is rebuilding and installing remote control. 1DPS is rebuilding. 1ABE, 1ABF, 1BE, 1AE and 1AWE are all putting in a fine showing. The hot weather will permit. 1AWV is on his vacation. 1AAU is a new ORS and promises to be a good one. He is now in contact with Australia and 1BEZ with WNP. 1AVX has been placed on the inactive list for the present.

Dist. 2—1BVH has rebuilt the station and is getting out better than ever. 1AAP is also getting out on both 40 and 80.

Dist. 3—1BQD, our newlyweds, has moved to a new QRA and has the set parking there now. Getting out in fine shape as usual, they are putting in a good showing. Address him at 19 Charles St., Newport from now on.

Traffic: 1AHP 10, 1AEQ 9, 1AWE 7, 1BV 6, 1BQD 6, 1BE 5, 1ABP 4, 1AOU 3, 1AVW 2.

CONNECTICUT—SCM, H. B. Nicholls, 1BM—Enthusiasm and activity throughout the state continues despite the vacation season and hot weather. Real distance traffic is being handled by 1BEZ and 1BQO has been appointed Route Engineer for New Haven County and needs the support of his local stations. Watch this Section as the New Haven boys are organized and will do much to improve the future. 1FD and 1HJ have both handled traffic with VQ which shows all the real distance work does not have to wait until fall to be done. 1AOX has made the BPL this month. 1ADW is constructing a radio shack where he hopes to have a real station. 1BEZ and 1BQD are all putting in a good showing. The ORS, have both been doing creditable work. 1BLP being in contact with Australia and 1BEZ with WNP. Congratulations.

IVY was in communication with New Zealand 1AOG who has started the Twin City Radio Club of West Haven is starting off in fine shape and the boys are working earnestly to make it a real live organization.

Traffic: 1AOX 111, 1CJX 26, 1HJ 15, 1BFF 11, 1FD 10, 1BHMM 7, 1BEZ 6, 1BGC 4, 1AVX 3, 1AOS 3, 1IV 2, 1CTT 2.

EASTERN MASS.—SCM, R. S. Briggs, 1BYL—Don't forget, gang, that failure to report for two
Concord. 1AVF reports a case of YLitis but his traffic did not show it. 1LM and 1BMM will be back with a bang in the fall. The stay at summer camp so does 1GMP. His famous DX station is trying for an ORS, 1INV says that 1BQ, an old timer, is on the air again in one sound bad. 1WQ works nights but does good traffic work. Everybody reports very good DX. 1TPM is in the Forestry Service and is busy putting out fires. 1NS is working out a crystal control set for the fall season. 1NH attended the Oct. 15 meeting of the Oregon DX Club. 7VOO and 7EO are newcomers. 1HC and 1ACB are breaking in. 1BU is an Official Observer. 1UBU will be on as soon as Bob Wasley returns from his Barrow. 1AGD was high traffic man for the month. Traffic: 1WQ 40, 7RL 20, 7TX 8, 7VL 5, 1AF 4, 1MP 2, TP 2 4.

OREGON—SCM. A. C. Dixon, 7IT—The most active stations in the state are in Portland and Medford. 7VQ-TM, 7AEC, 7TP and 7AV are regular active Portland stations. 7MF and 7ACM represent Medford. 7VM-TM uses a three coil Meissner circuit with a 200A as a driver. His station is chiefly a DX layout and not much traffic. He kept schedules with Borneo and is being reported in South Africa. 7AEK is handling lots of messages with TIX in Alaska. He works on schedule every day. 7TP kept schedules and handled traffic with Java, Philippines, and New Zealand. He gets a DC note with a 2000 volt storage battery. 1AV has had bad luck with tubes but works consistently. 1TPM is chiefly a DX station. No message report this time. 17EO at Dayton, worked Japan and did a little relay work. Traffic: 1AVQ 14, 7TP 25, 7EO 7, 1AVY 4, 1TPM 4.

MONTANA—SCM. A. R. Wilson, 7NT—7PU has been having and hasn't had time for his new 50 watt yet. 7DQ worked 1600 miles with a UV201A portable transmitter. 7QFL was on regularly during August before going to the state college at Bozeman. 7AFC and 7ATK are Red Lodges are new stations who will be running up a good message total soon. 7AJC has been busy with BCL business activities and will be out of town part of August. Ham Hocks will be in print again soon. 1AQ is a forest fire fighter in the Bitter root range. He is going to college in Oregon in September. 1BFL was on the air some. 1AGF is busy getting his radio business ready for the fall rush. The Anacouda Radio Club has a live bunch and the SCM and all the gang welcome them. Traffic: 7DQ 7, 7PU 7, 7FL 4, 7NT 2.

PACIFIC DIVISION

NORTHERN CALIF.--Sect. 4—SCM. F. J. Quenon, 6NX—Heall of 6BVY believes in thoroughness and confirms each message by mail and finds only about one third messages reaching destination via radio. All traffic from this station received via schedules. Leon Fry of 6CLP is going to sea and Section loses one of its best operators. Fry remains at home keeping the set perfect. 6CLU visited the San Jose gang and promised a large delegation at October Convention. 6CIS keeps schedule with 6ARK while 6CID finds it hard to get on the air. Nelson of 6APS works USA and Australia with a Eliminator and 301 tube. 66SK is travelling up and down the state, advertising the convention. 6AJZ uses 80 meter fone. 6NX celebrated the nine

NORTHWESTERN DIVISION

I SAHO—SCM. K. S. Norquest, ex7OB—The prospects for a good winter season are excellent. Several stations are waiting for licenses. 7ABB and 7GC are new this month. 7GW is experimenting with R. F. feed lines and new rectifier tubes. 7FP was away last month to the ROTC summer camp so does not report much activity. 1AT has his 500 watt transmitter in a crystal control set. 1IAK and 1GET is being reported in South Africa. 1HC and 1ACB are breaking in. 1BU is an Official Observer. 1UBU will be on as soon as Bob Wasley returns from his Barrow. 1AGD was high traffic man for the month. Traffic: 1WQ 40, 7RL 20, 7TX 8, 7VL 5, 1AF 4, 1MP 2, TP 2.

Traffic: 7WQ 8.

WASHINGTON—SCM. Otto Johnson—A majority of the gang are working thru the summer, and will be back with a bang in the fall. The stay at homes are having trouble with hot wx and Ya (that

QST FOR SEPTEMBER, 1926
SOUTHERN SECTION—SCM, L. E. Smith, 6BUR

—Dist. 1—Activity is not what it should be here. Perhaps winter will bring more action. 6SB is experimenting with soup rectifiers. 6AOY now uses 500 watts—some jolt! 6BQ keeps schedules with five stations. 6SB, 60P, 6CNK, and 6LH promise action sooner. MB promises to 1 KW in a few weeks—WOW! Dist. 2—Activity here is sure top-notch. Great work, fellows—keep it up, you are leading them all! 6BSV has been mighty busy but still has a good traffic load. 6J is a new White River ORS, is QTH—off at Alaskan regularly. Another new ORS, 6CLK works Java. Pl. Japan etc. on 7.5 watts consistently. 6JRl spent most of the month in the mountains. In June he was a 203 A on 40 meters—4RN is now at 1CU but 6BQF and 6BRY are running his set. 6BBQ is a new Army Amateur station. 6BUX attended the CIC, 6BTV has a 513Q antenna. 6CMC has a schedule with Alaskan NX. Our YL, 6BXA is on regularly now. 6BMT holds his schedule with pS6D. 6BRF works schedule with 6BBQ, 6RFW and 6BUC. 6BSO is crazy over Hertz antenna now. A new fifty is making 6DAJ happy. 6CAE has been operating 6CGW working the Yacht Pointe network—schedule with KGBF. 6DDO wrote a fine article on ham radio for the Los Angeles Times. Fine work! 6BGX leads as usual—handling most of his traffic with PL. He also had charge of our So. Section ham picnic. 6BRF pounds out as usual. 6DHG has a schedule with 6BAC—good dope! 6CGH reports a schedule with a YL—not radio. Hi! 6DSF is doing test work for the air mail. He wants help from San Francisco. 6NPW worked a new Jap. 6NP has moved to Los Angeles. 6DWC gets good results from 6AKY. He keeps schedule with portable 6XRR. KY now runs 800 watts self-rectified 500 cycle. 6AE was at CMTC. 6CDY spent his time on antennas this month. The 20 meter sigs of 6BHD reached a new high. 6KJF worked schedule with 6BUC. His new 40 meter set works with a Hertz antenna on 15 and 10. 6CTN is building separate sets for 40 and 80. 6HFI tried 80 but goes back to 40. 6DAH has a set on KGBF going to Alaskan. Everything works smooth now says 6DAl. 6HIW works schedule with KGBF. 6BGC does good DX. 6DDO does fine DX and good traffic work too. 6CTQ is back in the U. S. band. Guess he was scared of the World-Horn.

Dist. 3—Activity is on the increase here. Things should be strong by fall. 6ABJ is putting Santa Barbara back on the map. They handled traffic with a boy's summer camp on Santa Cruz Island. 6BVM sports a new 7.5 watt. 6ALR improves every month. 6ANZ and 6HAV spent most of the month in Huntington Beach. 6AVY is a new Army station. Arizona—Summer is hard activity on this hot state but winter will make up for it. 6ANQ is always ready to do his best when good work comes. 6BGJ is also settling ready for winter. The rest of the bunch are off for the summer.

Traffic:

6GJX 56, 6GQ 144, 6BBQ 28, 6KY 166, 6BGJ 158, 6CMQ 146, 6BDY 101, 6DQD 94, 6DTM 87, 6NP 79, 6BXC 75, 6BHI 67, 6CQA 66, 6BBV 59, 6ABR 56, 6CLK 51, 6VIW 45, 6DS 43, 6BD 39, 6BN 34, 6CST 32, 6GW 16, 6BUC 6, 6AXK 14, 6CTN 14, 6HII 11, 6DAJ 11, 6ANQ 7, 6AVY 7, 6GKX 6, 6BGC 5, 6MB 6, 6BAY 5, 6CAE 5, 6ASV 5, 6NW 1.

HAWAII—SCM, K. A. Cantin, 6TQ—The Honolulu Tower was September and runs for one week. 6BUJ will have the station at the Fair to take traffic filed by visitors. Mainland stations should stand by for quick delivery. A man's birthday party can be arranged. Hi-6AFF is back on the air with his "traffic constructed" 250 watt set. 6AFF is out to handle traffic. 6ANW, the Luke Field Radio Club is handling traffic actively having a schedule with 6BVC. So. Africa reports sign R4. Honolulu hopes to send a representative to the Pacific Division Convention at San Jose Oct. 15-17.

Traffic: 6TQ 17.

Section 5—SCM, St. Clair Adams. 6BAF—There are five active stations on the air here. Some of the BCL's are Eureka and we have over 80 that they will all have stations soon. 6BAF is looking for more active brass pounders to qualify for ORS appointment.


NEVADA—SCM, C. B. Newcombe, 6UO—6AJP is working on a summer job at Chilcoot, Calif. He is saving his money for tubes for winter DX. 6Z0 has moved to Reardon where he has a new pole and a good station. 6CRV is a new station but an old time telegrapher. 6ATN is now on at Fallon but does not use a schedule at present. It is struggling with the code and gaining speed daily. Swartz at Elko is having trouble getting self-rectifying chokes to perk. He has been assigned the call 6AZK.

Traffic: 6UO 17.

NORTH CAROLINA—SCM, R. S. Morris, 4JR—4RY handled messages from WXP at Balboa, C. Z. 4TS has been at Camp Glenn with the Signal Corps. 4RX has been turning his brain at a little DX—p.s.f. 4RW and 4RF are off the air. 4RK has been on very little due to YL, work, and hot weather. 4JR is going to rebuild. 4ML is getting out better with a new plate transformer. 4NH gave the crystal sets at 4XE and 4BR the once over while on a business trip to Florida recently.

Traffic: 4RY 51, 4JR 42, 4ML 40, 4TS 18, 4RX 15, 4RF 7.

ROANOKE DIVISION

Traffic: 6BUC 196, 6AXW 178, 6BDL 140, 6TQ 56, 6OA 47, 6CFN 45, 6AJL 32, 6ASR 29, 6NL 9, 6DCU 6, 6CST 3, 6HSU 2.

TRAFFIC

3HG IS A DENTIST. HE FILLS TEETH BY DAY AND SELLS THE Ether AT NIGHT. (BALTIMORE)
very little doing with practically no QSO. 3CKL seems to be able to connect with the Z stations most any time.

Traffic: 38MM 22, 3RL 13, 3BSG 12. 3CKL 10, 3CA 9.

WEST VIRGINIA—SCM C. C. Hoffman, 3BSU—Dewitt has a very active group of Pi Alpha Tau Fraternity. Members are 3ASE, 3BSU-3QY, 3CDV and 3DOH. 3CDV worked b, zt, f, g, fm. eh. 3BSU worked Europe. He is a member of the Virginia Amateur Wireless Club. 3DOH is working 10 watts and gets out some signals 100 miles away. 3FDL and 3SBD are new hams. 3C8K does good work on low power. 3A9P again has a good message record. 3A9I is a new one. 3AMD has a 1 kw. Neumann tube. 3BNF and 3BHG are going to Detroit for exams. 3CAY is in Charleston, temporarily. 3BHG built a MO using two UX210s and improved 3BGX. 3BHG is recovering from an appendicitis operation. 3AWW and 3CVR have test schedules. 3CVR and 3ACZ built new tube sets. A-A schedules now handled from Huntington control station, by 3SV absence of 3AMD.

Traffic: 3A9P 143, 3C8K 66, 3BSU 58, 3CDV 36, 3AMD 17, 3BHG 10, 3BNF 6, 3AWW 2, 3AUL 2, 3ACZ 1.

ROCKY MOUNTAIN DIVISION

COLORADO—SCM, C. R. Siedman, 9CAA—9ASJN lends this section for traffic this month and many of them are originated. 9EAM has been too busy with his filling station to get much thru. 9DKM has a new rate time now: teaching YLs to cuss in code. He says he is doing good. 9GQY has his wallapop on 40 and is stepping right along. 9CAW cut off his antenna 30 feet and now is working all over the world. 9QL is still trying to get the crystal-controlled phone going. 9LQ went on a trip last month and saw a number of hams. He says he is going back to the Hartley circuit. 9CAA is experimenting with no morse, but says he thinks he will have the big flat top hack this winter and be on 80 meters again.

9DV made some good work before going to the Citizen's Military Training Camp on his vacation. 9ASJ got transferred to a different office in the city by the company he works for and was so overjoyed he sent home and put 15 messages thru right off the bat.

Traffic: 9EAM 58, 9DVL 50, 9CQY 46, 9CAW 35, 9DGQ 6, 9CAG 29, 9DOK 20, 9CAE 20, 9OO 17, 9AOI 15, 9EAM 2, 9EAA 2.

UTAH—SCM, Art Johnson, 6ST—6RV appears to be the most consistent station in this Section, although his power is only five watts. This station made a 942 miles schedule with 6IDL in Honolulu on Monday, Wednesday and Friday nights at 10:30 pm Mountain Time. Practically all of our other stations were away from the vacation and business trips and the result is very little traffic handled. On July 12th the SCM had the pleasure of visiting Rocky Mt. Director Segal in Denver and discussing the League situation in this territory. We hope that he and Mr. Hebert will be able to pay us a visit this fall.

Traffic: 6SV 80, 6FM 11, 6SI 7, 6CVS 4, 6BUV 3.

SOUTHEASTERN DIVISION

ALABAMA—SCM, W. D. Trum, 5AJP—Now is the time for all good men to come to the aid of their country. We are getting our new methods in shape now and we want to show the rest of the sections how we did it. The SCM wants each and every honest-to-goodness ham in the State to come forth each month with a good illustrated report to him. Let's get some of our stations in 5AML and show them to the others who want models to go by. HI1 5QL is the leading man of the southern portion. 5AJP has just returned from a trip across the ocean and tells the fellows "there's no place like home". 5PF has gone to Annapolis, 5AR reports ND but promises and understands that the real DXers are making contact in USNRF class V-3 as Swede 2nd and radcom. 5LC and 5QK just plain forgot to let us know anything about themselves. 5ADA has been traveling around this month. 5ATP is getting the Aussies and Zedders anything anytime he wants 'em. It is with regret that 5ATP will soon leave us to enter upon his college career at Georgia Tech. He has made many friends abroad. 5AJP has been absent a great deal while building his station and working for the Community Broadcast Station of Montgomery. Auburn has let out for the summer and 5WI and 5DI are the old reliables at doing stick-up things for our state. 5WI has the old pure DC shrill that pierces most any ham's set. 5DI had hard luck when he broke one of his tubes he was using in the self-rect. set but is now working on another with 1200 volts on the plate. 5ANE and 5LJU are working with rifles and getting out good. 5DJ and 5AI are two new hams that are touring Florida on vacation. 5AWF is getting his set into better shape for excellent DX. 5AX can be found on the air most of the time when he's not around, he slips in and does his DX stuff. 5APS has at last secured his most looked-forward-to pure DC note and was tickled pink when he got a favorable report on it. 5AHU and 5AGA are DXing for paralyzed tubes and bump rectifiers and are working at 5YB when the opportunity arises.

Traffic: 5DL 158, 5YR 42, 5ADA 35, 5AJP 23, 5AX 21, 5DI 19, 5APF 19, 5TV 12, 5APW 12.

FLORIDA—SCM, W. F. Grozgan, 4GY—Things are going great in Florida now. 4TM was QSO NZ and took a message for WNP. The Radio Twins, 4BL, are on vacation. 40B is a new OBS and will be on the air. 4DD is stepping out with a new tube and handled traffic with England. PB, QM 4VS is a hard worker and is the new FM. Let's help him get a traffic route going. When a message comes on, gang, show some action! 4HJX burned out all his receiving tubes. 4XY has hard luck with tubes.

Traffic: 40B 80, 4XZ 48, 4VS 40, 4HX 25, 4TK 23, 4TR 20, 4DD 19, 4QY 17, 4KJ 9, 4HY 7, 4TV 5.

SOUTH CAROLINA—SCM, A. M. Dupre, Jr., 4RR—In spite of the fact that QRN hasn't been the greatest of the year, the traffic totals for the average station showed an increase. Early evening DX was not as good as for a long time. 4AMD is doing fine on both traffic and DX, doing fine work in each. Among his messages was one from WXF to NAA which he handled via NAV. The traffic handled in August, 4RT, so he's experimenting with that. 4AAM QSR'd 29 messages in 12 hours. 4RR is changing antennas, rectifiers and filters about, trying to get a steady wave.

Traffic: 4MV 122, 4RR 48, 4AAM 20, 4IT 7.

WEST GULF DIVISION

SOUTHERN CALIFORNIA—SCM, E. A. Sahm, 5YK—Two new Official Relay Stations have been added to this section this month.—G. N. Witting, 5ME of San Antonio and E. W. Wilkens, 5AL of Waxahachie who is your SCM. Report to him hereafter.

Traffic: 5HY 25, 5MS 21, 5EW 12.

OKLAHOMA—SCM, K. M. Ehret, 5APG—5x5AGN and 5AAV report that their nine foot stripped-down transmitter has rolled up a DX record of 850 miles in 11 hours and are keeping schedules with the YLs every chance they get. 5AAM's new station in Oklahoma City. 5SW handled one man from France and one for Honolulu. 5ATK operates under the call of 5AGN now and is getting out good with a straight set. 5AGN has built a very nice receiver and transmitter, a master oscillator. 5QL has been knocking hunks out of the ether and is QSO South Africa and all Europe. He is now in the knock-down and drag-out trying to key his set without a regular cricket chorus. 5ANL is building a shack as fast as possible. 5AX is building in anticipation of a visit here. 5ADO and 5ASK have been on vacation. 5ATA reports his gang is getting together for the fall offensive. 5AFG is home on a month leave from WGY.
5AVF has his master oscillator going and in the heat of the excitement of working 2DXA for an hour, almost forgot to report. Looks like 5TW has a good chance for a second leg on the BP trophy as his report contains of nothing but figures and high ones at that. It is not our policy to advertise the cancellation of ORS appointment but in the heat of good operating and to be expecting some same and in the appointments worth while, we will say that we have cancelled eleven.

Traffic: 5TW 53S, 5AGN 12, 5SW 10, 5APG 2.

QUEBEC DIVISION

Quebec—SCM pro tem, Alex Reid, 3BE—U2CHK and 2BE have a portable set at Ste. Jovite, 100 miles north of Montreal and find radio conditions wonderful in the mountains, July 12. 1V7L0, 2DNQ, 4DQ, 5GF, 5GR and 5CF operated from Cape Breton. New stations are reported from Liverpool, N. S. and one new one is in the course of construction in Yarmouth. The Halifax gang is still giving out our weekly QST on Wednesday nights.

PRINCE EDWARD ISLAND—SCM, W. A. Hyndman, 1MB—2BH holds completely blanked out radio this month but lives well in August.

Traffic: 1AI I07, 1AM 56, 1AM 16, 1AN 7, 1AQ 3.

ONTARIO DIVISION

ONTARIO—SCM pro tem, W. Y. Sloan, 9JH—The publicity gang keep things humming. Niagara Falls, Ottawa and Toronto papers carry ham news reports and service assistance information. See or write the Canadian News Manager, c3CK, E. C. Thompson, better known to all as c3CE, has been notified to follow in place of 6Y7B, W1AN on working DX. He is going strong with two twinnies. 1AI can be heard working the world. 1DJ and 1DD are rebuilding. 1DE is most active. 1AW is on with a low power set. New ham 1DE, operated by S. G. Crate, Cape Breton is on 31 meter set and 3GT was worked using 80 meter set. New stations are reported from Liverpool, N. S. and one new one is in the course of construction in Yarmouth. The Halifax gang is still giving out our weekly QST on Wednesday nights.

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CANADA

MARITIME DIVISION

NEWFOUNDLAND—SCM, Loyal Reid, 8AR—8AV worked c1ED and 1, 2, 8, 9's using 201A with 225 volts. 8AZS at Battle Harbour, Labrador, is on 41.5 meters with a 250. He has a regularly scheduled station operated by 3FJ and is enjoying the summer weather. 8B2, 3BB, 8C, 8RG will soon be on the air to stay. 8W6 is back again and trying a new receiver. NPEL has eight active stations and sigs are rolling in FB.

NEW BRUNSWICK—SCM, T. B. Lacey, 1EB—Most of the N. B. stations are on and active for the time of year. 1AI made the Brassound Founders. FB3 Traffic has been coming this way and all stations report a good number of messages. 1AI’s H tube is going and 1AM is experimenting on 20 and getting good reports. 1AI is holding ten regular schedules and scooping all the traffic coming NB. A few have just the highest DX station in the Maritimes. BH3 is on 31 meter set and so far, one waverueter is a Halal. Nice DX too as traffic in good shape. 1AM is experimenting on 20 and getting good reports. 1AI’s FR is using R bats. 1ARQ is on with 201A’s and is a 1DE working fine. 1AM is on with 1DR, 4GT and 4AO in the evenings, and a "fifty" after midnight. 1ARQ is on with 201A’s and B batteries.

Traffic: 1AI 107, 1AK 56, 1AM 16, 1AN 7, 1AQ 3.

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