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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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T
HE Washington Convention of 1927, embodying the results of the recent international radiotelegraph conference, will offer many grave problems for amateur radio when it becomes effective the first of next year. We have said that amateur radio can find a way to get along satisfactorily under this convention and that in fact the necessity of hitching up our jeans and tackling some really difficult jobs is going to act as a spur to new effort which will put a tremendous zest into the old game. It is now time we set about the solution of some of these problems. Admittedly it won’t be possible to foresee all of them. Some of them can’t be planned for until they crop up next year. But many of them can be foreseen and these we should plan for now, perfecting our arrangements during the balance of 1928 so that we can carry on smoothly next year under the new regulations.

The problems are introduced by the operating restrictions of the new convention: the narrowing of amateur bands and the fact that the amateurs of every country will have to operate in the same bands. The difficulties are of two major sorts: technical problems and operating problems. The technical problems are those brought about by the necessity for many thousands of stations operating in the same restricted bands, making it essential that we achieve an altogether different order of stability of frequency, sharpness of wave, goodness of note and precision of adjustment in our transmitters than we have had in the past; an altogether different order of accuracy of reading in our frequency-meters; an altogether different order of selectivity and precision of control in our receivers. These are jobs which should be whipped during 1928, so that we will be ready for the new conditions when they come. They are jobs for QST, and QST is setting about their solution, of which we shall have more to say soon.

The difficulties of the other sort are those that we shall still have even after we have vastly improved transmitters and receivers: operating difficulties brought about by the fact that we amateurs of every country are put in the same bands. It becomes necessary to think about the purposes for which we should use our various bands and how we may introduce a certain measure of cooperation in their use so as to insure satisfactory communication. The problems of this latter class came in for a lot of heavy thinking at the recent meeting of our A. R. R. L. Board of Directors and finally resulted in the adoption of some policies. These are here set forth for the dual purpose of informing the A. R. R. L. membership and of seeking the cooperation of the amateurs of all the world.

Long-distance international communication is almost the greatest single amateur interest. It is not the most vital amateur activity but it is very important. It must be preserved. With the amateurs of every country assigned the same wavebands, it is apparent that cooperation amongst ourselves is imperative if we are to have international contact. The A. R. R. L. Board is convinced that a friendly division of the international amateur waves is desirable in the interests of international communication and wishes to propose a plan to that end, a plan under which the amateurs of each continent agree, even if assigned the full width of the international bands by their governments, to confine their transmissions to a certain part of the bands and to stay clear of other parts that are used for transmission from other continents. If this is done we shall have international QSO if we can achieve enough selectivity to work our man through the interference of other stations of his continent. If it is not done, international DX will be just about hopeless through the QRM of all the world, including our own continent. Amateurs are human; their observance of any plan will be imperfect, either from technical inability or normal human frailty; but it is our one chance to preserve DX, the one way out, and we must try it. There is another very important angle. Many of the less liberally disposed governments may not assign their amateurs the full width of the international bands but only a fraction thereof. These small assignments, left to the vagaries of governments, could easily be so unrelated as to produce a condition of mutual interference under which the amateurs of two important countries would never be able to achieve communication. On the other hand, with a definite plan to work towards the amateur societies of the world could ask their governments for assignments that at least included the frequencies sug-
suggested for that country in an international cooperative scheme. Hence the added importance of developing a plan now, so that there may be time to take care of this important matter.

The international amateur bands are the 40-meter band and the 20-meter band. DX of course is possible on the 80-meter band too, but that will be needed for domestic communication and the A. R. R. L. proposes the plan of division only for the two shorter-wave bands. It adopts the territorial subdivision suggested by the I. A. R. U.: Europe, North America, and “the rest of the world”, and suggests that in both the 40-meter and 20-meter bands the amateurs of North America work in the long-wave half of the band, the amateurs of Europe in the bottom quarter, and the amateurs of the rest of the world in the intermediate quarter of the band. Let us tabulate this and put it in terms of frequency:

<table>
<thead>
<tr>
<th>40-meter band</th>
<th>20-meter band</th>
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<td>7,000-7,150 kc.</td>
<td>North America 14,000-14,200 kc.</td>
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<tr>
<td>7,150-7,225 kc.</td>
<td>Rest of world except Europe 14,200-14,300 kc.</td>
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<tr>
<td>7,225-7,300 kc.</td>
<td>Europe 14,300-14,400 kc.</td>
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This is not a perfect plan but it is the best that it has been possible to devise. It does offer hope, and there is no hope without a plan. More elaborate subdivision seems impracticable in an initial plan; practice will indicate the desirability and practicability of modifications that will meet further need. It is thought that this plan does meet the major needs of the situation. The amateurs of North America are sufficiently interested in having good international contact to propose to stay out of half of the available frequencies which certainly should be accepted as fair enough by the amateurs of the other countries when it is realized that North America has three times as many amateurs as the rest of the world combined. The League proposes this plan for the consideration of amateurs in other countries and offers, if it is acceptable, to recommend to American amateurs that they keep their transmitters clear of the waves used by other nations, so that international QSO may be possible.

The League recommends to the amateurs of the world that the 80-meter band be considered as primarily a national and intra-continent band, for what might be called domestic communication, and that it not be the subject of an international agreement. It recommends that the 40-meter and 20-meter bands be considered as primarily for long-distance international work, and that, because of the great congestion they will suffer, they be used for intra-continent work only on distances of over 1,500 miles. The League does not suggest that any of these proposals be incorporated in law or regulation anywhere, but that they be adopted purely as a basis for organized cooperation. In sponsoring this plan the League feels that some friendliness agreements on the international waves are essential and it believes that the suggestions herein related are best calculated to produce the desired results. By this article and by letters which are being written to national amateur societies it lays this plan before the amateurs of the world as the best and fairest plan it is able to devise, earnestly urging its acceptance, and awaiting and soliciting comment and reaction from amateurs everywhere.

K. B. W.

Official Wavelength Stations

The Official Wavelength System furnishes a service cooperative with, but differing from that of the Standard Frequency Stations 9XL and 1XM, which are also operated in accordance with plans made with the O.W.L.S. Committee. Contact with the O.W.L.S. is through Mr. D. C. Wallace, 6AM, who is also chairman of the committee. Mr. Wallace is continuing contact with national amateur societies it lays this plan before the amateurs of the world as the best and fairest plan it is able to devise, earnestly urging its acceptance, and awaiting and soliciting comment and reaction from amateurs everywhere.

K. B. W.

The list is as follows:

1AAC, 1AVW, 1AWW, 1BHWW, 1BZQ, 1CCW, 1CK, 1KP, 1ZL, 1ZO, 2CLA, 2DS, 2MU, 2SZ, 2XI, 3APV, 3BE, 3XW, 4LK, 5AGN, 5AKN, 5BW, 5MN, 5OX, 5PH, 5SP, 5XBH, 5ZAV, 6AKW, 6AM, 6BB, 6BCP, 6BGW, 6BGM, 6BMW, 6BQB, 6CAE, 6CMQ, 6CVO, 6DJ, 6LQ, 6XZ, 6TY, 6TS, 6XAG, 6XAO, 6ZC, 6ZHD, 6ZV, 7AG, 7BE, 7BU, 7QG, 7NX, 7QK, 7XF, 7ZX, 8AA, 8APZ, 8BAU, 8BZT, 8E8Q, 8GU, 8GZ, 8XC, 8ZG, 9AXQ, 9BCH, 9BGM, 9BMR, 9CPM, 9CXU, 9DYN, 9EFO, 9EGU, 9ELB, 9FF, 9IG, nc1AE, nc2BE, nc3C0, nc3NI, nc3FC, nc4BT, nc4AI, eg20D, eg2SE, Ireland 5NJ, 0A2CM and 0Z2AC. Crystal Controlled O.W.L.S.; NKF, 1AXA, 2B0, 2BRB, 2EF, 2WC, 4BY, 4XE, 6AOI, 6DLL, 8CM, 8DADJ, 9AUG, 9BE, 9EZ-NRRL, 9Z9A, eg2AN, eg5LF and 0A5BG. Standard Frequency Stations: 1XM and 9XL.
Some Investigations of Short Waves at Nijni-Novgorod

By Władysław W. Grzybowski

EARLY in 1925 a series of experiments on short-wave propagation was begun with the main objective of clearing up the best ratio between fundamental and working waves of an aerial and in the meantime to try out a transmitter using a large power such as 25-50 kilowatts.

The theoretical diagram (Fig. 1) shows that the oscillator consisted of two 500-watt valves type G. O. and a 25-kilowatt amplifier valve especially designed for the experiments. The circuit is symmetrical Hartley. Grid leak R₁ is connected directly to the center tap on the coil L₁ and consists of leak only without shunting capacity. Condenser C₁ compensates some asymmetry of the oscillating circuit L₁-C₁ due to both plates of C₁ being not in the same capacitative coupling with the earth. The amplifier is coupled to the points A and B of the coil L₂. R₂ is the grid leak of the amplifier tube. The anode potential of the latter comes from a mercury arc rectifier giving 7000 volts. There are resistors of 100, 300 and 400 ohms in series with the plate supply.

FIG. 1. DIAGRAM OF THE FIRST TEST TRANSMITTER AT NIJNI-NOVGOROD

Two 500-watt type G. O. oscillators working push-pull in a symmetrical Hartley circuit feed the single 25-kilowatt amplifier which is directly coupled to the antenna. Resistances in the 7000-volt plate supply of the amplifier regulate the power output.

Usually the circuit worked with the 100-ohm resistor. For keying, the Klifden's relay (K) was employed in the plate lead of the power amplifier.

A single vertical wire 2\(\frac{1}{2}\) mm. in diameter strung between two poles 95 meters high served as an aerial and with the wavelength 83 meters the Ro-to-R ratio was 4.58; at 102 m\(\text{m} \) Ro/R=3.73, and with antenna shortened a little so as to be 78 meters long and \(\lambda=104 \text{ M} \) it was found that Ro/R=3.00.

The antenna current was about 11 amperes and it was noticed that with antenna current larger the wave became unsteady.

The intermediate filter circuit consists of condensers C₂ and C₃ and the E-F part of the antenna coil.

The experiments showed that signals were very steady, easy to read, very strong and covered the whole globe. For instance, New Foundland reported signals to be much stronger than those of nearby American stations and San Juan (Porto Rico) reported signals such as to "deaden" the locals.

The experiments proved that the power of the transmitter was more than sufficient to make consistent American-Europe communication possible although it was not possible at that time to point out the best ratio of R/Ro at different distances and with different angles of radiation. At the same time it was obvious that in order to obtain regular contact with a distant point over the whole 24 hours of the day the

*WXX c/o State Bank, Niin-Novgorod, U. S. S. R.
note of the transmitter must be improved and the wave must be something shorter on the order of 20-30 meters. Finally the mercury arc rectifier must be changed for a valve rectifier.

The channel between Nijni-Novgorod and Tashkent (the latter in Turkestan) has very heavy traffic and an investigation of the short-wave communication between these points became necessary. Therefore from July 20th to the 23rd of September, 1925, a second series of research work was carried out.

The transmitter was hurriedly assembled, not with a separate oscillator, but using only one copper tube. Fig. 2 shows that the oscillating circuit consists of the internal capacity (plate-grid) and the inductance of two parallel copper rods with a bridge for tuning. The wavelength range was 20.5-33 meters. Several aerials were tested: (A), vertical wire 2.5 mm. diameter and (A₁) 100 meters, (A₂) 25.6 meters, and (A₃) 5.1 meters high; (B), 3 stranded wires 140 meters long—aerial of a broadcast station—, (C), An aerial with upper radiation.

Fig. 3 shows antenna C. The feeder consists of 2 Lecher wires, an odd number of the quarter wavelengths high and one wire projects ¼-wavelength higher than the other. This projecting portion serves as a radiator.

It was noted that 20-meter signals were heard better during the day than night, 25 meters equally well during the day and night and 30 meters better during the night time. The strength of QRN diminished with shorter waves. Higher aerials proved better than lower, e.g., the aerial A₃ (5.1 meters high) was the worst. The vertical aerial A₁ (100 meters high) and the broadcast horizontal (140 meters long) were identical, and the antenna C with upper radiation was decidedly the best.

After this, some experiments were made to establish contacts between Nijni-Novgorod, Tomsk, Irkutsk (Siberia) and Tashkent. The photo B shows a 150-watt transmitter for an expedition to Aldan. One of this type was also installed at the gold field Nezametny.

In October, 1925, all primary arrangements of "radio field" (simply an S. W. station near Nijni-Novgorod) were at the end and a third series of investigations was begun.

Two transmitters were installed for the waves 23 and 40 meters using the circuit...
as shown in Fig. 4. Each transmitter consisted of a symmetrical oscillator with two 500-watt tubes (type G.O.) and of an amplifier with two tubes of the same type. The power of the oscillator is a little more than necessary; this is to make the wave more stable. Keying is done by detuning the primary circuit. To facilitate the reception of the emitted signals to broaden tuning somewhat and to smooth out the possible changes of the wave, a frequency "variator" is employed. It consists of a cogged wheel rotating between two stationary plates, see photo C and Fig. 4.

The antenna is coupled directly to the intermediate (tuned plate) circuit excited by the amplifier. Photo C shows the general view of the transmitter. The base of the transmitter does not touch the floor but is supported by iron tubes driven down directly into the ground. The construction of such a primitive "private base" for the transmitter is quite necessary for gaining stability. In the photograph the frequency "variator" is seen in the foreground. The tubes are air-cooled by means of a ventilator. Ordinary incandescent bulbs are inserted in the antenna lead-in as current indicators.

For the 23-meter wave a directional phased antenna is generally used. It con-

![Diagram of a transmitter setup]

C. ONE OF THE TWO TRANSMITTERS INSTALLED IN DUPLEX AT "RADIO FIELD", NINI-NOVGOROD FOR 23-AND-40-METER SERVICE TO TASHKENT

The diagram is shown in Fig. 4. Prominent in the foreground is the capacity chopper.

![Diagram of a "Synphase" antenna]

FIG. 5. THE "SYNPASE" ANTENNA USED WITH THE TRANSMITTER OF FIG. 4 AT 23 METERS

The vertical parts are each 3/2 wavelength or 11.6 meters long and are fed from the Lecher wires which in turn are fed through a single pair of feeders from the station. The system is so phased that it radiates "broadside" that is to say toward or from the reader as he looks at the page. It is made unidirectional by putting behind it a similar system (without feeders) to act as a reflector and the resulting beam is inclined 5° upward by leaning the whole system backward by that angle.
sists of 5 vertical wires each \( \frac{1}{2} \lambda \) long = 11.5 meters. Such an antenna is shown in Fig. 5. The radiating system is here connected to two systems of Lecher wires in the absence of feeders. On this wave an alternate-phase antenna of 8 vertical wires has been tried also. It is shown in Fig. 6. At the same time the antenna with upper

potential nodes. From the middle point of the lower system 2 feeder wires are carried down to the station as shown in Fig.

FIG. 6. ANOTHER ANTENNA SYSTEM USED WITH THE TRANSMITTER OF FIG. 4 AT 23 METERS

In this case 8 vertical wires are used, each wire operating in phase opposition to its neighbor.

5. The plane of the antenna is at 5° angle to the vertical line (Zenith) so that the main beam has an elevation above the horizon of 5°. The system is used with a reflector which is exactly similar except for the radiation as before mentioned (See Fig. 2) has been tried out.

The comparison of these 3 antennas has shown that the best is the synphase antenna (Fig. 5) (R8-9). Noticeably worse is alternate phase antenna (Fig. 6) (R6-7 and little fading) while the worst antenna is the one of Fig. 3 with upper radiation (R5-6 pronounced fading-effect). The result is that the “synphase” antenna (Fig. 5) gave the best audibility and the smallest fading effect and also has very sharp directional properties.

It is interesting that when the antenna was worked while turned 8 degrees to the south from the steepest portion of the curve of radiation (which is normally pointing out to Tashkent) the fading effect became decidedly noticeable in the morning and evening.

The fading-effect that comes out during the work of antennas of alternate phase (Fig. 6) and upper radiation (Fig. 3) may be explained by the fact that these antennas give less power than the synphase one and fading-effect becomes more pronounced with less power.

For the work on 40 meters another sort of antenna with upper radiation is used.
It is shown in Fig 7. It consists of cage, \( \frac{1}{2} \) wavelength long and one meter in diameter. The lead-in wire is 2\( \frac{1}{2} \) mm. in diameter. The exclusive radiation from the upper part (cage) of the antenna is

![Diagram of antenna](image)

**Fig. 7. The 10-Meter Vertical Antenna Used With the Transmitter of Fig. 4.**

Radiation is chiefly from the upper half wave portion as is explained in the text, the lower portion serving mainly as a feeder.

Such a type of upper radiation antenna gives results equal to the type previously described and yet the wave is smoother and steadier. Such antennas are simple in construction, give excellent results and are greatly used by amateurs.

The main objective in conducting these experiments was to clear up the best suit-

Due to the current in the node of cage being larger than in the lead-in according to ratio \( \frac{C_1}{C_2} \) where \( C_1 \) is the capacity of cage in a unit of length and \( C_2 \) is that of lead-in. In this case \( \frac{C_1}{C_2} = 3 \).

D. THE TRANSMITTER FOR TASHKENT

BEFORE INSTALLATION

It is of the same general type as the two at Nijni-Novgorod but of a later and more advanced form.

The experiments allowed to conclude that signals on 23 meters are heard better dur-

![Graph](image)

**Fig. 8. Fading Out of Signals in Tashkent in Nov. 1925 at a Wavelength of 23 Meters**

Sunset in Tashkent at 12:00 G. C. T. Sunset in Nijni-Novgorod at 13:00 G. C. T.

![Graph](image)

**Fig. 9. Reappearance of Signals in Tashkent in March, 1926, at 40 Meters**


Curves in Fig. 8 and Fig. 9 show characteristic examples. The signal sometimes
fades out entirely, but frequently the audibility is changed more or less.

Diagrams in Fig. 10 and 11 allow one to compare the periods of audibility corresponding to the sunset and sunrise in Nijni-Novgorod and Tashkent. The shaded areas show good audibility. The diagrams show that periods of appearing and fading out of signals are retarded with respect to sunset and sunrise. It is clear that waves of 23 and 40 meters overlap each other and that 24-hour contact between Nijni-Novgorod and Tashkent is possible. It must be noted that the time of appearing and fading out of signals does not change regularly from day to day but changes irregularly. Perhaps this is due to some meteorological disturbances. Nevertheless when one wave fades out we have good enough audibility on the other. Covering would be better without doubt if more waves in the same band could be used.

This series of experiments gave as practical results improvement of our short-wave transmitters, and of the emitted wave (which is now steady, well modulated and easy to take and to speed up). Directional work gave further improvement. A practical rule for working over the 2400 km. distance with waves of 23 and 40 meters during different times of the day and night was also found.

At the present time the experiments are being continued with the objective of clearing up the possibility of short-wave communication between Nijni-Novgorod and Siberia and the Far East (Vladivostok) and Central Asia.

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(Concluded on Page 38)
Low-Power, Flexible Crystal-Control for Four Amateur Bands

By S. P. McMinn*

WITH the narrowing of the amateur bands, and the probable increase in population density which likely will result within them; the importance of crystal control greatly increases, not only must we crowd a greater number of stations within the confines of each so-called band, but we must do so without increasing QRM either to other transmitting amateurs or to our army of BCL friends.

The expense of crystal control has been the chief reason it has not been more widely adopted, for the benefits of its bell-like signal, its sharpness of tuning, its positive and unfailing location in one and only one spot on receiving operator's dials are recommendation enough for its universal use.

Now that crystals generally are more reasonable in cost (according to friend Watts they aren't at all difficult to prepare in the home laboratory) additional interest attaches to the physical means of using them.

And that, in brief, is reason for this description of a crystal-controlled trans-

two places in each of the four amateur bands—20, 40, 80 and 160—that requires the minimum of junk, the least possible space in the shack and that is a first-rate, all around means of communication, excellent for local work and with distinct DX possibilities.

FRONT VIEW OF THE COMPLETE 20-TO-160-METER TRANSMITTER

From left to right the meters are: crystal tube tank-circuit ammeter (0-3); crystal tube plate-current milliammeter (0-100); a.c. filament voltmeter for all tubes (0-15); amplifier plate current milliammeter (0-500). The D. P. D. T. switch is for changing the two amplifier tubes from d.c. (parallel) to a.c. (back-to-back self-rectified) operation.

Hence, this newest transmitter of mine is built around a trio of 210 tubes. One is used as the oscillator and the other two as an r.f. amplifier. The beauty of the rig is that it can all be constructed of such receiving junk as may be around the shack. The condensers are ordinary receiving Cardwells, the chokes are receiving type and the plate blocking and coupling condensers are receiving type Sangamos.

So far, the rig is entirely orthodox and not at all startling. However, a degree of flexibility has been obtained that is altogether out of the ordinary.

In the first place, the crystals, four of 'em, are in plug-in mountings and thus are rapidly changed. Next, the inductances

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*2WC, also Editor, Automotive Merchandising, 97-108 Horatio St., New York City, N. Y.
also are plug-in. And finally, the two tubes in the amplifier are so arranged with a double-pole double-throw switch that they may be worked either back-to-back, self-rectified, or in parallel with d.c. supply. When anyone says "QSS" I shift to RAC by flipping a switch, or use the buzzer modulation. If they say "QRM" I put in another crystal, swing the oscillator and amplifier tuning condensers a few notches, retune the antenna and GA. Nothing to it. Furthermore, it is a very simple matter measures 24 x 10 inches. The whole transmitter fits nicely in a 7" x 24" x 10" standard cabinet.

CONSTRUCTION
Although the wiring diagrams tell about all that is necessary to know about the set, a few notes will help in building it. The inductances are wound of No. 11! bare wire on forms that once held Cardwell radio frequency chokes. They are 2 inches in diameter and were used chiefly because the form was handy and already equipped with plug-in jack tips.

The crystals are in circular Bakelite holders which are completely enclosed to exclude dirt and moisture. They never need be touched. The mounts are fitted with knife-blade type contacts which fit nicely into those parts from a small knife switch that the blade normally fits. It makes a very nice, tight, easily separable mounting.

The wiring was first done on paper, by putting all the apparatus on a sheet the size of the baseboard and drawing in the wires with pencil. After the various parts had been shifted about a bit the best arrangement for short leads, reduction of possible feedback effects, and safety was easily found. Then the wiring was done with No.

### Crystal and Oscillator Wavelength

<table>
<thead>
<tr>
<th>Wavelength</th>
<th>Antenna Radiating Wavelength</th>
<th>Meter</th>
<th>Antenna tuned to (Harmonics in Parenthesis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>amplify straight through</td>
<td>160</td>
<td>160 with ground</td>
</tr>
<tr>
<td>84.15</td>
<td>amplify straight through</td>
<td>84.15</td>
<td>84.15 with C. P.</td>
</tr>
<tr>
<td>77.8</td>
<td>amplify straight through</td>
<td>77.8</td>
<td>77.8 with C. P.</td>
</tr>
<tr>
<td>77.8</td>
<td>double frequency in amplifier</td>
<td>42.07</td>
<td>42.07 with C. P. (2nd) 126.2 (3rd) with ground.</td>
</tr>
<tr>
<td>40.0</td>
<td>amplify straight through</td>
<td>40.0</td>
<td>40.0 with C. P. (2nd) 126.2 (3rd) with ground.</td>
</tr>
<tr>
<td>77.8</td>
<td>quadruple in amplifier</td>
<td>19.45</td>
<td>19.45 with C. P. (4th).</td>
</tr>
<tr>
<td>77.8</td>
<td>quadruple in amplifier</td>
<td>20.00</td>
<td>20.00 with C. P. or ground (5th).</td>
</tr>
<tr>
<td>40.0</td>
<td>double in amplifier</td>
<td>20.00</td>
<td>20.00 with C. P. or ground (5th).</td>
</tr>
</tbody>
</table>

### FIG. 3 CHART TO SHOW METHOD OF AMPLIFICATION FOR THE 9 DIFFERENT WAVELENGTHS-ALL CRYSTAL CONTROLLED AND ALL WITH THE SAME ANTENNA

to put Heising modulation on the amplifier and use phone, of which more later. The whole rig is built behind a 7" x 24" bakelite panel which holds all the meters, the tuning condensers and the switch for changing from r.a.c. to d.c. on the amplifier. The compactness of the affair may be judged by the fact that the baseboard 12 enameled stuff which is easy to work but stiff enough to stay put.

### THE CRYSTALS
There are two crystals in the 80-meter band, one oscillating at 77.8 and the other at 84.15; there is one in the 40-meter band; and one in the 150-190 band. Thus, either
of the 80-meter crystals can be used in that band and also in the 40-meter band by doubling frequency; by quadrupling frequency, the 80-meter crystals also furnish harmonics for the PA to amplify in the 20-meter band. The 40-meter crystal can also have its frequency doubled in the 20-meter band and gives better output at 20 than do the 80-meter crystals. The 160-meter crystal works in its own band, of course, and also in the 80-meter band by doubling its frequency in the r.f. amplifier. No attempt has been made to use the 160-meter crystal in the 20-meter band because the output undoubtedly would be exceedingly small; besides, there is no need to do so. All of this is further explained by Fig. 3.

THE EXTRA 40-METER CRYSTAL

In the list above and in Fig. 3 (see the *) there will be noticed a 40-meter crystal. This is not strictly necessary. It is perfectly practical to quadruple frequency from 77.8 and 84.15 to 19.45 and 21.04 as shown at t in Fig. 3. This is regularly done at 2WC, especially since at 20 meters small power seems to go about as well as big power.

If you want corroboration of the fact that you can quadruple frequency in 1 stage, refer to that article by Glaser in June, 1927, QST. However, the efficiency by that method is low and it is an expedience rather than a good way to do the job. This is so because the output when quadrupling from 80 to 20 is very small.

It is therefore much better to use the 40-meter crystal or to wire in an intermediate amplifier and double frequency twice. This is not so tricky because it does away with the need for neutralizing and gives better output.

There is nothing tricky about using a 40-meter crystal except that it is wise to reduce the plate voltage a bit, say to 300, and to be very careful that the circuits are properly neutralized if amplifying at the same frequency. A 40-meter crystal is a very fragile animal and a surge or kick back that makes the thing vibrate too strongly is likely to cause edge chips. Too high voltage may puncture the thing and make it worthless. It is important, with any crystal for that matter, to use a very light top plate, a vertible featherweight. A thin dime smoothed perfectly flat is excellent. If a heavier top plate is used it imposes a physical burden on the crystal which must lift and lower the plate with each vibration and they vibrate darn fast! The result is that operation becomes unstable, the crystal is hard to start and heating results from the work the crystal must do. It is better, too, to use a top plate that leaves a generous margin of crystal all around it. This will prevent brushing between the top and bottom plates at the edges. It is not necessary ever to have the top plate completely cover the crystal, contrary to popular conception. Another popular misconception is that you have to strive by might and main not to have any more capacity in shunt with the
crystal than is absolutely necessary. Refer again to Glaser's article in which is described the use of three crystals in parallel with a switching arrangement to use either. Thus he has tripled the capacity

FIG. 4. DIAGRAM OF ONE OF THE MODULATOR SYSTEMS

This one uses a UX-112 as a leak on the amplifier tube. The heavy wires are normal set wires and the light wires are added as part of the modulator. The lead from the r.f. to the filament of the 112 must not be over 2 feet long. Try to find a truthful listener and increase the grid bias of the 112 until it starts to become fuzzy. If any of the batteries on the 112 are grounded trouble may follow. Dry cells are therefore recommended, likewise a separate C battery, though the mike may work on the 112 filament battery if the latter be not grounded. Things are simplified if the mike cord has a plug to operate a filament-control jack for the 112.

With a little more complication Heising modulation of the amplifier may be used. In this case the 112 becomes an audio amplifier, feeding a pair of 210 modulators through a resistance-capacitance-impedance coupling, which permits the same plate supply to operate the 112 and the amplifier-modulator combination. The simple system shown here has the advantage for several reasons.

in shunt without disastrous or untoward results.

As a general rule, the lower the frequency of the crystal, within limits, the higher the plate voltage may be with safety. Thus you can use 550 to 600 on a 160-meter crystal, but 400 is safe on an 80. Over at the Bell Labs. in Whippany they are using 750 v. on a 500-meter crystal through a 211-D tube, with safety. Of course the crystal is in a mounting that keeps its temperature constant, but this is unnecessary for amateur work.

THE ANTENNA

The antenna has a calculated fundamental of about 120 meters and consists of a single No. 12 enamelled sky-wire 100 feet long and a single-wire counterpoise 75 feet long. It is tuned with a single condenser large enough to reduce the fundamental for 80-meter operation; for 20 and 40, it is operated on harmonics. For 160 meters the antenna and counterpoise are tied together and worked against a water-pipe ground.

THE POWER SUPPLY

It is hardly possible to use the same plate power transformer for both oscillator and amplifier because of the poor regulation of transformer and rectifier combinations. In other words, with the key down a single transformer rectifier that would give 550 volts on the amplifier and not over 400 on the oscillator would produce well over 600 with the key up and this might easily endanger the crystal, to say nothing of putting an unnecessary strain on blocking and filter condensers. The power supply consists of a Thor­daron T210 Power Compact for the oscillator. This furnishes filament current for the 216B rectifying tube without the need for a filament rheostate. It also supplies exactly the proper voltage for the crystal tube.

The Thor 210 Power Compact uses a special transformer developed to furnish "B" power for an ordinary receiver and also 400 volts for a 210 amplifier. It also has two filament windings, one giving 75 volts without external center tap (which serves to heat the filament of the 216B type rectifier tube) and the other giving 75 volts with center tap. This second filament winding is not used because the transformer has not sufficient capacity to heat the filaments of all three 210 tubes in the transmitter. The 400-volt winding gives about 500 volts on no load through a filter consisting of two mikes ahead of a 30-henry B-eliminator type choke and two mikes behind it. Under 40-mil load the output voltage is slightly over 400, and therefore is exactly right for crystal operation.

On the amplifier a Thor­daron T-2098 furnishes plate power which is run through a Thor­daron T-2098 choke (two 30-henry chokes in series) with two mikes of condenser on each side of it. The 2098 also supplies the filament current for the 281 rectifying tubes. The filaments of the 210's are all in parallel and fed by a separate transformer. The rectifier for the amplifier plate supply is a pair of 3-year old "S" tubes.

The reason for arranging the amplifier for the use of either a.c. (which, of course, becomes r.a.c.) or d.c. is because the a.c. is a bit broader, though not enough so to be objectionable to other nearby amateurs.

Some operators complain, justly or unjustly, of excessive fading when using pure d.c. on the amplifier. In such cases it is
sometimes helpful to be able to shift to a.c., which, with the singing, bell-like d.c. oscillator behind it has a peculiar and quite distinctive note that is pleasing to the ear and easy to copy. Also, the a.c. is often of assistance in raising stations that might pass over the razor sharp pure d.c. crystal note.

The only drawback to using two tubes in the amplifier is that it is almost impossible to get a perfectly pure d.c. note. There is always present a slight ripple about 5 per cent, I should say, though everyone reports the thing pure d.c. Still it is not as perfectly pure as when using a single tube in the PA. I don't know why this is, but it probably is not important. Anyway, a little ripple helps make the tone less monotonous!

GETTING INTO OPERATION

This little baby rig is about the easiest thing imaginable to get going and properly tuned up. You first get the oscillator going and tuned for maximum tank current with minimum mils. Put about 400 volts, rectified and well filtered a.c. on the oscillator. The tank current should be about three amperes, using an 80-meter crystal, and the plate current of the oscillator should be around 40.

Then with the filaments of the amplifier tubes lighted, but the plate power left off, vary the amplifier tuning condenser until you get quite a hit of current in that tank. If you don't get any, the chances are the thing is by lucky chance nearly neutralized, but generally you will get quite a lot.

When working 'straight through' with any of the crystals it will be necessary to neutralize to prevent feed-back from the amplifier to the oscillator and to permit the amplifier to be tuned properly to the oscillator frequency. When doubling, the neutralizer may be left on, or cut out with a switch, as desired. When quadrupling, the added capacity of the neutralizing condenser is too great and the neutralizer must be cut out of the circuit.

Then vary the neutralizing condenser and the amplifier tuning condenser until you reach an adjustment of both which gives practically no current at all in the amplifier tank and no appreciable movement of the oscillator plate milliammeter when the amplifier tuning condenser is passed through the resonance point.

The adjustment of the neutralizing condenser is quite critical, but don't get discouraged. It is entirely possible to neutralize the amplifier properly and it won't work right until you do. Move that neutralizing condenser only a hair at a time!

When neutralization has been effected, hit the key and see what happens, using low voltage on the amplifier tubes, of course. Hold the key down and tune the amplifier tank for maximum current as indicated on the ammeter.

Next couple the antenna, re-tune the amplifier tank and tune the antenna to resonance. The coupling is fairly critical and will take a bit of experimenting. Every time you change the coupling you must re-tune both the antenna and the amplifier tank. When the coupling is right you will get maximum antenna current with minimum amplifier tank current—showing that the antenna is soaking up nearly all the current generated in the amplifier tank.

High amplifier tank current indicates insufficient coupling, or an antenna that will not properly tune to the working wave of the amplifier. You may have to load your antenna by using a coupling coil with a greater number of turns in it.

CONCERNING THE COILS

Now, as to L. When using the 80-meter inductances, you merely shunt them with a Sangamo fixed receiving condenser of
.0015 or .002, which boosts the QRH of the combination to 160 or thereabouts, final adjustment being made with the variable condenser. The 80-meter inductances have 14 turns in the oscillator; leaving three for the below-ground neutralizing condenser connection. And the PA inductances have 11 turns of a little heavier wire a little widely spaced. The 40-meter inductances have 7 and 5 turns, respectively; and the 20 which is only needed in the PA has 3-4 turns. All inductances are 2" in diameter.

AS TO PHONE

There are several ways to use phone on the set. Perhaps the easiest, (though a low percentage of modulation is obtained) is to put the secondary of a modulation transformer in series with the C bat on the oscillator. The primary of the modulation transformer is in series with the usual 6V. battery and mike. Substituting a buzzer for the mike gives a beautiful 500-cycle tone that is very attractive and not at all broad. This is the scheme that was described by Ed. Glaser of 2BRB in QST for June, 1927.

It is comparatively simple, of course, to throw together a Heising modulation circuit and feed the plate power for the amplifier through that instead of direct to the plates of the amplifier tubes. This gives a high percentage of modulation and very good quality. Whatever modulation system is used it will be found that even a small filter on the power amplifier is adequate because of the refining effect of the crystal-controlled energy that is fed to the grids of the power amplifier.

In conclusion it is only fair to give credit to Scientific Radio Service of Mount Rainier for their excellent co-operation in assisting in the design of the rig and for supplying the crystals and mounts around which it is built and which are so important in its proper operation. Crystals that are fussy, or tricky, or at all uncertain in starting oscillation and in keeping right at it indefinitely, are an abomination. Good ones are a joy to work with and are easily responsible for the elimination of about 80 per cent of the troubles that might be blamed on other things.

Strays

An interesting method for controlling regeneration is suggested by 1AQD. It consists of using our old friend, the absorption loop. He uses a turn or two of wire coupled to the secondary coil of the tuner. A carbon pile rheostat is connected across the coil and as its resistance is varied, the amount of energy absorbed is likewise varied. One side of the circuit is grounded to reduce hand capacity effects. He states that it is necessary to use a compression type rheostat as a wire wound affair would be noisy in operation.

Woolworth V & X stores are offering another boon to amateurs in the form of straight glass cylinders which may be purchased at 5 cents each. They are normally used as the middle section of a hydrometer, are open at both ends and have a uniform diameter of approximately 7/8-inches throughout their entire length of six and a half inches. By sticking a cork in each end and fastening them to suitable supports, a first rate mounting for an r. f. choke will be had. Corks for the job may also be obtained at the same store for 5 cents a dozen.—6DCA.
THE Board of Directors of the American Radio Relay League was in regular annual session throughout the 17th and 18th of February, at Hartford. Every Director was present, every section of the country represented. The affairs of the League were examined in detail, the Headquarters properties inspected, and policies outlined and instructions given to the officers for the coming year.

Mr. Maxim and Mr. Stewart were unanimously re-elected as President and Vice President for terms.

The Board received the annual reports of the League's five officers; ratified the acts of the Executive Committee in the past year; voted to meet hereafter in May instead of February; examined League finances; commended the Headquarters Staff on its handling of the business affairs of the League; made plans for encouraging the beginning operator; outlined plans to further international communication under the restrictions of the new international convention, as is discussed editorially this month; authorized the undertaking of a technical development program to aid members in meeting the technical difficulties of operating under the new convention, a most important action on which we shall have considerable to say in QST soon; voted to request the restoration of the Extra First Class Amateur Operator's license; discussed at length the question of wave-bands for amateur phone and adopted new recommendations to the Commission as reported below; considered Division boundaries but made no changes; provided for the investment of the surplus funds of the League; adopted protective policies respecting invasion of amateur bands by non-amateur stations and respecting quiet hours and interference from harmonics, heard a report from Director Segal on his work in combating anti-amateur municipal ordinances and extended thanks to him for his valuable work, particularly in the matter of the Wilmore decision; reconsidered at length the question of national conventions and reaffirmed the previous decision to abandon them; discussed pending legislation; inspected the new Headquarters Station 1MK and commended the Communications Manager on the job. Detailed reports of conditions in every territory were made by the Directors, the desires of the member-
ship reported, and action taken on matters brought up. The Secretary's minutes of the meeting fill eighteen pages; obviously only the high-lights can be mentioned here.

The question of amateur phone wavelengths was most carefully considered by the Board in several hours' discussion, after a committee of the Board had given a hearing to a representative of phone amateurs who was dissatisfied with the change in regulations sponsored by the League. With every Director present and views therefore expressed from every section of the country, the Board unanimously decided to recommend to the Federal Radio Commission that the two upper phone bands be changed to read 1715 to 2000 kilocycles and 3500 to 3550 kilocycles. Some explanation of the thoughts back of these recommendations may be of interest. Let it be said at the outset that the Board took into account the changes in amateur bands provided in the Washington Convention, when a way to be expected by the first of next year.

The long-wave band mentioned is from 150 to 175 meters. Although phone at present operates up to 190 meters, the waves above 175 will be assigned to the mobile service after this year. It is undesirable to encourage the establishment of stations on waves above 175 now, only to have the owners forced to change wavelength next year. A more important consideration is QRM to BCLs; the probability of interference by phone operation on waves above 175 is so great that such operation seems inadvisable. Most of the phones are below 170 meters now anyway. Therefore the recommendation of 150 to 175 meters.

The 85-meter recommendation embraces 50 kilocycles. The original phone assignment, there of 100 kc. was made at a time when the 40-meter band was 1000 kc. wide and carried an enormous percentage of the A. R. R. L. domestic communication. Under the conditions of the immediate future the bands will be so seriously curtailed that reduction in privileges will be suffered by every form of amateur operation. As a single example, the 40-meter telegraphing band becomes 300 kc. for all the world, instead of 1000 kc., for North America alone, and when this is shared with amateurs of other countries the congestion will be so great that 40-meter operation will have to be confined to international and coast-to-coast work. All of the moderate-distance work that has been going on in that band will then have to be accommodated in the 80-meter band. For that reason the Board's recommendation, arrived at after intensive consideration, is for a phone privilege 50 kilocycles in extent.

The Board has recommended that the 20-meter phone privilege be rescinded. The new international band for amateurs at 20 meters is 400 kc. wide. The width of a signalling channel increases, at the present state of the technique, directly with the frequency. That is to say, in terms of the number of stations which can be accommodated the 20-meter band is equal to 200 kc. at 40 meters or to only 100 kc. at 80 meters. Of course the chief utility of the 20-band is for international DX and it is therefore one of the bands which will have to be shared with amateurs of other nations. The League is undertaking to negotiate an informal agreement with the amateur societies of other countries, under which North American amateurs would operate in the top halves of the 20-meter and 40-meter bands. The net effect of this is to say that the territory which will be available for American amateurs at 20-meters after the first of next year is no greater than an expanse of 50 kc. in the 80-meter band. Immediately it becomes apparent that it is a physical impossibility to make provision for phone in the limited band which the international conference has left us and have any assurance of privileges for telegraphy. Looked at another way, imagine that we have, next year, 200 kc. at 20 meters for American amateurs. Reliable engineering figures indicate a minimum commercial channel width at 20 meters of 40 kc., which is to say that our band contains room for but five commercial channels of minimum width. Even if a single one of these channels was made available for phone, it would amount to 20% of the entire territory if every phone in America succeeded in working on exactly the same wavelength, which they would not and could not do, and it would be a privilege utterly valueless to the phones themselves. It was therefore the opinion of the Board that the state of the art does not offer promise of successful and satisfactory work under the conditions now confronting us in the 20-meter band and that, for the present at least, they should recommend rescinding the 20-meter phone privilege.

The Board brought to bear upon this question all of its past experience in planning for the future, its technical talent, and its ability to reflect amateur viewpoints from every part of the country. It is hoped that the membership will be pleased with the decisions and will appreciate the reasons which lie behind each one. The recommendations have now been conveyed to the Federal Radio Commission.

K. B. W.
Notes on the Design of Iron-Core Reactances Which Carry Direct Current

By D. E. Replogle*

This is the third of a series of articles by members of the Raytheon organization on the practical design of filters and filter parts. The first appeared in the September issue and the second in the February issue. The fourth will follow shortly.

These articles are based on the very extensive experience of the Raytheon organization with the problems of manufacturers of "A" and "B" substitutes. It covers the "low-pass" type of filters used in these devices and also in transmitting plate supplies.—Technical Editor.

The great increase in the use of rectified and filtered plate and filament supplies within the last few years has emphasized the need of adequate design methods for filter reactances. Such chokes carry a comparatively large amount of d.c. with a superposed a.c. ripple, and the design is thus somewhat more difficult than that of an ordinary a.c. reactance.

An excellent contribution on this subject was made by C. R. Hanna who gave design curves for use with Westinghouse 4½% silicon steel and for Westinghouse "Hypernik." Since most choke coil manufacturers do not use these steels, however, it was thought worthwhile to compute similar curves for other commercial sheets. Data were obtained from the manufacturers, and the necessary calculations were made in accordance with Hanna's formulas. For the theory of the method, the reader is referred to the above work by Hanna, a brief synopsis of which appears at the end of this paper, and also to papers by Spooner.

PERMEABILITY CURVES

Permeability curves for a number of steels are given in Fig. 1. They were computed from the manufacturers' saturation curves by use of the relation,

$$\mu = \frac{B}{H}.$$

It will be noted that steels 1 and 2 are very high in permeability, the other materials grouping themselves at a lower level.

INCREMENTAL PERMEABILITY CURVES

Referring to Fig. 2. When direct current having a superposed a.c. component flows in a choke, the flux density rises to a certain point (a) on the saturation curve, this point being determined by the d.c. ampere-turns and by the ordinary permeability ($\mu$). The a.c. component then causes the flux to describe the small hysteresis loop at (a). The permeability to the a.c. component is not the permeability ($\mu$) but a smaller value ($\mu\Delta$) which is equal to the slope of the line drawn through the ends of the small hysteresis loop. The permeability ($\mu\Delta$) is called the **incremental permeability**. As $H$ due to d.c. increases, the hysteresis loop moves up on the saturation curve. It will be noted that at high values of $B$ the slope (and therefore the incremental permeability) decreases.

The method of determining ($\mu\Delta$) is given in Spooner's papers and will not be repeated here. The curves of Fig. 3 give the incremental permeability for several grades of steel, and it is evident that ($\mu\Delta$) decreases as $H$ increases as pointed out above. These curves were calculated for a very small a.c. component. When the a.c. component is large, the hysteresis loop increases in size and tilts at a greater angle. Thus the incremental permeability increases somewhat for large values of a.c. Additional curves...
for various amounts of ripple could have been plotted, but it was not felt that the greater complexity would be warranted.

![Permeability Curves](image)

FIG. 1. NORMAL PERMEABILITY CURVES

Also, due to the use of a small value of a.c. component the results obtained will always be on the safe side.

**DESIGN CHART**

The design chart, Fig. 4, shows the relation between $L/I/V$ and ampere-turns per inch. Curves are plotted for five grades of steel. The numbers along the curves are the ratios of air-gap to length of magnetic path to give the maximum inductance. Other values of $(a/l)$ can be used, but will not give quite as high inductances.

For a given choke with given current, the inductance is directly proportional to $L/I/V$. This means that the higher the curve is on this sheet, the more inductance will be obtained in a given size choke. Thus steels 1 and 2 are seen to be better than any of the others. In Figs. 1 and 2 we saw that they had the highest permeabilities, and here we see that the effectiveness of a choke is greatest if made of these steels.

The difference is not large, however, the maximum difference between numbers 2 and 5 being only about 15%. Therefore, it would seem that for most reactances an ordinary steel of low silicon content would be advisable because of its lower cost and smaller wear on the dies.

**PROCEDURE IN DESIGN**

The desired inductance $L$ and the direct current $I$ are known.

1. It will now be necessary to assume some size of core. Usually a standard punching will have been decided upon, in which case it will only be necessary to assume a height $d$ for the stack of laminations. Then determine the cross-sectional area of the core $A$ and the length of magnetic path $l$. $V$ is the product, or $V = Al$.

2. Compute $L/I/V$.

3. From design chart, find the value of $NI/I$ corresponding to the above value of $L/I/V$.

4. The total number of turns to be used is then found by dividing the above value of $NI/I$ by $I$ and multiplying by $l$.

5. The approximate length of air gap is determined by noting the $(a/l)$ number nearest the point on the curve used in getting $NI/I$. This number is multiplied by $l$ to get $a$.

6. The designer may now find that he cannot get the required number of turns in the winding space, or that the winding space is unnecessarily large. In either case he will make another assumption of depth of core $d$ and try again.

**CHOKES FOR LARGE RANGE OF DIRECT CURRENT**

If the choke is to be used over quite a range of direct current, it is advisable to calculate the inductance at two or more values of current to make sure that there is not too much variation. The d.c. flux
density must first be obtained, using the formula

\[ B = \frac{3.20 \, NI}{1/\mu + a} \]

Since \( \mu \) is not known until \( B \) is, a cut-and-try method must be used. For a first approximation, consider \( 1/\mu = 0 \) and calculate \( B \). Take a slightly lower value of \( B \), get \( \mu \) from the permeability curve, and cal-

\[ L = \text{inductance in henries} \]
\[ N = \text{total number of turns} \]
\[ A = \text{cross-sectional area of core and gap} \] (sq. in.)
\[ l = \text{length of magnetic path in inches} \]
\[ a = \text{total effective gap in inches} \]
\[ B = \text{flux density in lines per sq. in.} \]

**FLUX DENSITY**

Though the design chart is all that is required in the design of the magnetic circuit of a reactance, it is often desirable to know the flux density used. Accordingly, Fig. 5 was plotted from data obtained from the design chart. It gives the flux density which will occur if the chokes are designed according to Fig. 3. It is rather interesting to note that with both grades of iron the flux density will be about 55,000 lines per square inch with large values of \( NI/l \). These densities will be obtained if the air gaps of Fig. 3 are used. Smaller gaps will

\[ L = \frac{3.20 \, N^2 \Delta \times 10^{-8}}{1/\mu \Delta + a} \]

In these formulas,
increase the flux density, saturating the core and reducing the inductance. Larger values of gap length will reduce the flux, again decreasing the inductance.

**SYNOPSIS OF METHOD OF CALCULATION EMPLOYED BY HANNA IN OBTAINING DESIGN CHARTS FOR IRON-CORE REACTANCES WHICH CARRY DIRECT CURRENT**

In order to prepare the design chart, Fig. 4, both the normal and incremental permeability curves, Figs. 1 and 3, are employed. Fig. 1 is readily obtained from manufacturers' saturation curves by use of the relation \( \mu = BH \). Fig. 3 is computed for small values of a.c. from the data given in the paper by Spooner.

Then, using the following notations:

- \( B \) = Steady flux density in iron and air-gap, gausses.
- \( N \) = Number of turns in winding.
- \( I \) = Direct current, amperes.
- \( A \) = Area of core section, and air-gap, cm².
- \( l \) = Length of iron path, cm.
- \( a \) = Air-gap length, cm.
- \( L \) = A.c. inductance, henries.
- \( \mu \) = Normal permeability = \( \frac{B}{H} \)
- \( \mu \Delta \) = Incremental permeability = \( \frac{\Delta B}{\Delta H} \)

and \( \Delta H \) are the increments from tip to tip of a minor hysteresis loop.

We have

From (1)

\[
B = \frac{0.4 \pi NI}{\frac{1}{\mu} + a}
\]

(3)

Substituting in (2)

\[
NI = \frac{0.4 \pi}{\frac{1}{\mu} + a}
\]

(4)

\[
L = \frac{0.4 \pi I^2}{\frac{1}{\mu} + a}
\]

(5)

Letting \( V = \frac{1}{l} \), the volume of iron in the core,

\[
\frac{LIP^2}{NI} = \frac{B^2 \left( \frac{1}{\mu} + a \right)^2 \times 10^{-4}}{0.4 \pi \left( \frac{1}{\mu} + a \right)}
\]

(6)

Also from (1)

\[
\frac{NI}{V} = \frac{B \left( \frac{1}{\mu} + a \right)}{0.4 \pi \left( \frac{1}{\mu} + a \right)}
\]

For any assigned value of \( \frac{a}{l} \) (the per cent. air-gap) equations (5) and (6) may be considered as parametric equations with \( B \) as the parameter, and a curve of \( \frac{LIP^2}{NI} \) against \( \frac{NI}{V} \) can be plotted. To do this, several values of \( B \) are assigned, and the values of \( \mu \) and \( \mu \Delta \) corresponding to \( B \) obtained from curves of Figs. 1 and 2. These values are substituted in equations (5) and (6) to determine corresponding values of \( \frac{LIP^2}{NI} \) and \( \frac{NI}{V} \). \( \frac{NI}{V} \) represents the steady ampere turns for each centimeter of iron length and \( \frac{LIP^2}{V} \) is a quantity which if
divided by the square of the current gives the inductance per cm. of core. It is seen
that if \( \frac{NI}{l} \) is increased, by increasing \( N \) or \( I \) or by reducing \( l \), \( \frac{LI^2}{V} \) is greater for larger values of \( a \). Evidently the envelope of the family of curves gives the relation \( \frac{LI^2}{NI} \) and \( \frac{a}{V} \) if the best value of \( a \) is chosen. Since each curve of the family corresponds to a certain value of \( \frac{a}{l} \),

![FIG. 6. TWO TYPES OF REACTANCES](image)

the point of tangency with the envelope shows the value of \( \frac{a}{l} \) that requires this \( a \). Hence, along the envelope curve may be plotted a scale which shows the proper value of \( \frac{a}{l} \). Fig. 3 shows the envelope curve with the \( \frac{a}{l} \) scale along it.

This is the design curve which has been discussed in the foregoing paper in its extended form in which it applies to commercially available core materials for use in connection with filter circuit reactors.

**Strays**

Four of the leading entomologists of Buffalo have recently succeeded in discovering and capturing the specimen whose photo appears herewith.

This arthropoda is an elongate creature not unlike the lavae of Ephemeridae in form. The antennae are long, slender and quasi-spiralesque and the body cartridgeous in form. The mouth organs are mandibulate although somewhat subject to modifications of a haustellate nature. Caudal setae are conspicuous by their absence as are the visual and aurial appendages. It seems to have no proboscis, whatever. The tail, helically inclined has an inductance of 3.1416 micromillihenries which value is reduced 3 percent for each degree rise in temperature above 20 degrees Centigrade.

It is believed that the victim of this articulata finds it extremely difficult to indulge in the normal nocturnal slumber common to the species; man. Instead, he must sit awake night after night sending out into the ether innumerable calls somewhat resembling the code characters for the letters “C” and “Q” interspersing them with mixtures that are usually quite undecipherable even if one did happen to be curious enough to give the matter one’s complete attention.

The disease is called hamophobia and although known for many years has never completely responded to any treatment. While it may be slightly alleviated it is, as far as is known, incurable. Perhaps the segregation of this specimen may result in rapid gains in the amount of knowledge concerning it which will result in the evolving of vastly superior methods of treatment for those poor unfortunate victims of its voracious appetite. If so, the credit is due in no small measure to 8BHX, 8AHO and the 8KW brothers.

It is said that you don’t have to be crazy to be a radio enthusiast but it certainly helps a lot if you are.

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D. B. Parke

9EGU had a lot of trouble with his note on 20. He even went to the expense of an 852 in hopes of clearing it up. Imagine his feelings when he finally located the trouble as being a lot of dust in the antenna series condenser. We presume that the moral is to build a cabinet around your set or run the vacuum cleaner over it occasionally.
A Transmitter Without Transformers*

By L. W. Hatry**

This is a transmitting circuit for two tubes operated entirely from the 110-volt line without transformers and similar devices. The tubes are connected in what is known as "back-to-back" shunt-feed system, which provides a full-wave, self-rectifying circuit. The best system of keying this circuit requires a double contact key in order that the connections to both grid-leaks may be opened at the filament end. The keying system shown requires two things: that the tubes used be large enough to dissipate the r. f. power internally when the key is "open", and that condenser 3 be used at a capacity value very appreciably larger than the self-capacity of the key, on the order of 6 to 10 times greater. The key should be connected exactly as shown in the diagram with the lever contact connected to the inductance. The plate voltage of each tube is at least the line a. c. voltage, or an r. m. s. voltage of 110. With the 171 or the new 250-volt power tube, this is a good little set.

Standard Frequency Transmissions from WWV

The Bureau of Standards announces a new schedule of radio signals of standard frequencies, for use by the public in calibrating frequency standards and transmitting and receiving apparatus. The signals are transmitted from the Bureau's station WWV, Washington, D. C. They can be heard and utilized by stations equipped for continuous-wave reception at distances up to about 500 to 1,000 miles from the transmitting station.

The transmissions are by continuous-wave radio telegraphy. The signals have a slight modulation of high pitch which aids in their identification. A complete frequency transmission includes a "general call" and "standard frequency" signal, and "announcements". The "general call" is given at the beginning of the 8-minute period and continues for about 15 minutes. This includes a statement of the frequency. The "standard frequency signal" is a series of very long dashes with the call letter (WWV) intervening. This signal continues for about 4 minutes. The "announcements" are on the same frequency as the "standard frequency signal" just transmitted and contain a statement of the frequency. An announcement of the next frequency to be transmitted is then given. There is then a 4-minute interval while the transmitting set is adjusted for the next frequency.

Information on how to receive and utilize the signals is given in Bureau of Standards Letter Circular No. 171, which may be obtained by applying to the Bureau of Standards, Washington, D. C. Even though only a few frequency points are received, persons can obtain as complete a frequency meter calibration as desired by the method of generator harmonics, information on which is given in the letter circular. The schedule of standard frequency signals is as follows:

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<tr>
<td>10:00-10:08</td>
<td>3000</td>
<td>650</td>
<td>1500</td>
<td>3000</td>
<td>125</td>
<td>300</td>
<td>650</td>
</tr>
<tr>
<td>10:12-10:20</td>
<td>2500</td>
<td>750</td>
<td>1650</td>
<td>3300</td>
<td>160</td>
<td>250</td>
<td>750</td>
</tr>
<tr>
<td>10:24-10:32</td>
<td>2600</td>
<td>850</td>
<td>1900</td>
<td>3900</td>
<td>175</td>
<td>400</td>
<td>850</td>
</tr>
<tr>
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<td>4000</td>
<td>950</td>
<td>2900</td>
<td>4000</td>
<td>200</td>
<td>450</td>
<td>850</td>
</tr>
<tr>
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<td>1050</td>
<td>2250</td>
<td>4400</td>
<td>225</td>
<td>500</td>
<td>1050</td>
</tr>
<tr>
<td>11:00-11:08</td>
<td>4900</td>
<td>1350</td>
<td>3000</td>
<td>4900</td>
<td>300</td>
<td>550</td>
<td>1200</td>
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<td>1850</td>
<td>2750</td>
<td>5400</td>
<td>275</td>
<td>600</td>
<td>1850</td>
</tr>
<tr>
<td>11:24-11:32</td>
<td>6000</td>
<td>1500</td>
<td>3000</td>
<td>6000</td>
<td>300</td>
<td>650</td>
<td>1500</td>
</tr>
</tbody>
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*By permission of Hartford Times, original title, Standard Circuit No. 142.
**Radio Technician, Hartford Times.
Designing Fixed Resistors†

By R. C. Hitchcock*

A n alignment chart for the rapid calculation of the resistances of various kinds and sizes of wires is given in this article. The safe current rating of a resistor is also given, on two charts, for the usual current values used in amateur radio work.

Wire tables are available, manufacturers' booklets give the required data, and an alignment chart has been published recently giving resistances. However, most of these references contain much extra material, while the charts in this article include only the essential data needed in calculating resistances and current ratings, and it is felt that they fill a need of the radio amateur.

The current carrying capacity of a wire is limited by the amount of heat which it can radiate. Especially in the case of resistors, where the wire has a higher resistance than that of pure copper, it is essential to provide surface enough to prevent the burning out of the resistance wire. It will be obvious that if a resistance wire is wound in several layers on a spool, its safe heat radiation will be smaller than for a similar length of wire wound in a single layer on a tube.

For average room conditions, the radiation value may be taken to be two watts per square inch of radiating surface. Higher rates are sometimes used, but a conservative rating is two watts per square inch of surface. If a resistor is wound on a tube in which the air circulates inside as well as outside, the inside area can be included in figuring the surface.

SAFE CURRENT THROUGH A RESISTOR

The preceding paragraph gave the basis for constructing Figs. 1 and 2, which are charts representing the electrical law that $I^2R = \text{Watts}$, $I$ being the current in amperes, and $R$ the resistance in ohms. In Fig. 1 the column at the left gives the current in milliamperes, the center column gives the watts which must be dissipated, and the right hand column gives the resistance in thousands of ohms. Fig. 2 is similar except that the current scale is given in amperes, the resistance scale in ohms, and the watt scale is extended to cover a larger range of power to be dissipated.

The current carrying capacity of a resistor is also, is resistant to oxidation at fairly high temperatures. There is one disadvantage in using Nichrome—its resistance rises slightly with temperature. At the temperature of boiling water (100°C) the resistance of a given Nichrome wire is 1.85% greater than at the temperature of freezing water (0°C). If a wire is wanted which has very small changes of resistance with temperature, Advance wire is recommended. With

‡The present paper is also known as Scientific Paper No. 272.
1. Smithsonian Physical Tables, pub. by Smithsonian Institution, Washington, D. C.
2. Nichrome and Other Alloys, Driver Harris & Co., Morristown, N. J.
5. One one-thousandth of an inch.
the same limits as stated above, from boiling to freezing water, the resistance of an Advance wire is reduced by .08%. For a direct comparison, consider two 10,000-ohm resistors, one of Advance and one of Nichrome wire, these resistances being measured at the temperature of freezing water. At the temperature of boiling water the resistance of the Advance resistor will be 9.992 ohms, and that of the Nichrome will be 10.185 ohms. For a given wire size, Advance has less than one half the resistance that Nichrome wire has, and the choice has to be made between small space and low coefficient of resistance change with temperature. It should be understood that when in use, these resistors will rise several degrees above room temperature in dissipating the energy. It is the rise in the resistor temperature which changes the resistance value, and not room temperature changes, which ordinarily would be negligible.

### Resistance of Various Wires

The table gives nearly all the data needed to calculate the resistance of any kind of wire for any length. The one additional factor is the cross section of the wire, which is related to the gauge number, or the diameter. Fig. 3 is a chart which gives necessary data for finding round wire resistances for B. & S. gauges from 10 to 44, or from 101.9 to 2.0 mils diameter. The left hand column shows sizes both on B. & S. gauge, and the diameters in mils; the right hand column gives the resistance in ohms per thousand feet of wire. The center column can be used in two ways, the relative resistance is given on the right side of this column. The names of some of the common wires are given on the left side opposite their value of relative resistance. A few of the ordinary wires could not be included in the chart, due to crowding, but by referring to the table for relative resistances, their places on the center column can be found.

Two examples will illustrate the use of Fig. 3. Suppose the resistance of No. 30 B. & S. Advance wire is required. Aligning size 30 in the left column and the line at the end of Advance in the center column, the value of the resistance is found in the third column to be approximately 30,000 ohms per thousand feet, or 30 ohms per foot.

Suppose, to take a second example, that a ten-thousand ohm resistor of Nichrome wire is to be made. Lining up these values on the right and center column, the required size is seen to be closest to B. & S. size 32.

A chart such as Fig. 3 is useful in forming the approximate design of a resistor within a few per cent of the desired value. But the resistance is subject to manufacturing variations or perhaps less than five per cent, which is about the usual error in reading the chart. The use of a Wheatstone bridge, or a voltmeter-ammeter method of
measuring resistance is recommended for a final determination if the accurate resistance value has to be known.

FORMS FOR WINDING RESISTORS

There are several good kinds of forms on which to wind resistance wires. One which is easy to secure is the porcelain tube used in house wiring. If bare resistance wire is used it should be space wound by using string or thread between the wires, the string being unwound after the resistor is completed. If a gas or an electric furnace is available, Nichrome or Advance wire can be heated to a red heat, forming a thin insulating layer of oxide. The wires can then be wound touching each other, without short circuiting. Another material which is very satisfactory as a form on which to wind resistance wires is sheet mica. Sheets of two by three inches in size are not very expensive, and will stand heat better than almost any other insulator. A special advantage in using flat sheets for winding resistors is that the magnetic field is concentrated, causing little disturbance in nearby radio circuits. If the flat sheets are mounted vertically so that the heated air from the wires can rise freely from both sides of the sheet, radiation is aided, keeping the working temperature within reasonable limits. Mica wound resistors may look unusual to a person who is accustomed to seeing only the cylindrical enamelled resistors, but mica resistors are not a new tried idea. The heating element used in electric flat irons and in some toasters consists of a mica resistor. When using mica it is advisable to make small notches or slits in which to wind the resistance wire, so that if the wires expand with heat they will not move out of position and cause a short circuit with adjacent wires.

It is the opinion of the writer that the average experimenter should not attempt to make an enamelled resistor, as this covering requires elaborate equipment, in addition to finding a proper enamel. Most vitreous enamels will eat into the wire during the process of firing, which either destroys the wire, or greatly reduces its cross section.

Resistance wires can be purchased having the regular cotton or enamel coverings, but the extreme heat that is sometimes encountered by resistance wires in use is so great as to char a covering. For this reason covered wires are not often obtainable except from the manufacturers. However it should be kept in mind that in any ordinary use in a radio receiving set the heat will seldom be over a few watts, and if covered wires can be secured, there will be gained the advantage of being able to wind wires touching each other without making grooves for separation.

Shellac, waxes, or similar substances should not be put on a resistor as most of them soften at fairly low temperatures.

TERMINALS

Terminals should be fastened firmly to the form on which the resistance wire is wound and the wire wound tightly around the terminal and soldered if possible. If a wire like Nichrome which cannot be soldered is to be attached to a terminal, some clamping arrangement is generally the best. The wire should be carefully scraped and clamped tightly to ensure good contact.

If the wire is wound on a tube, a clamp like a radio ground clamp can be used as a terminal. If sheet mica is used, the terminal can be a machine screw with several nut sand washers, the first nut and washer holding the wire to the mica form, and the second to be used for attaching to the circuit where the resistor is to be used. A better terminal for sheet mica can be made by bending a copper or brass strip around each end of the resistor, drilling through both the metal strip and the mica and using a screw with nuts to clamp the wire. If a wire such as Advance is used, it can be soldered directly to the terminal strip.
Standard Frequency Transmissions

While no guarantee of accuracy is made on a gratis service, it is the aim of the staff to maintain an accuracy of 1/10 of 1%, which is materially better than can be "held" by most wavemeters. The frequency values are based on the Standards of the Bureau of Standards and have been checked by the Communications Laboratory of The Massachusetts Institute of Technology, also by Cruft Laboratory at Harvard University.

Important Notice: The continuation of this free service from month to month depends on the response received. Direct acknowledgments to "Experimenters' Section, A.R.R.L., 1711 Park Street, Hartford, Conn.", using ordinary stationary or else the special blanks supplied by the Experimenters' Section, on request. A goodly number of these blanks has been gathered and as the number grows we will gradually gain a unique and accurate record of transmission phenomena possible with no other station. Details on 9XL may be found on pages 8 of the June issue.

9XL now uses a small percentage of tone modulation to make the signal distinctive.

SCHEDULES

(Figures are frequencies in MEGACYCLES per sec.; approx. wave-lengths in parentheses.)

<table>
<thead>
<tr>
<th>Time</th>
<th>Schedule A</th>
<th>Schedule B</th>
<th>Schedule C</th>
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<td>f</td>
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<td>f</td>
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<tr>
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March

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<td>B</td>
<td>C</td>
</tr>
<tr>
<td>13</td>
<td>A</td>
<td>B</td>
<td>C</td>
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</table>

DIVISION OF TIME

1 minute—announcement of frequency in megacycles per second.

1 minute—announcement of frequency in megacycles cycles per second.

Special Notice—If you use the transmissions send a note to Experimenters' Section, A.R.R.L., Hartford, Conn.

R. S. K.

1 minute—an announcement of frequency in megacycles per second (8.75 megacycles per sec. is sent as "8 r 75 MC").

A Correction

An error occurred in the article "The DX Tape Measure" in the March issue. In the formula at the bottom of the second column on page 47 the figure 9.70193 should have been shown as the sum of the three logs above it. The line to indicate addition was misplaced.

BYE BYE PURTY BABY
MOST amateur transmitting sets are constructed around a particular size of tube without any thought of an increase in power in the future. In many cases this is thought to be necessary as the man wants to get a set on the air with the smallest expenditure of money. However, if it is desirable to increase power at a later date, pleasing note that is easily picked up by the receiving operator and does not become wearying if one has to copy it for a lengthy period of time.

The oscillatory circuit, filament and plate transformers, and keying relay are all mounted upon the panel and baseboards. It is only necessary to run the 110-volt a.c. leads to binding posts provided for them.

The tuned-grid tuned-plate oscillatory circuit was chosen because it is stable in operation and easily adjusted. The two tubes are in a back-to-back or full-wave self-rectified arrangement which gives a hook a key and battery to the relay and clip the antenna onto the plate inductance in order to put the set in operation.

The plate and grid tuning condensers are National double spaced units having a maximum capacity 450 µµfds. The plate and grid blocking condensers are R.C.A. type number UC-1846 and have a capacity of approximately 36 µµfds. Four of these are necessary and they are mounted in pairs on small stands. These, together with the tube sockets, r.f. chokes, and filament by-pass condensers are mounted on a small shelf which fits between the two tuning condensers. The two filament by-pass con-
densers which are Sangamo receiving type are mounted just beneath the tube sockets which are above the filament lighting transformer. They are of 2000 µfd. capacity each. The various connecting leads are, therefore, quite short and solidly mounted.

The plate and grid chokes are similar in construction and consist of approximately 175 turns of No. 30 d.s.c. wire wound on a one-inch bakelite tube. Only two of these chokes are visible in the photograph, the other two being located behind the plate and grid stopping condensers. It is always advisable to make the two grid chokes of exactly the same electrical constants unless some arrangement is provided whereby the chokes may be tuned. The same applies to the plate chokes although a difference in them will not be as damaging. In the absence of electrical measurements it is advisable to make them as near to being identical from a mechanical standpoint as can be done practically. If the chokes differ greatly, the output for the two tubes will not be similar and the note will be poor. It may also cause the wave to be broad and of an interfering nature. Of course, it is quite possible to have trouble of this nature if the tubes are not closely enough matched as to their electrical characteristics.

The inductances are made of quarter-inch copper tubing that has been heavily silver plated. The two coils for a band are similar in all respects. For the 40-meter band the coils are of four turns and are three inches in diameter. The two stems of the coils which fit into the clamps that hold them in place on the condensers are approximately five inches long. The 20-meter coils are of three turns each, their diameter and the length of their stems being the same as the 40-meter coils. The coils are firmly fastened to the condensers by means of brass fittings which are mounted on the condensers themselves.

One of these fittings takes the form of a heavy brass strap that is held by the tie rods which support the stator plates of the condenser. These tie rods are run out the back of the condenser as far as their length will allow so that the strap will be a satisfactory distance from the endplate and the screws holding the pieces of insulating material in place. The upper end of the strap holds a collar into which the end of the stem of the coils fits. This collar may be clamped tightly around the coil stem by means of a simple locking arrangement. A piece of rod is threaded at one end and its other end is turned at right angles to act as a handle by which it may be turned. The side of the collar nearest the handle end of the screw, is threaded so that the screw may be run in and out of it. The other side of the clamp has a larger hole that will clear the rod. The rod terminates in a nut which is kept from turning on it by a bit of solder. As the rod is screwed out of the threaded side of the clamp, the nut pulls against the other side and causes the clamp to contract. It can, therefore, be made to grip the stem of the coil very tightly giving an excellent electrical contact, providing the surfaces are thoroughly clean.

A LOOK AT THE 'WORKS'

Note the simple though effective arrangement used to hold the coils in place. The apparatus is mounted in a compact manner at the same time leaving plenty of space for getting at the various parts. The filament transformer is located at the center of the baseboard and the plate transformer and keying relay are at opposite sides of it.

The other clamp is fastened to one of the rods which holds the condenser frame together. It is really two clamps similar to the one described above. One of these clamps to the rod on the condenser frame and the other holds the coil stem. The proper relative positions of the two clamps to fit a given coil may be obtained by sliding the clamp on the support rod of the
condenser frame either backwards or forwards to a point where the coil is in its correct position. In this manner it is possible to use coils varying widely in their number of turns without it being necessary to vary the spacing between turns to make them all of a uniform length.

Separate grid leaks and condensers are used for the tubes which help in obtaining stable operation. It is possible that trouble may be encountered in operating tubes in a full-wave self-rectified arrangement which is due to the generation of parasitic oscillations of a very high frequency. The effect usually shows up in the form of excessive heating of the plates, erratic operation with varying output or it may be indicated by an inability to obtain or hold a smooth note. A remedy that is, in most cases, quite effective is to insert a center-tapped choke in the circuit at the point where the two grid circuits and the lead to the grid inductance connect. The outer terminals of the choke are connected to the leads from the grids of the tubes and the center terminal goes to the grid circuit inductance. Currents flowing from the center to the two grid circuits will generate fields that oppose each other thereby giving a non-inductive effect while currents tending to flow from one grid to the other meet with the full impeding effect of the choke. For 20 and 40 meters such a choke may consist of about twenty or twenty-five turns of wire on a 3/8 or 1/2-inch form. The size of the wire is not very important. Double-cotton covering would be useful as it would give sufficient spacing between turns without requiring special precautions in the winding to obtain this result. It is also possible to use resistors in the grid leads to prevent parasitic oscillations. However, the chokes are inexpensive and do the job in a satisfactory manner.

A 300-watt, 750-volt Acme transformer supplies power to the plates and the filament are excited by an R.C.A. 150-watt affair. An Allen-Bradley radiostat is inserted in the 110-volt line to the primary of the latter and allows the filament voltage to be kept at the proper value as indicated by a Jewell 0-15 volt a.c. meter. Both transformer primaries are in series with a resistance. The value of the resistance may be between fifty and two-thousand ohms and can be determined by experimentation alone. If any trouble is had with key clicks, an adjustment of this resistor will usually help matters considerably. The key itself is connected in series with a six-volt storage battery and the relay winding thereby being entirely isolated from the higher voltage circuits.

The toggle switch just below the knob of the Radiostat is in the primary circuit of both transformers and is, therefore, the main switch controlling the power supply to the set. The bullseye next to it indicates whether or not the power is turned on. The hole through which the tube is viewed is large enough so that one could get a full view of the plate of a 203-A was type used.

WHAT APPEARS ON THE PANEL OF THE TRANSMITTER

The toggle switch just below the knob of the Radiostat is in the primary circuit of both transformers and is, therefore, the main switch controlling the power supply to the set. The bullseye next to it indicates whether or not the power is turned on. The hole through which the tube is viewed is large enough so that one could get a full view of the plate of a 203-A was type used.

The 30-meter antenna used with the transmitter is of the Hertz type. It is approximately sixty-four feet long and thirty-five feet high and is supported by two telephone poles that are used for masts. At the exact center of the antenna there is a ten-watt thirty-two volt Mazda lamp. The feeder line, which is a single wire, is taken off at a point that is exactly halfway between the lamp and one end of the antenna. This feeder may be twenty-five or one hundred twenty-five feet long without effecting the wavelength of the system. Pyrex insulation is employed throughout and the feeder enters the house through bowl insulators and connects to the feeder series condenser which can be seen to the left of the lead-in insulator. This condenser is a UC-1803 unit of 25 µfd. capacity.

There is also a 19.5-meter Hertz which is almost 22 feet long and the same height as the 39-meter one. Its current indicating feed system is closely equivalent to that of the larger antenna. A switch located just outside of the window may be thrown to connect the 19.5- or 39-meter antenna to the set. The same lead-in through the wall is, therefore, used for both systems. No ground connection is used on either wave.

(Concluded on page 45)
The very excellent little CX-350—UX-250 tube is the unhappy victim of more hard luck than the heroine in an old-fashioned serial movie. Madhouse rumors have surrounded it for 6 months, and now its own folks are not agreeing on the story they will tell in announcing it. As if that isn’t enough the samples have come through with such amazing slowness that QST even at this date has been compelled to go out and borrow some from a good friend in order to have some chance of finding out just what to believe.

THAT FAMOUS “25-WATT” RATING

The grapevine telegraph was busy for many months announcing the 250 as a “25-watt, 200-volt tube”. That at least can be knocked on the head at once. The 250 is so far from being a 25-watt tube at 200 volts that it has little (if any) advantage over the 171 at that plate voltage.

The next question is, ‘Is it ever a 25-watt tube?’ As to that, we will tell the story as it has been shown us, after which your guess will be as good as another’s.

A. The rumors made it a 25-watt tube.
B. The R.C.A mimeod release says, “When used as a transmitting tube the UX-250 is rated at 25 watts as against the 7.5-watt rating of the UX-210”.
C. Consideration of the amplifier ratings and of the structure of the tube made it seem that perhaps the typist had hit the wrong key in cutting the stencil.

In table A, the figures for the UX-210 are taken from standard information of R.C.A. and the figures for the 250 are taken from the same release which gave the 25-watt oscillator rating, and which may therefore need some later adjustment. The bracketed figures are those of the 210.

AS AN OSCILLATOR

With the incomplete data at hand oscillator comparisons must be made indirectly. Referring back to the UX-210 we take (Continued on Page 33)
Keying Master-Oscillator Circuits

By Beverly Dudley*

In keying master-oscillator circuits we have the choice of keying (1) the oscillator, (2) the amplifier, or (3) both the amplifier and the oscillator.

If the oscillator is keyed, there is a possibility that key clicks will be present in the emitted wave. A further disadvantage in keying the oscillator is the fact that the wave is not as steady as if the oscillator were kept running continuously. This unsteady state or creeping, may change the emitted frequency as much as several hundred cycles. Each time the key goes down and the tube heats its elements expand and change the frequency of the emitted signal. The single advantage of keying the oscillator in master-oscillator circuits is that keying is positive.

Keying the amplifier has the advantage that the oscillator does not creep, and the signal is consequently easier to read. Key clicks are apt to be present when keying the amplifier but do not seem quite as pronounced as when keying the oscillator. The disadvantage of most methods of keying the oscillator is that some energy is radiated from the oscillator even when the key is in the up position.

Keying both the amplifier and the oscillator makes for definite action, but key clicks are often present, and the arrangement has the further disadvantage of creeping.

Key clicks may of course be eliminated, or their deleterious effects greatly reduced, through the use of a key thump filter. In keying a small, and low power master oscillator circuit, it was desired to (1) secure definite and positive keying action, (2) eliminate key clicks, or reduce their effects to a negligible value, and (3) to accomplish keying with a medium of apparatus.

A study was made as shown in Fig. 1. By keying in the negative side of the plate supply (A) both the oscillator and the amplifier were very effectively keyed but key clicks were very pronounced and a key thump filter would have been necessary for operation. If possible a key thump filter was to be eliminated to fulfill condition (3) named above.

The grid circuit of the oscillator was keyed by placing the key at the point B. Action was definite and sure. Key clicks were not as bad as when keying in position A. In both positions A and B, the oscillator had a tendency to creep, and while this was not bad when sending dots, the frequency and power output varied noticeably when sending long dashes and this method of keying was eliminated for this reason.

The key was next inserted at C in the grid circuit of the amplifier tube. The keying was found to be rather erratic. Furthermore, a considerable portion of the full power of the transmitter was being radiated when the key was up, and it was not found possible to set the neutralizing capacity to such a value as to cut the antenna current down to zero without producing a strong tendency of the amplifier to oscillate. If the neutralizing capacity was adjusted to prevent the amplifier from oscillating, the antenna current was about 10% of its full value even with the key up. If the neutralizing capacity was adjusted to cut the antenna current to zero, the am-

*Technical Editor, Chicago Evening Post; 9BR, 4730 Central Park Ave., Chicago, Ill.

1. That is to say some power from the oscillator reaches the antenna by accidental coupling even when the amplifier is not working. This happens in practically all oscillator-amplifier transmitters though the operator frequently does not know it.—Tech. Ed.
The keying system shown at D was used for quite a while. The complete circuit using this keying method is shown in Fig. 2. However, the keying system shown at E operated better than position D, and had the advantage of not requiring the use of relays, key thump filters, or other accessory apparatus. The final circuit used is shown in Fig. 3. The final keying system used has the disadvantage of supplying d.c. to the plate of the amplifier at all times. This has never been found objectionable in the case of 210 tubes, but might prove so in the case of larger tubes.

The resistance across the plate supply is simply used to “empty the filter” as a filter having a total inductance of 50 H. and total capacity of 9 mfd. as used here retains its charge a long time.

The UX-250—CX-350 Tube
(Continued from Page 56)

from the Sept., 1926, issue of QST some General Electric data to indicate how the amplifier rating and oscillator rating of a tube of this general type may be expected to compare. The following figures are correct for an older type of 210 but the general proportions of the picture may be expected to apply to the present 210 and to the 250.

<table>
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<td>Plate mfd.</td>
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<td>Input watts</td>
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<td>Rated safe</td>
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<tr>
<td>Plate loss</td>
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<tr>
<td>Output watts</td>
<td>7.5 watts at</td>
</tr>
<tr>
<td></td>
<td>eff. of 37.5%</td>
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</table>

Note that the max. amplifier input rating is approximately equal to the max. safe plate loss when used as amplifier (naturally since the plate circuit input is mainly plate loss when the tube is not working for a moment) also that the oscillator plate loss is 5/4 of this.

Referring to that the 250 we have a max. input rating of 55 mls at 450 volts which is 24.8 watts, suggesting a plate dissipation of 24 watts when resting as an amplifier. Following the assumption, we have 5/4 (24) = 30 watts plate dissipation as an oscillator which compares nicely with the 2-to-1 result of the rough test mentioned above.

Finally, if we assume the same 37.5% efficiency for this tube as was used in rating the 210 we have an oscillator rating of 15 watts and an input of 42 watts at a plate voltage of ?? and a current of ???.

All of which is another method of guessing, but arrives at the same result.

—R. S. K.
Easy Tuning in the Short-Wave Bands
By F. Austin Lidbury *

The increasing use of plug-in-coil receivers brings out the suggestion that those who do not mind using a few extra coils in such receivers can obtain much greater ease of tuning by the use of a condenser in the tuning circuit with a high ratio of minimum to maximum capacity. A condenser which will vary from 25-to 50-
uf. (shunted as it is by tube capacity and other capacities of an unavoidable nature) will usually tune a coil of the proper inductance and fairly low distributed capacity over a range equal to one of the short wave bands with a slight but comfortable margin. Three properly proportioned coils will therefore cover the 20-, 40- and 80-meter bands respectively; five or six intermediate coils will be necessary to cover the ranges between.

Such a condenser can readily be made from a Cardwell 250 uuf. variable by removing the 1st, 3rd and 5th of the five stator plates, and all but one of the rotor plates. This gives a double-spaced variable of about 25 uuf. To this is added about 25 uuf. of fixed capacity by supporting another plate (which is connected to the frame and is therefore equivalent to an additional rotor plate) about 1/16" from the back stator plate, by drilling out the threads from the three holes which will be found on the back end-plate, threading and riveting three 6-32 bolts (from which the heads have been cut) at corresponding places on the extra plate, which is thus held firmly to the back end-plate by 2 nuts (one each side of the end-plate) on each of the bolts. (See photograph.)

This gives also an easy method of adjusting the value of the fixed or minimum capacity, by increasing or decreasing the distance of the extra plate from the back stator plate.

WAVEMETER CONDENSER

A condenser which fills the rather severe requirements for use in a wavemeter capable of really accurate work in the higher frequency bands can be made as follows:

Start with a General Instrument Type 51 F-.001 variable condenser. This has 22 rotor plates and 21 stator plates. Counting from the “panel” end, remove all but the 2nd, 5th, 8th, 11th, 14th, 17th and 20th of the stator plates: and all but the 1st, 4th and 7th of the rotor plates. If you reassembled the condenser at this stage there would be 7 fixed plates and 3 movable plates, one outside and two meshing with the front fixed plates. It is now necessary to provide, between the remaining fixed plates, four plates which, though grounded like the rotor plates, are not attached to the rotor and remain “in,” whatever the position of the rotor. This is done by so shaping four flat brass plates that (while having ample clearance from the slotted metal pieces to which the stator plates are attached, as well as clearance for the shaft) they each have three projecting arms which can be fastened to the two top and center bottom hexagonal rods which separate the end plates of the condenser. These should then be firmly fixed in positions exactly between the five remaining rear stator plates, preferably by sloting the hexagonal rods referred to and soldering the brass plates in position. You now have, on reassembling, a condenser with seven insulated stator plates and seven grounded plates, of which four are permanently and immovably “in” and three (attached to the rotor) variable. On reassembling, care should be taken to tighten up all bolts thoroughly: preferably they should then be soldered in position.

A condenser so prepared has the following properties all of which are desirable in a

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* Experimenters' Section, A.R.R.L., Box 619, Niagara Falls, New York.

1. There is a very general idea that the goodness of a tuner is determined by the smallness of the tuning condenser and that a very high L/C ratio proves that the tuner is excellent. There is room for argument on this point because the story isn’t quite with told by L and C; we must also consider the R of the coil, which goes up as L goes up. See Glenn H. Browning’s “Rating Circuit Resistance,” page 42 of QST for December, 1925.—Tech. Ed.
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 fourth quarter of 1927 is published for the information of the membership.

K. B. WARNER Secretary.

STATEMENT OF REVENUE AND EXPENSES FOR THE THREE MONTHS ENDED DEC. 31, 1927.

REVENUE

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<tr>
<td><strong>Total Revenue</strong></td>
<td><strong>$51,937.65</strong></td>
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Deduct:

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<tr>
<th>Description</th>
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<tr>
<td>Returns and allowances</td>
<td>6,992.23</td>
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<tr>
<td>Provision for newsvendor returns</td>
<td>2,324.71</td>
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<tr>
<td>Discount 2% for cash</td>
<td>337.72</td>
</tr>
<tr>
<td>Exchange and collections</td>
<td>10.65</td>
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<tr>
<td><strong>Net Revenue</strong></td>
<td><strong>$42,571.64</strong></td>
</tr>
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EXPENSES

<table>
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<tr>
<th>Description</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Publication expenses, QST</td>
<td>15,745.25</td>
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<tr>
<td>Publication expenses, Handbook</td>
<td>2,783.50</td>
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<tr>
<td>Salaries and commissions</td>
<td>16,650.33</td>
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<tr>
<td>Forwarding expenses</td>
<td>735.58</td>
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<tr>
<td>Telegraph, telephone and postage</td>
<td>1,611.17</td>
</tr>
<tr>
<td>Office supplies and general expenses</td>
<td>2,194.90</td>
</tr>
<tr>
<td>Rent, light and heat</td>
<td>933.99</td>
</tr>
<tr>
<td>Traveling expenses</td>
<td>1,113.46</td>
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<tr>
<td>Depreciation of furniture and equipment</td>
<td>235.17</td>
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<tr>
<td>Bad debts written off</td>
<td>278.50</td>
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<tr>
<td>Communications Dept. field expenses</td>
<td>104.90</td>
</tr>
<tr>
<td><strong>Total Expenses</strong></td>
<td><strong>$22,918.77</strong></td>
</tr>
</tbody>
</table>

Net Gain from Operations                        $ 5,652.90

If you work a station signing okMNX don’t write in and tell us you’ve snagged a new one. His QRA won’t be worth having because it will be some non-existent place in Africa, Siberia or what have you. Several stations have been “swiped” by okMNX and as near as we can make out it is the call used by members of Barney Google’s Billy-Goat Club.

We were mighty pleased to hear that John M. Clayton who is well known to readers of QST has recently been appointed as secretary to the Institute of Radio Engineers succeeding Dr. Alfred N. Goldsmith who is now president of the Institute. Hearty congratulations from all at hq's. go to J. M. C. on his advance.
A Portable Receiver

By James J. Lamb*

The major points considered in the design and construction of the receiver were that it should be sturdy and compact, self-contained, totally shielded, and adaptable to use with a short-wave r. f. amplifier or super het.

The panel is of ¾ inch hard rubber stock, 7 by 12 inches in size and backed with aluminum shielding 1/16 inch thick. The hard rubber was first marked and drilled for instruments to be mounted and then this panel was used for the template in drilling the aluminum shield. The holes in the shielding were drilled sufficiently large to pass all shafts without contact with the exception of the tuning condenser shaft bearing, which is grounded. Mica paper insulation was used to insulate the shell of the regeneration control resistor, the shell of the volume control resistor, the filament switch, the filament rheostat and the phone jack. Empire cloth or similar sheet insulation material would be equally serviceable.

The sub-panel is mounted on Benjamin aluminum brackets, and carries on its top the inductance socket, tube sockets and audio transformers. Bolted to the back of the sub-panel brackets is a hard rubber strip carrying the binding posts and antenna series condenser.

The circuit is quite conventional, and embodies the features recommended by the Technical Staff of QST in recent issues. The plug-in inductances are wound on UX tube bases, and an UX socket is used as a mounting. Regeneration control is by means of a Frost 50,000-ohm maximum variable resistor, shunted by a .25-µfd. fixed condenser to eliminate any tendency to scratching noises.

The first audio transformer has a 1 megohm resistance shunted across its secondary to eliminate fringe howl, and this it does with no loss of signal volume. This resistor may have to be of lower value with some transformers of different make or type. The second audio transformer has its secondary shunted by a Frost variable resistor having a maximum resistance of 500,000 ohms, and this serves as a volume control of infinite variation, being not only useful in controlling signal volume, but also in attaining a more favorable signal to static and background ratio on weak signals.

The cabinet is made of 1/16 inch aluminum sheet, and is 12 inches wide, 12 inches deep and 7 inches in height. The corners are formed of pieces of the aluminum stock bent in the form of right angles, and the pieces forming the panel shield, sides, bottom and back bolted to these angles. The top is made of a sheet 12 by 12 inches, with angles bolted to the under side so as to fit snugly against the sides of the cabinet when the top is in place. The top is not hinged, and is therefore completely and quickly removable.

THE DIAGRAM WITH CONSTANTS

C1 50-µfd General Radio miniature variable used in series with antenna.
C2 Same as C1, used to tune L1.
C3 100-µfd Sangamo mica grid condenser.
C4 Sangamo 1000-µfd mica bypass condenser.
C5 .25-µfd Tobe fixed condenser.
R1 5-meg. grid leak.
R2 50,000-ohm Frost rheostat for regeneration control.
R3 1-meg grid leak for preventing fringe howl.
R4 20-ohm Yaxley Filament rheostat.
R5 500,000-ohm Frost rheostat used as a gain control.
Tr Stromberg-Carlson andlo transformers.
National dials used.

*83CEI, ex9CEI, care Dr. James J. Cahill, 2607 Connecticut Ave., Washington, D. C.
The set uses three tubes of the 199 type, and the requisite dry-cell A battery and 45 volt B battery are contained in the cabinet. In operation, the receiver "handles" very well, having no body-detuning effects or

![Front View of the Set with Batteries In Place](image)

(noises from the variable condenser and regeneration control. The variation of the regeneration control has no detuning effect on the signal, and the regeneration control has been found very satisfactory on the reception of phone signals. The coils are wound on ordinary UX tube bases. Those that have been made so far are as follows, all wound with No. 28 D.S.C.

<table>
<thead>
<tr>
<th>Wavelength range</th>
<th>Tuned coil</th>
<th>Tickler</th>
</tr>
</thead>
<tbody>
<tr>
<td>43.5-28.5</td>
<td>11 x 1/4</td>
<td>9 1/4</td>
</tr>
<tr>
<td>17.5-26</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>10 meter band</td>
<td>3 1/4</td>
<td>5 1/4</td>
</tr>
</tbody>
</table>

The tuned, or grid input or "secondary" (there is no primary coil so this name is hardly appropriate) coil is in each case the upper one, the tickler being nearest the base. Longer forms may be used with the same plug-in arrangement and go into the broadcast band.

The outer carrying case is an ordinary hinged one made for traveling.

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**8DPO**

(Continued from page 33)

The receiver is of the popular type using Aero Coils and capacitive control of oscillation. The plate voltage is obtained from a Bosch "B" supply and it is found that the knob which controls the detector voltage may be advantageously used as a control of oscillation. It helps greatly in "building up" weak signals. A ground connection to a cold water pipe is used on the receiver. An antenna that is 135 feet long has been found to be the best that has been tried here for receiving.

The station which is located at 136-11th Street, Warwood, Wheeling, W. Va., is the property of Mr. Ross J. Arrick. It is operated by him and Mr. John F. Niess and was constructed by 2AMB located at Woodbridge, N. J.

**Strays**

9CGY had a lot of trouble getting a d. c. note from his transmitter and, after trying everything else he could think of, discovered that what was needed was an adjustment of the center tap of the filament transformer. He finds now that he can change the note from r. a. c. to d. c. just by shifting the contactor on the potentiometer shunted across the filament transformer. Perhaps such a stunt might help some of the notes one hears on the air; it certainly couldn't do any harm to them.

Overheard at the local BCL club, "Well, Sir! I put a lot of thumb tacks along my aerial—I don't know why I did it—but—ad nauseam."—5CO.
DIRECT current supply is available in large areas of many cities and towns, and since the system of distribution smooths it out very nearly flat, it isn't much of a job to take out the residual hum. The beauty of it is that it will furnish A, B and C-power for receiving sets at practically no cost, which (being almost something for nothing) should appeal to the ham. I give below the hook-up I have been using in New York City for the past year.

The diagram is self-explanatory. My choke is an Amertran 418, which will carry 3 amps without appreciable drop. I use "five-and-ten" carbon lamps (115 volts) in series for the divider circuit, from which the B voltages are drawn. Variable resistances may be used instead.

The rheostat controlling the A voltage is reversed, because it is used as a by-pass. The more current is by-passed through the rheostat, the lower the voltage in the tubes, and vice versa. Take an ordinary rheostat (say of 50 or 60 ohms) and mount it backwards, so that when you turn it "on" (to the right) you really turn it "off"—if you know what I mean! The rheostat and voltmeter are both, of course, in parallel with the filaments.

Your reading lamp is used to trim the voltage for the filaments. Since we only take away 5 volts for the filaments, the reading lamp doesn't know the difference, and we continue to use the lamp for the purpose for which it was intended. Of course if you listen in in daylight, the reading lamp is so much waste; but at night the radio beneficially furnishes light for nothing, or the reading lamp beneficially furnishes radio power for nought; as you please. The size of your reading lamp—this being really a check-valve on amps—depends on the size of your set. You can figure exactly, by the IR formula. Allow approximately 32 watts (at 120 volts) per quarter-amp tube or equivalent. Thus, 4 201A's and 1 112 equal 6 tubes, and take 192 watts. A 200-watt lamp will do the trick, the rheostat taking up the slack. Or use a 150-watt lamp and a 40-watt lamp in parallel, and dispense with rheostat and filament voltmeter altogether. I have not used mine in months.

The C voltage is taken off the IR drop in the negative leg, next to the fuse plug. I use a burnt out heater unit for the resistance. It is adjusted to 5 ohms, and is shunted by a potentiometer, and a 4µfd, fixed condenser. This latter may be low voltage and cheap. I use a 807 Dubilier and find it quite good enough. For several C voltages of varying values, which we always need, use several potentiometers. Since all the A and B current passes through this resistance, it is simple enough to design the C resistance for your own needs. In the above case, 1 ½ amps passing through 5 volts gives us an IR drop of 7½ volts. Your potentiometer takes what it wants of this. As Kruse brought out in his article on eliminators in Feb., 1926, QST, a mutual C voltage has a compensating effect on hum, since grid buck's plate.

If you want to use 171's, you will need more C bias—always at the expense of B voltage, remember. To get it, trim your heater element to the correct resistance. These heater elements can be bought new and entire on the sidewalk stores for 50 cents, and contain about 20 ohms of nichrome wire. As you trim C volts off B, you can build up B again by adding B battery blocks in series on the B end. Since this battery block is used, and only partially, for the last tube only, it makes a very economical arrangement. If you are a brave man and possess an electrician's license, go down in the cellar and get hold of the other side of the Edison three-wire system, with its 240 volts, for your higher B voltage on the last tube. This of course will require another filter system.

I have been using tubes a whole year with this hook-up which speaks well for voltage regulation. Occasionally we hear a hum, when their commutators get dirty or rough, but usually it is almost "pure d. c." Since you can get any voltage you want, up to 120, on the filament end, it makes a handy re-activator, if your thoughts run in that direction.

There is no minus B tap, this being taken

*663 Lexington Ave., New York City.
Experimenters' Section Report

PREMIX R-12, existing quiescently for so long on account of the limitations imposed on it by three electrode tubes, has, since the advent of the UX-222, bloomed forth in all its glory. Experimenters' Section Members have been quick to grasp the possibilities offered by the new tube and we are able to present the report and deductions of one of them—the ever-active Lidbury.

The UX-222 as a Short-Wave Amplifier

By F. A. Lidbury

A NUMBER of measurements of voltage amplification with the UX-222 at frequencies between 3 and 18 megacycles has been carried out at this station. It is not believed that the method and detailed results would interest enough readers to warrant publication, but a discussion of the general results is likely to be of service to those who wish to use this tube as a short-wave amplifier. The tube with its associated plate circuit was of course thoroughly shielded, and all leads by-passed and choked; separate B batteries were also used. The method consisted in feeding the grid with an approximately constant voltage (about 25 volts) and measuring the output by a tube voltmeter. A tuning condenser of about 75 picofarads shunted the plug-in inductances in the plate circuit of the 222.

It is found that: (1) Amplifications of nearly 10 are obtainable in the 20-meter band and of over 20 in the 80-meter band, using ordinarily good receiver coils. (2), quality of coils being equal, the amplification increases with the amount of inductance, and roughly as the square root of the inductance. (3), Most coils show an almost flat amplification factor over the tuning range of about 1 octave. (4), Improving the coil by the use of heavier wire than usual, properly spaced, and so on, increases the amplification factor; but a very considerable improvement in coil gives only a moderate improvement in amplification as compared with an ordinarily good coil. The use of a very poor coil, on the other hand, violently reduces the amplification. (5), Slightly higher amplifications are observed on a tube voltmeter using plate current characteristic (high negative bias) than on one using grid current characteristic, (grid leak to positive filament). The small difference will probably not compensate for the considerably greater sensitivity of the latter type of detector, in use.

As the measurements in question were done on a tube voltmeter, it is a question as to how far the results can be applied to an oscillating detector. Measurements, at least reliable ones, under such conditions would be much more difficult to carry out. How the impedance of the tuned circuit in the plate of the 222, looked at from that tube, would be affected, if at all, by setting the detector into which it feeds, and whose tuned grid circuit it constitutes, into oscillation, is an interesting subject of speculation on which it would be useful to get the opinions of some theoretical sharks. Insofar as the present results may apply to those conditions, the first clear conclusion would be to use as large an inductance and as small a tuning capacity as possible, both of course of the best possible quality. As usual there is an unfortunate inherent limit. There is a high plate-to-ground capacity in the 222 of the order of 15 picofarads. This is in shunt with the tuning condenser, so also

THE LATEST 5-METER LOW-POWER TRANSMITTER AT SMP STATION OF DR. E. C. WOODRUFF, DIRECTOR, ATLANTIC DIVISION

In this view the tuned circuit may be seen. It consists of the tuning condenser on the farther support together with the single turn formed by the two copper strips connecting the uprights at the top. The end of the strips nearest the reader are connected by the mica disc stopping condenser, to one side of which the plate supply is connected and from the other side of which the adjustable grid leak goes to filament. The plate and grid of the tube are connected across the variable condenser, thus giving the usual ultraudion circuit with excellent mechanical rigidity.

is the grid-filament capacity of the detector tube, and all the stray capacitances of the wiring, sockets, bases, etc., between the plate of the 222 and the grid of the detector. All told, we have a minimum capacity of something like 25 picofarads, which is inherent in the circuit, and can be reduced very little

*8BAC, 33 Sugar St., Niagara Falls, N. Y.
by such devices as debasing the tube and paying very careful attention to stray capacities. It will be well, however, to select a tuning condenser with an extremely small minimum capacity, and build inductances so that they tune to the lowest desired wavelength with plates "all out". The maximum capacity of the condenser will be determined by the range desired, but at higher wavelengths a better amplification will be obtained by using a larger coil than by using the same coil with a large tuning condenser. The writer hazards the guess that much of the disappointment which has been expressed by amateurs who have tried without much success to use the tube as a short-wave amplifier is due to an improper L/C ratio; too large C and much too small L.

While the coil should be as good as reasonably possible, over-fussiness in its construction will scarcely repay the trouble. A puzzling thing about the writer's measurements was the flat amplification frequency characteristic obtained on most coils. The answer became clear when one of his receiver coils was compared with: (a), a similar coil of much heavier wire (No. 12) and (b), one of much finer wire (No. 36). All these coils tuned from about 25 to 50 m. The receiver coil (No. 22 wire) gave a factor varying little from 11.5 over that range; the No. 12 wire had a factor of 14.5 at the highest wavelength, which diminished to 13 at the bottom; the No. 36 wire had a factor of only 2.6 at the top, and increased to 5 at 25 meters. This increase with frequency is what would ordinarily be expected from any given coil-condenser combination, if that combination were all that entered into the question, but the other capacities mentioned in the last paragraph enter into the argument more and more as the value of the tuning condenser is reduced. The principal of these is the plate to shield-grid capacity of the amplifier tube, (with which can be lumped the grid-filament capacity of the detector). This is connected to the inductance through the tube lead-in wires, which are not the kind of material we should choose when we are trying to obtain a resistanceless resonant circuit! The more our tuning condenser is "out", the more of the circulating current is compelled to travel over these resistances, and this circumstance neutralizes the increased amplification one would expect with a given coil-condenser combination as one reduced the variable condenser with increase of frequency.

(If your coil is so bad that its resistance is larger than that of the tube leads, you get the increased amplification with frequency: but in such cases of course the amplification is comparatively small.) The limitations imposed by this circumstance are likely to become so serious at waves much shorter than 20 meters as to render 222 amplification a practical impossibility, unless Kruse can persuade the R. C. A. to put out a line of tubes with nice fat silver lead-in wires, or something equally good!

Variable A-, B- and C- Power From D. C. Mains

(Continued from Page 45)

care of automatically. Also, no ground is needed on a receiver ordinarily using one. If you do use a ground, be sure and use a fixed condenser, say $\frac{1}{2}$ muf, in series.

Since we want all the inductance we can get in the choke, it will suggest itself to the experimenter to design a special choke in place of resistance $R$, for the C voltage. This would be killing several birds with one stone. Wind 3 pounds of No. 18 enameled wire on a laminated core 1½ inches square. This should carry 2 amperes without running too warm for comfort.

If you run a super heterodyne, and your reading lamp is too bright—a 10-tube set might take 320 watts—scatter the lights among several receptacles, always in parallel, of course. If you can't do this, and don't want so much light, use old fashioned carbon lamps.
Ten O. R. S. Commandments

By John J. Hallahan*

I. Thou shalt not forget to report to thy S.C.M. on the 20th day of each month.
II. Thou shalt endeavor to arrange schedules and faithfully keep them.
III. Thou shalt report these schedules to thy Route Manager each month.
IV. Thou shalt place correct and complete address and date on each message.
V. Thou shalt not permit messages to remain on the book over 48 hours.
VI. Thou shalt not repeat each word twice unless requested to do so.
VII. Thou shalt use directional "Q" when thou hast traffic for QSR.
VIII. Thou shalt keep a file of all messages for at least three months.
IX. Thou shalt use no abbreviations in the text of thy messages.
X. Thou shalt have a good wavemeter and clock in the station at all times.

*2CP, RM No. N. J.

TRAFFIC BRIEFS

An "original" QSL card found its way in from ARV. It's one of the photographic type, and carries a small picture of the transmitter in the upper right corner and of the whole station in the lower left. Connecting these two pictures is a strip containing the call letters. In the upper left corner is a little guy with a big head who says: "Here's what is in my log. OM, and on the opposite corner is the top hunk of an ARRL log sheet, on which he writes the dope on your sign. It's one of the "must be seen to be appreciated" kind.

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K D Z

nKDZ is the call of the present Wilkins Arctic Expedition. TAHB reports working him, and says KDZ's size varied from R7 to 3, i.e., on 331 meters. TAHB got the following message during the QSO: "He may be Fairbanks, Alaska, nKDZ, Mar. 1, 1928—This is the Wilkins Arctic Expedition at Fairbanks Alaska. Pse send word ARRL giving them dope on this contact. Card. Wilkins arrived Fairbanks last Sunday. We are testing radio before installing in airplane. It is installed at radio station in town. Geo. V. Heath is Geo. Stratis, and was QSO with VCR at Nottingham Island, Hudson Straits, on 525 meters.

K D Z

The band between 3.99 and 10.71 meters (30,000-28,000 kc) has been opened to general amateur use by action of the Federal Radio Commission at the request of the A.R.R.L. Now try to 10-meters with some special types of antennas to get it to perform for the real long distance work!

Flash! The band between 3.99 and 10.71 meters (30,000-28,000 kc) has been opened to general amateur use by action of the Federal Radio Commission at the request of the A.R.R.L. Now try to 10-meters with some special types of antennas to get it to perform for the real long distance work!

Intelligence Tests for Amateurs

By John A. Bayles, SAYA*

Question No. 1

S POP has a 5 watt transmitter and QVH 558 times and does not raise a single station. When of the following should he do? (1) Put his set on 80 meters. (2) Put his set on 40 meters. (3) Start calling a few stations. (4) Write a hot letter to QST amusing everybody.

Question No. 2

S TOT had a UX-210. He put 2000 volts on the plate. He has not been heard lately. Why not? Underline correct reason: (1) He is in jail. (2) He is putting in a 250 watt. (3) His UX-210 is deceased. (4) He got married. (5) His license expired.

Question No. 3

The BCL living next door to SMAT has complained about SMAT's key clicks spoiling his music. Which of the following should he do? (1) Tell the BCL to go to Hades. (2) Quit operating from seven to ten PM. (3) Beat up the BCL. (4) Put in a keying filter. (5) Use compensated wave keying.

Question No. 4

SMAT had a good station. He worked all continents on 36 meters. Which of the following reasons explains why he isn't on the air? (1) He moved to Japan. (2) The Electric Co. turned off his juice because he wouldn't pay the bill. (3) He got tired of amateur radio. (4) His license was cancelled for operating off-wave. (5) His key broke down.

Question No. 5

A certain BCL is tired of listening to: "This is the — — hour, sent to you through the courtesy of the — — Co., makers of — — The orchestra will now play — — etc., etc." He wants to get into the ham game and realizes he will have to learn a lot before he can get a license. What is he going to do about it? Underline the sentence which explains correctly: (1) Read the Saturday Evening Post. (2) Go to college. (3) Subscribe to QST and get a copy of The Radio Amateur's Handbook. (4) Buy a copy of Radio News. (5) Ask some hard-boiled ham to help him.

Question No. 6

STAP has a 360-watt crystal-controlled set and a Vibroplex. He doesn't seem to get out as well though. One of the following reasons explains correctly why he doesn't. Which one is it? (1) Other stations don't like his call. (2) He has halitosis. (3) His sending is too fast. (4) His sending is too slow. (5) He is on the air.

*22 Laurel St., Cincinnati, Ohio.

G M D

The Dvait Brazil Expedition has been out for nearly a month. The base station (two 200A's in self rectified Hartley circuit, 1000 volts, 400 cycle plate supply) is expected to be on the air by April 1. During March traffic for the U.S.A. has been coming through fine by amateur radio. 8H1B and KCRF are to be congratulated on their fine work. All amateurs are requested to be on the lookout for GMD's signals and traffic. In addition to the base station a field transmitter consisting of two UX-210's in a P.T.P.T. Circuit with 500 volts B-battery supply will be used for contact with the base sta-
tion. Messages will be sent in semi-code form and addressed to ALLIANCE NEW YORK. Amateurs should work forward to the North American Newspaper Alliance, 68 Park Row, New York City. Amateur cooperation will be greatly appreciated.

GMD will work on the following schedules: Daylight, 29.5 meters between 2 and 5 PM EST, Night, 38.0 meters between 7 and 9 PM EST and midnight to 5 AM EST. Get band and do your part with GMD, OM.

WNP

WNP (Reed via 1FL and 1MK) nr. 469, March 5, To: A.R.R.L., Hartford, Conn. We are back on twenty meters. This band will be used exclusively until the Howard sails for home next September. During the shorter nights we have killed eighty meter signals but the sixty-meter band is again quite reliable. February was a period of stormy weather and bad signals. Eighty meters dropped the lowest and the very erratic. The following stations helped greatly in moving our traffic when regular schedules were not running smoothly: 2V1, 3G2, 5AF, 8BF, 8BN, 9EFH, NCEO. Three stations broke through to us with voice on twenty meter band. 1SZ's new crystal-controlled for... WNP through WGX and the west stations. It had 1MK at 1PM one afternoon. It was also... with "DN" of 9ZT at the kennel. "WW" of this same 9ZT handed us some of the passing of WSA and WPA two husky commercial sparks into hands of RCA to be converter into tube outfits. Wish a station can be of service.

 message with the main mission at Brainard Field, Hartford. The evolution between made for working both transmitters from one... and between working in the 80-meter band... and since the unavailability of the transmitters is a variable to be taken into account. The new installation particularly invites messages for any individual or department at Headquarters. It is requested that inquiries of the Technical Department or Cir... possible with schedules for placing messages for Headquarters or for QSR. You will find him ready for any traffic you have for Headquarters or for QSR.

A.R.R.L. Members everywhere should be able to broadcast messages to A.R.R.L. Members on 83.86 and 41.93 meters (7150 kc) when working in the 40-meter band. A definite frequency will be announced for 40-meter operation in the near future together with a complete list of scheduled points through which you may route messages to Headquarters if you do not shoot them in direct... A pecu... to the station so that 1MK will always be found right on the given point selected for work in the different amateur bands. The frequency will be one to three meters above or below the specified frequency in case of necessity. The new installation is in every respect a "real" station without the disadvantages of its predecessors. 1MK will be found on 85.86 meters (3575 ke) whenever working in the 80-meter band... and on 41.93 meters (7150 kc) when working in the 40-meter band. A definite frequency will be announced for 40-meter operation in the near future together with a complete list of scheduled points through which you may route messages to Headquarters if you do not shoot them in direct to 1MK.

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message with the main mission at Brainard Field, Hartford. The evolution between made for working both transmitters from one... and between working in the 80-meter band... and since the unavailability of the transmitters is a variable to be taken into account. The new installation particularly invites messages for any individual or department at Headquarters. It is requested that inquiries of the Technical Department or Cir... possible with schedules for placing messages for Headquarters or for QSR. You will find him ready for any traffic you have for Headquarters or for QSR.

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A pecu... to the station so that 1MK will always be found right on the given point selected for work in the different amateur bands. The frequency will be one to three meters above or below the specified frequency in case of necessity. The new installation particularly invites messages for any individual or department at Headquarters. It is requested that inquiries of the Technical Department or Cir... possible with schedules for placing messages for Headquarters or for QSR. You will find him ready for any traffic you have for Headquarters or for QSR.

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WNP
When you have traffic for the Philippines, give it to either 6AJM or 6AMM. They both have daily shafts with the Islands, and feel it over in a hurry. 6AJM’s shaft is with op1AD, and 6AMM’s is with op1HR.

You’ll be interested in this message that op1AD sent: “Have just rec’d card from an under-cover ham in Japan. He advises that aj1MPB and aj1JLB are not amateurs but Japanese decode secrets interested on the value of under-cover hams. Suggest that you inform all hams possible and QST. Also suggest boycott of these two stations.—(sig.) op1AD.”

Traffic Brieﬁngs

The Boy Scout Radio Exhibit held in Buffalo some time ago was a complete success. Lots of interest was stimulated in the League and its work, and a total of 275 messages were collected. These were cleared through the cooperation of the AT&SF, B&O, and CS&Y. The demonstration aided in proving to the Scout Council the importance of the amateur, and plans are being made to continue this program. In this report, to introduce transmitters into the Scout Troops. Boys Life, the official Scout Organ, will include a story of the exhibit in its radio section.

During the recent fire at Fall River, Mass., IPE, 1ACH, 1BUB, 1BKQ, and 1ASR were on the air from one to three A. M., ready to help in any way possible. From time to time these stations called Fall River, but received no reply. 1ASR and 1BKQ kept watch for a time, but observed no QRR signals, and signed off at three A. M. 

Didja know that British amateurs hold a QSO party on 80 meters every Monday evening? They say that many “nu” stations come in FB on that wave, and want more of us to keep our ears open for them. 1FL worked 2NH the other night, getting an R7. 2NH was coming through about R4 on 28 meters.

6CCT’s entry card in the International Contest was really different. You see Walt is a member of the Telephone Staff of the Pacific Tel. and Tel. Co., in San Francisco. So he took a piece of paper, printed 6CCT’s entry (Qrd in the International Contest

An interesting little item which appeared in the Northern States Power Co.’s Safety Service Magazine says in part: “On the night of February 7 a select group of amateurs held a surprise jam in the powerhouse of the St. Joseph, Minn., Power Co. Some 150 people gathered in the powerhouse, where considerable damage to the distribution system of the various towns, interrupting service, and destroying all communications by telephone and telegraph. At last report, 28 of Minneapolis, succeeded in getting in touch with 9CAJ, of Pipestone, and arrangements were made for sending material and a crew of men down to help restore service. This is a striking example of the value of the American Radio Relay League, and is likely to result in the forming of a Northern States Power Radio Transmission Service.”

The Daily Argus Leader of Sioux Falls, S. D., carries another story of the same emergency. 9DES, of Sioux Falls, worked together with others of that city, worked long and hard to get into contact with 9CAJ at Pipestone, Minn. From 1:45 P. M. until Midnight, all hands worked and 9DES was doing most of the operating, handling in all over 40 messages for the Power Co., and the other boxes were doing the delivering. 1DMN at Pierre did his share in relaying a lot of DES’s messages. FB work,—all of you!

DIVISIONAL REPORTS

ATLANTIC DIVISION

MARYLAND-DELWARE-DIST. of COLUMBIA—SCM, H. E. Bayton, 301 S. J. L. St. in this state is nearly 100% Naval Reserve with exception of 3A1Q and 3BL. 3AJH is now on 80 meters and thinks it FB. 3A1Q is not on much lately. 3AED is heard in nearly all countries. 3WJ rattle the cans of the west coast gang with his new Y2k set on 3200. 3AM is on the air with a 50 since his 250 went west. 3AUN is coming back on the air with one of ZO2’s 250 watt bottles. FB. 3AO1F is a newcomer in our ranks.
Maryland: 2CFO at St. Michaels came through with his report by letter saying that he is keeping a sked with 3KU and 3ZI but complain of no traffic over his way. 2BFW reports that due to tube trouble he has not been on the air for nearly a month but is now going strong with two five tube transmitters.

Dist of Columbia: We are all sorry to hear that 3CB has signed off indefinitely and has turned in his QSL certificate. 3APX has made application for ORS.

Traffic: 3AJL 1, 3SL 4, 3A9H 8, 3AED 4, 3WJ 3, 3AIS 9, 3BBW 6, 3APX 30.

SOUTHERN NEW JERSEY—Acting SCM, E. G. Kaiser. 2CFO has been hampere by the Tests but turned in a good total just the same. 2BSD lost his Fifty watt and his zop that was the pride of his home. He is now using a P. U. operated oscillator on his 2nd dist. amateurs, and is doing consistent DX and traffic bound now. We have a new ORS project in 3AMI at Merchantville, N. J. 3CBX is a great time house hunting, 3HFL better got 8A VK going to operate in the National Guard, Field Artillery and is just forming in Trenton. 3ZI is still hard at it with sked and RM-SCM duties.

Traffic: 3ZI 171, 3CFG 185, 3AOC 43, 3SJ 25.

EASTERN PENNSYLVANIA—Acting SCM, E. L. Maunder. 2EKF reports that ORS QRTs are excellent. 3GP is sure well skeded, 3EU reports financial QRM. 3AEF will soon be an ORS, 3CNO is a great DX operator. 3DK not run out of ink on his report card. 3RF reports by radio, 3QR in trying new sked. 3VP is taking a week off to build a new circuit over his ORS. 3DQ reports the nonness the arrival of a brand new YL op. 3APJ is in and out of town. 3HH did some clever routine in 2nd dist. amateurs. 3VBW has a pair of 216s. 2AKM has been heard on 5000 cycles.

Traffic: 3EU 327, 3AWT 6, 3CDS 7, 3AYL 8, 3BRH 16, 3BQP 11, 3DHT 11, 3BMS 11, 3LC 20, 3SHF 12, 3SHF 78, 3TWH 12, 3BUJ 129, 3AYV 139, 3CQZ 168, 3ADEF 214, 3GQF 408, 3AKH 441.

WESTERN PENNSYLVANIA—Acting SCM, G. L. Crosser. 3FTX reports that his transformer is resulting from sickness. 3AOS, 3CQX, 3CBE are looking a bit like BCTAs. 2CBE is QRW at school. 3CWE is running an 852. 3BBN worked on a phone. 3HQQ has a subject of SARC is using a 231s as rectifiers as well as a chemical rectifier. 3GI reports using a 231 as a rectifier. 3UGC has a 20 meter sked with 3CWZ. 3SAMU latest reports using a 112A tube in his transmitter. 3AMU tried his set on 20 meters using the 3rd harmonic, and worked 3DHJ. 3SAW has a pair of 216s. 3DWO reports that he has now sked and is now on with chemical again until arc comes.

Traffic: 3SGH 223, 3SOQ 177, 3FXE 38, 3AKI 86, 3BBN 58, 3EA 25, 3CWF 25, 3SOQ 25, 3A1J 15, 3DSK 15, 3CYP 3, 3AGO 5, 3ARC 5, 3BQG 5, 3AWB 3, 3COS 2.

CENTRAL DIVISION

HIO—SCM, H. C. Storck. 3BYH—3BYH, 3DIH. 3BANZ, 3IQR, and 3MIR made the BPL. 3BANZ reports handling some traffic for WSM and some other foreigners. 3IQR is a little timid on account of key clicks to BCL. 3IQR has had a busy month handling over 700 mags from Boy Scout meet-

ings. 3BQK has been away so traffic was slight. 3BUP wants schedules with eastern and southern stations. 3BQF reports his arm still out of commission. 3CBD reports he plans to start DX and traffic in his 210a. 3CDO worked Panama and Tasmania with 7 watts input. 3CPC worked 6th dist. and India, with his new 2000 watt 20 meter sked. 3BIB is using a 60 watt now. 3CRO says Syracuse is alive once again with High North School and Nottingham H. S. building, showing traffic, 

Q ST FOR APRIL 1928

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ALL PUTTING IN AN ALL WAVE TRANSMITTER. DKX was quite decided not to hold the convention in Grand Rapids. 8A1J reports using 600 volts on his 201As and says they are working out good. BCKZ will have a 150 meter band and have 160 wa at the way. 8AJL has a five schedule with sa-2AK at Tela Honduras. 8DED has fifteen schedules per week and you can hear him most of the time. 8HBBK is back on the air with kick and ready for all the traffic you can handle. 8BRS reports trouble with filter condensers on 20 meters so is going back to 15M in 40 watts with a lot of space between. 8HCS has his stall job completed working in 41b. 8ACU reports nothing doing on the tests. 8DIV had the same trouble and is going back to 15M. 8AYT had trouble with power leaks but has been trying forns with 9EGG. 8SF has just started work on 80 meters. 8TLP was not linked up with 8SF and has the old set wide. 8DSF is still using spark coil for plate supply. SNQ will operate another station at New Baltimore soon. 9CEX handled a few during February and is ready to make chemical rectifier on the job now. SCU of "Cherry Tree Fame" foned that in he is back on the air again after his journey and have been busy working on a new receiver using the UX222.

Traffic: 9CFT 18, 9EAY 17, 9SDX 18, 9AUV 11, 9CAY 11, 9FV 8V 12, 8BRS 12, 9CIS 17, 8ACU 13, 9SF 51, 9CFTX 20, 8SNQ 13, 8CIS 35, 8CAT 8, 9DSF 13, 8CIP 29.

9A4C: D. J. Ancrus, 9CAYQ-9EZ, the station at Culver Military Academy is now an ORS and going big. 8EVT handles fine work on 20. 9AIN that no stations are on schedules and plenty of time. 9AEF after 8 years of faithful work has at last worked his first 7. 8AGW says that boras in his rectifier makes his sigs mediocre. 9NTRU has a new transformer and has still problems. 8DDQ is moving to Ada, Ohio. 8CAT and going strong. 8BRV and 8DOT have been busy with auction work.

2NEBO--R: S. M. Linnell, 9CSC along with his friend in Polynesia. 8AZN 1'processed his Elze generic after which an inspection made during the madison Club had its transmitter at the Madison Show and transmitted messages, which made quite a hit. 8CBF now 9EYU has its working on 20G and says that the 9DSC has got the best on account of his transmitter and is moving. 9EQP is a new station at Milwaukee using a 201A on low power. 9CVV is working in the evenings.

9DX reports its 40 below in Siddwells and still the plates get red. HJ 9A2FZ has been on the 16 meter band lately and hears lots of tunes from the DX thanks hard during the past two weeks. 9GSW worked three OA's one morning. 9HBL says not doing much but some schedules. 9DBZ sent in a report for the first time and makes 9DLY not doing anything, rectifier on the blink.

Traffic: 9DLD 40S, 8DTK 265, 9EBO 230, 9EKXH 219, 9CDDT 151 working in 80 watts. 9CAYQ 114, 8AMN 112, 9HPW 87, 8EPW 79, 9JXK 55, 9SMD 63, 8HAE 45, 9DND 35, 9CO 27, 8EYJ 36, 9AYZ 8, 9BWO 17, 9EOX 29, 9CIS 11, 9UYJ 8, 8AMN 10, 9JXK 8, 8AYZ 15, 8BMC 15, 9JSU 17, 9EVE 7, 9AFZ 7, 9BIB 4, 9ELE 4, 9CFT 3, 9EGQ 2, 9DZZ 2, 9BJY 1.

with 9DBZ in his receiver and reports it eliminates power leak QRM. 8BAN works Mexico in Spanish. HJ 9EXM is still handling the 9BDJD 8, 9CSC along with his friend in Polynesia. 8AZN 1'processed his Elze generic after which an inspection made during the madison Club had its transmitter at the Madison Show and transmitted messages, which made quite a hit. 8CBF now 9EYU has its working on 20G and says that the 9DSC has got the best on account of his transmitter and is moving. 9EQP is a new station at Milwaukee using a 201A on low power. 9CVV is working in the evenings.

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Traffic: 9DLD 40S, 8DTK 265, 9EBO 230, 9EKXH 219, 9CDDT 151 working in 80 watts. 9CAYQ 114, 8AMN 112, 9HPW 87, 8EPW 79, 9JXK 55, 9SMD 63, 8HAE 45, 9DND 35, 9CO 27, 8EYJ 36, 9AYZ 8, 9BWO 17, 9EOX 29, 9CIS 11, 9UYJ 8, 8AMN 10, 9JXK 8, 8AYZ 15, 8BMC 15, 9JSU 17, 9EVE 7, 9AFZ 7, 9BIB 4, 9ELE 4, 9CFT 3, 9EGQ 2, 9DZZ 2, 9BJY 1.

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watts. 9HTX despite the fact that he is taking pipe out, the brass as well as the ivories.

9CZU is changing his xmitter to operate on 40 meters this winter. In the usual contest only operating one evening. 9CMM can find much traffic bound for Oregon, Ill. 9CNB is rebuilding his regular on 39 meters. 9CNP reports for the first time and is using a remote-control and break-in. 9CNY using one meters handled a few msgs. 9CHH has increased power in his working schedules with 4VZ. 9CTO sure gets a kick out of the ham game and is still having a fine time.

Traffic: 9EDN 180, 9BCC 98, 9DGR 43, 9AQD 36, 9EUB 83, 9DNS 27, 9DGS 49, 9APJ 32, 9BWW 22, 9DMS 20, 9DLY 15, 9CJS 14, 9DB 11, 9BQT 9, 9BRH 4, 9DIY 2, 9AGL 1.

NORTHERN MINNESOTA--SCM. C. L. Barker.

9GU--The contest bullets and the SCM in this Section is creating no small amount of interest and some lucky boy will be the proud possessor of one of the new shielded grid tubes for handling the largest number of communications. 9BKB is sure getting some traffic as he has been on the air since October is back on again with a 210. 9DTX is a traffic station operating in very heavy traffic this month. 9EAI reports QRN from work. 9DAJ has a schedule with 9OB in Brazil and has also worked 9QW, 9LNO, 9CZU, etc. 9EAU is offering a $15 reward for the information of the wacker in a short time. 9DYA another new man in the ham game and reports traffic not so heavy keeping schedules with 9DXZ. 9OM reports for the first time and is using remote control scheduling with 9BBY. 9HUB 90.

Portage Lake--9BOY 12.

ST.BOR

9DIVA--9EFK reports a bunch of point scorers for the power company to 9CAJ at Pipestone, Minn., during a sleet storm which took down all wires, antennas, etc. 9DWN assisted in relaying messages.

Traffic: 9DWN 180, 9BCC 98, 9DGR 43, 9AQD 36, 9EUB 83, 9DNS 27, 9DGS 49, 9APJ 32, 9BWW 22, 9DMS 20, 9DLY 15, 9CJS 14, 9DB 11, 9BQT 9, 9BRH 4, 9DIY 2, 9AGL 1.

SOUTHERN MINNESOTA--SCM. D. F. Coletta.

9BYA-9EFK Acting--9COS keeps six schedules and is on both 20 and 40. He has been appointed RM. 9CO is strictly a traffic station operating in very heavy traffic. 9COS has been assigned an additional call 9EZM. 9DIY reports a bunch of traffic and is on with 3 cp's. He also reports 9EFO and 9EPE at Dundas. 9COS is on both 20 and 40. He has been appointed RM. 9COS is strictly a traffic station operating in very heavy traffic.

Traffic: 9AMA 701, 9BTT 823, 9JKL 232, 9AMO 199, 9DFE 165, 9DIY 51, 9HXZ 82, 9BMY 80, 9DKJ 70, 9CZL 70, 9BAJ 60, 9AEZ 62, 9SE 57, 9DUS 56, 9CNY 45, 9CBL 43, 9DCK 42, 9UCO 38, 9BDX 35, 9AKM 34, 9DGA 33, 9GDU 31, 9BN1 31, 9CNP 28, 9AHC 25, 9DKJ 23, 9AWX 21, 9DXX 20, 9CIA 19, 9CNB 19, 9AQD 8, 9GAW 19, 9AEU 17, 9EKN 17, 9DEA 16, 9APF 16, 9DAM 15, 9AGU 14, 9DGB 13, 9CNE 11, 9HSH 10, 9BAK 9, 9LTK 9, 9GKX 9, 9HJ 8, 9BMH 9, 9AFL 8, 9HFL 8, 9LS 6, 9ALM 5, 9EBJ 4, 9AJJ 3, 9PHD 2, 9FEG 2, 9CZK 2, 9DAP 2, 9ARL 2, 9CZL 1, 9AVL 1.

DAKOTA DIVISION

NORTH DAKOTA--SCM. G. R. Moir. 9EFN--9BPR is using a Colpitts circuit in his xmitter now. 9GTT has two skeds badly burned with 1500 volts. Tough, OM. 9BRR is rebuilding his xmitter now and says it sure is FB for steady note. 9DVA was off for a week getting his storage battery charged. 9DVA has no QRW to do much traffic work. 9BVF put up a Zepp and it seems to work OK. 9DMU is using a Keycode 500. 9DKJ 9.

Traffic: 9BPR 72, 9GUT 72, 9BRH 71, 9DVA 7, 9BVF 79, 9DMM 52.

brought to you by SCM.--SCM. F. J. Beek. 9DB is the traffic is picking up again with most of the stations active and many keeping schedules. 9DWN leads again working schedules on 80. 9BCJ ran up a bunch of point scorers but had a few low last day. 9DQR has an 862 going FB on traffic. 9AQD and 9EUB have good scores on 40 and are starting skeds. 9GHF, 9BAP, 9DTS are all P, with lots of punch. 9BOW, and 9HRI ran up a few points in test and keep a couple of skeds. 9NMM has been QSO to a bunch out doing work in a regular way through the tests. 9DLY shielded his xmitter and worked oz first try. 9OM. 9CJS reports new station in Bryant, 9FEZ. 9DB works DX when power back good.

9DTX got new 222 R F amp. 9AGL has outfit going FB on 80. 9TI is building a new station on 222. Sure 9EUA is getting out FB on low power. Practically all the stations in the state have enrolled in the S.Dak. As secondary net, 9EUA has been QSO to other nets and msgs. for the power company to 9CAJ at Pipestone, Minn., during a sleet storm which took down all wires, antennas, etc. 9DWN assisted in relaying messages.

Traffic: 9DWN 180, 9BCC 98, 9DGR 43, 9AQD 36, 9EUB 83, 9DNS 27, 9DGS 49, 9APJ 32, 9BWW 22, 9DMS 20, 9DLY 15, 9CJS 14, 9DB 11, 9BQT 9, 9BRH 4, 9DIY 2, 9AGL 1.

ARKANSAS--SCM. W. L. Clippard, Jr. 9AIP--Prospects look much better for the Arkansas band than they did last December. 9CMM has been QSO to a bunch out doing work in a regular way through the tests. 9DIY is QRW with new 222 R F amp.
Traffic: 5ABF 88, 5OK 19, 5JK 11, 5API 9, 5AVA 6, 5SS 2, 5AQX 2.

MISSOURI—SCM, C. A. Freitag, 5UK—5AQO put up a new 30 foot mast especially for the International Tests but got no results. SCM says that it is not enough. SCM is still working and messages can be delivered anywhere now. Weather conditions not very good. SCM is rebuilding his transmitter into a TPE-100, etc. 2XL-210. 5RD is keeping two schedules which are going fine, also he is QCK school. There is only one of the guys here who interested in 5 meter work (5AE) and his transmitter is not yet completed.

Traffic: 5QJ 18, 5AQO 1, 5PM 25, 5IE 7, 5RD 7.

MISSISSIPPI—SCM, J. W. Gullet, 5AKP—The amateur outlook in this state is very bright as several new stations are being heard on the air now. 5AE is running 25 watts and will have a new crystal spaced QSO for the month of March. 5AQO is now on 43 meters. 5AGD is rebuilding his transmitter into a TPE-40 2, 5AQX is in operation. Let's have those reports. 5ARF is now transmitting on 40. 5AKP is now on 32 meters and is doing good work. 5ANP is transmitting on 40 meters. 5AJJ who has a boat equipped with radio has radio up for the 40 meter band and is glad to hear 5AQO has a 40 watt Signal Corps tube on 20 meters and is putting on 50 meters a ud is doing gfnl work. 5ANP a D 5AJJ 3 watts, is in full force very shortly. 5ACP has actually sent in a word report and reports going to 20 meters. 5ABR finally hooked his brother 5DR and showed thru lots of traffic last month. The Knoxville radio handled some traffic. 5ARZ handles lots of traffic belo R sake with him now. 5ADI says he will be out of town. 5ABR and 5ADI are getting along. 5ACU and 5ADD is dormant. 5AGL handled more traffic than ever and is going strong. 5AGS is hearing some WNP traffic. 5ABR 14, 5API 10, 5TD 2, 5ADI 2. They will be dropped shortly if no traffic is handled. 5AGS still insists on putting no messages handled and communicates with the SCM. 2AT is back from a trip and reports he handled some WNP traffic. 2ASZ "will have reported no new DX. 2EY still has trouble with the RI re license renewal. 2JC steps all over the globe and handles traffic. 2DK has a transmitter in one end of the room and makes the DX. 2EX is on the air and is QSO on all bands. 2BY, 2ANG and 2MD are new ORS. Some ORS are in operation. 2GQ is in operation. 250 watts and 2MD is putting on 40 meters. 2QRZ is also put down in the traffic lists. The ORS amateurs put out on a traffic contest with a 210 as prize. 4AZB topped the prize with about 140 mps. He plans to have another to send out to 40 hours a week. 4ABB and 4ADI are getting along OK. 4ABR turns his first good report in.

Traffic: 4ABF 18, 4FX 87, 4LX 26, 4JK 22, 4ACP 16, 4ABB 14, 4SP 10, 4TD 2, 4ADI 2.

HUDSON DIVISION

NORTHERN NEW JERSEY—SCM, A. G. Wester, 5ABF—The weather makes this month rather dull. 2WR is on the air and is QSO on all bands. 2BY, 2ANG and 2MD are new ORS. Some ORS are in operation. 2GQ is in operation. 250 watts and 2MD is putting on 40 meters. 2QRZ is also put down in the traffic lists. The ORS amateurs put out on a traffic contest with a 210 as prize. 4AZB topped the prize with about 140 mps. He plans to have another to send out to 40 hours a week. 4ABB and 4ADI are getting along OK. 4ABR turns his first good report in.

Traffic: 4ABF 18, 4FX 87, 4LX 26, 4JK 22, 4ACP 16, 4ABB 14, 4SP 10, 4TD 2, 4ADI 2.
cause he could not get out and then pulled an R from the station to the front. 9E6E is JRW washing machine business.

Traffic: 9DGX 175, 9BUF 5, 9BLP 3, 9BH6 46, 9CCQ 32, 9AFY 54, 9DRU 19, 9HGX 5, 9CFW 12, 9GKV 52, 9ERM 12, 9LN 17, 9JU 17, 9JRL 8, 9HI 1.

Traffic begins. B. Diehl, 9BXY—Our observer says he'll resign if there isn't more business in his line soon. 9CTJ, 9AW3 and 9CGQ fell flat again this time. 9ANZ hit good in the inter- normal report. 9DVR is working to perfect his filter between licks on the railroad. 9GDB is rebuilding his transmitter which has QSS caused from power line and QRM from power leaks, etc. 9EBL blew his plate transformer. 9GJY turns in first report which is a dinger. 9DVX after testing with the BQL finds that his set does not touch any of them except a few single circuits. 9AGP reports—SCM, J. B. Laizuere, 9RR—9DOE and 9H4Q led in traffic in St. Louis this month. 9HEQ tried the tests but had too much power lack QRM to do combined DX and traffic work. 9EHI was on 20 mostly and traffic suffered. 9DLB worked the 30 band and handled a good total. 9BLM increased his total over January. 9DZN had a good month. 9AJO has been authorized to work in new 10 meter band. 9BLK kept a 50 on 80 meters and another 50 on 24.1 meters but the 250 on 41.6 was QRT due to blown tube. 9DJD is now an OBS. 9DGX hit the QRM, the OPP for deliveries. Schedules helped raise his total. 9BEQ was lost this month. 9ABA handled a lot of test messages. 9BMM? Everything was handled by the OPP. 9CRM had an excellent traffic report and got 60 report from Loudon on 80 meters. 9CQX reports several new hams and a good total. 9DOR has the BPL with 5 skeds in effect. 9BUB is recovering from a siege of illness. 9BQX has been kind of neg/ereting the 80 meter band. RP who hails from the West, turned in a fine total this time. 1AJC turned in a fine report, showing that Portland is still finds time to pound now and he couldn't find anything left to report. Hi, 1AOQ is working a few on 20 and 1ASR has been doing well on the 10 meter band doing a bunch with his 201A, and worked Kansas City with an input of 2.3 watts. 1AEF, in spite of a blown transformer, worked hard and hit DX in a real hurry last month. 1AIR is on 20 mostly and traffic suffered. 1ANK is a new station reported by him. 1BFT reports a bunch of stations and ops at Nah. Ooo! and the 1BE5 is hit and 1AKS is working an USNR organization under way and desires to hear from Bangor and Portland hams who are interested in putting their respective cities on the map with a real home-towner. 1AVG, 1B3S 5, 1EMO 1, 1APX 14, 1PEX 17, 1BLF 14, 1AJC 31, 1BFX 18, 1ASM 10, 1AKR 7, 1HS 2.

NEW HAMPSHIRE—SCM, V. W. Hodge, 1ATJ—Traffic this month was scarce due to the many stations taking part in the Tests. 1IP pumped out a bunch with his 201A, and worked Kansas City with an input of 2.3 watts. 1AEF, in spite of a blown transformer, worked hard and hit DX in a real hurry last month. 1ANK is a new station reported by him. 1BFT reports a bunch of stations and ops at Nah. Ooo! and the 1BE5 is hit and 1AKS is working an USNR organization under way and desires to hear from Bangor and Portland hams who are interested in putting their respective cities on the map with a real home-towner. 1AVG, 1B3S 5, 1EMO 1, 1APX 14, 1PEX 17, 1BLF 14, 1AJC 31, 1BFX 18, 1ASM 10, 1AKR 7, 1HS 2.
fact that he was QRV accounts for small totals sayy. D.D. at the point, and fast. Our RCT.

wires are going pretty smoothly now with 1VR, 1MR, 1RL, 1AQE, IJM and 1UE taking part, 1KY, the YC, we don't know what is wrong with the ORS. 1FL had a lot of the fun. Parade was born at 5:47 A.M. for the New England Convention to be held in Boston at the Elks Hotel Apr 20 and 21st. It should go over big and will surely go over with the cooperation of the gang. Let's all plan to attend and meet one another.

Traffic: 1 HOA 26, 1 FM 356, 1 LM 198, 1 JWV 196, 1 KY 135, 1 KH 61, 1 ACH 86, 1 UE 14A 1BAI, 1 HYC 47, 1 ISL 27, 1 AGB 24, 1 ASI 23, 1 AHV 25, 10N 7, 1 ATW 11, 1 ALV 1, 1 BLW 8, 1 APK 46, 1 ACA 46, 1 IV 12, 1 AMD 2.

WESTERN MASSACHUSETTS -- SCM, A. H. Curtiss, 1 M. This is quitting the game. Sorry to hear it. "Kit" Duval is operating the station the OM under his own call 1AMW. 1AKZ says he would like to know what part of the 20 have come from Hawaii. An OM has been on the air regularly in his vacation periods. 1ANI has joined the Naval Reserve net. 1APL kept a bunch of scores as per usual and had a fine traffic total. 1AZD says he is just catching up on lost sleep after the contest. 1BVH has at last got back on the air again and says he hopes to be on regularly. 1BKY is now the call of the radio club here and they have several ops. 1ANI says anybody that isn't writing to him. The Springfield Radio Assn. have their new station nearly ready. 1PY has moved but says he will be on the air again soon. 1IL of Springfield, Mass., a new ORS. Looks like him the best of luck.

Traffic: 1 AJK 5, 1 AAM 38, 1 AKZ 30, 1 ADO 15, 1 IAMZ 13, 1 IAN 98, 1 IAPL 161, 1 ASU 2, 1 AZO 266, 1 IAMW 6.

RHODE ISLAND -- SCM, D. B. Chandler. 1DB--Sickness in the family has kept IAMU off the air this month but he says that a trip put a crimp in his traffic this month. 1AME's DX reads like a geography, and his traffic total isn't so bad either. 1BDR says that 3 points in the Contest and the Contest suffered, 1EJ sends his traffic report but no news so don't know what he is doing. 1BHT booked WNP this month and got the bulk of his traffic on 40. 1AJC is still pro and 1BVH has backed to the Hartley circuit as the other couldn't be made to work satisfactory. 1BHL handled some emergency traffic that big Fill River Fighters all who are entitled to a ticket are requested to write the 7MH. Better cooperation will mean more and better ORS.

Traffic: 1 TEC 364, 7 MH 45, 1 TQ 27, 1 ABB 21, 7FU 20, 7 TP 18, 7 UN 13, 1 AEK 7, 1 AKK 5, 7HV 4.

WASHINGTON -- SCM, Otto Johnson, 1FD--New ORS are 7BM, 7BB, 7ACA, 7QG, 7BR, 7DF, 7EK, 7VK and 7AG. Tommy Baird, 7VL, of Spokane, has been appointed RM. East Coast constructions tells us that it is expected that traffic totals will begin to show a healthy increase. The small totals this month are due largely to the contest. Next month will be another story. The new ORS are all live wires and 10 is hoping that the nice certificate will inspire hwar to mark time in the first month. ORS who were not reappointed but who believe they are entitled to a ticket are requested to write the 7MH. Better cooperation will mean more and better ORS.

Traffic: 7 TQ 22, 7KO 31, 7VL 14, 1TX 12, 1AFQ 9, 7MP 8, 7TZ 7, 7TV 7.

PACIFIC DIVISION

LOS ANGELES -- SCM, D. C. Wallace, 6AM--6AM is keeping some good schedules and one message handled from Phoenix covered 16,000 miles before it reached its destination. 6AM has good schedules. 6BZ is still rebuilding and is putting up a Hertz soon. 6QL has a chat with OM Russell of Lonet. 6BFP handled some traffic from China. 6AWQ extends a general invitation to the gang to come to Lake Arrowhead and pound brass to their heart's content, day or night. 6DXX located a good DX position through 6AG. 6DKX is now using a 100 watt transmitter, but 51,e still refuses to give up the air. 6FLZ put in more power there and gets the new to her field. 6ALZ says XKV3 is a lumber screw not worth mentioning. 6ALZ would like to hear from eg-5SW on 20 meters. 7AAT-QT now has a 900 cycle antenna. 6BTS will be back on with a 210 and a 500 volt MG. Those, in this part of the country, interested in copying the official broadcast from this section can get them through 7AAT on 38.2 meters at 5 pm MST every day except Sundays. 7AFM on 40 meters 9 to 11 pm daily ex. Sun. 7TQ, 7TP, 7VL 21, 7UN. 1 pm 21 meters. 5 pm, 42 meters, 11 pm 88 meters. 7AAW, Mon. Thurs. Sat. and Sun. and 7ABU, 7FX 7 pm. 47.64 meters. 7DH, 7FL, 7IV, 7MP, 7TV.

Traffic: 7AJU 39, 7EL 21, 7DD 20, 7ATU 14, 7AFM 11, 7FL 6.

OREGON -- SCM, R. H. Wright, 7PP--7PP takes this opportunity of attending this month. 7PP is using TG-TP circuit. 7TU is using the 100 watt transmitter, but 51,e still refuses to give up the air. 7FLZ put in more power there and gets the new to her field. 7ALZ says XKV3 is a lumber screw not worth mentioning. 7ALZ would like to hear from eg-5SW on 20 meters. 7AAT-QT now has a 900 cycle antenna. 6BTS will be back on with a 210 and a 500 volt MG. Those, in this part of the country, interested in copying the official broadcast from this section can get them through 7AAT on 38.2 meters at 5 pm MST every day except Sundays. 7AFM on 40 meters 9 to 11 pm daily ex. Sun. 7TQ, 7TP, 7VL 21, 7UN. 1 pm 21 meters. 5 pm, 42 meters, 11 pm 88 meters. 7AAW, Mon. Thurs. Sat. and Sun. and 7ABU, 7FX 7 pm. 47.64 meters. 7DH, 7FL, 7IV, 7MP, 7TV.

Traffic: 7AJU 39, 7EL 21, 7DD 20, 7ATU 14, 7AFM 11, 7FL 6.

WASHINGTON -- SCM, Otto Johnson, 1FD--New ORS are 7BM, 7BB, 7ACA, 7QG, 7BR, 7DF, 7EK, 7VK and 7AG. Tommy Baird, 7VL, of Spokane, has been appointed RM. East Coast constructions tells us that it is expected that traffic totals will begin to show a healthy increase. The small totals this month are due largely to the contest. Next month will be another story. The new ORS are all live wires and 10 is hoping that the nice certificate will inspire hwar to mark time in the first month. ORS who were not reappointed but who believe they are entitled to a ticket are requested to write the 7MH. Better cooperation will mean more and better ORS.

Traffic: 7 TQ 22, 7KO 31, 7VL 14, 1TX 12, 1AFQ 9, 7MP 8, 7TZ 7, 7TV 7.
receiver is great. His 6 phase transmitter was described in February QST. He has also been acting as chairman of the control committee for the Radio Trades Ass'n, of Southern Calif.

Traffic: 6AM 128, 6BSN 116, 6BJH 68, 6BZ 68, 6BHJ 26, 6DXJ 41, 6GCG 25, 6CHL 22, 6CCT 19, 6DOU 16, 6COT 16, 6ANN 16, 6DPK 16, 6BXD 15, 6DGT 15, 6CUC 11, 6CAI 11, 6AKW 10, 6GDG 10, 6CHL 9, 6GSM 9, 6BGT 8, 6BRS 7, 6ALS 7, 6LGR 6, 6DGY 3.

SANTA CLARA VALLEY—SCM, F. J. Quenmont, 6BSH. He has been in the city this month but notwithstanding the traffic seemed to move the same as other months. 6AMM was badly handicapped by power leaks, but the PI shook still held up. 6CHL in the 7-8 area is equipped with a 20 watt transmitter and is showing a gain each month. 6BMW got his crystal going on 20 and reports everything FB. 6BMW is the only one of the new 6CLZ transmissions that is working with very much regularity. 6CLZ is being greeted by a full house. 6CMJ has a 20 meter Zepp that works FB. 6CLX 34 has had trouble with his generator and had to close up. He has a 20 watt transmitter and is working DX and handling some traffic. 6CMJ has a WAC he has sold his fifty and uses 15 watts. 6DJM leads the Section in the recent Tests. 6BMN finds lots of traffic on the 50 band. 6BNK keeps doing his thing, is working off a pile of files, 6BQ still finds time to handle some traffic and sticks to ultra-audion transmitter. 6BZL 15 has been busy trying to line up more amateur traffic. 6DJM has been appointed QSO for Orange County. 6EC has been appointed 60. 6BRI is building a new 60 TT-TG. 6CNK keeps two skeds. 6BQZ has been his groucho and 6BNX has been his ronko. 6BSH has been his mainstay. Sorry to see you go, OM. 6FH has cleared up a pile of trouble for the BCLs and amateurs in San Diego and vicinity. 6DQX was heard on the air again recently. He plans on trying out the 10 meter band. 6BFE is QVR digging ditches. 6BDE has a superhet working on 10 meters and reports heard a third district station working. 6BQJ 26 is working for the 6th Dist., Mr. Linden, held examinations in the Federal Bidg., San Diego, recently and was greeted by a full wagon. 6BQJ 26 is a control person in the competition.

Traffic: 6BXI 216, 6AJM 188, 6BAM 158, 6EC 125, 6BQ 98, 6BYZ 48, 6BW 22, 6CNK 18, 6DAU 14, 6PP 14, 6OX 9, 6BAS 9, 6DJM 9, 6DKM 6, 6BYZ 6, 6DJM 6, 6UO 5.

Nebraska—SCM, F. L. Fullaway, oh6CFQ. The an­
nouncement that 6CLZ is going to try some new QSL cards was greeted by a full house. 6CMJ has a 20 meter Zepp that works FB. 6DJM thinks that all get along.


ROANOKE DIVISION

NORTH CAROLINA—SCM, R. S. Morris, 4JR—
4DQ is going up to 80 as much "see QSL out 73" on the air. He is still out of town for traffic lately. 4BQ is trying to catch up with 4AB but missed again. 4AJD is increasing the capacity of his Edison battery plate supply, and has had fine luck in the International Tests. 4EC is now located at New Bern and punching the key with 4EA. 4EA is going strong with a 250 watt. 4OH had trouble with his key but is back in the tests. 4JR has been QRV tests and convention. 4JR 116, 4WH 78, 4DB 60, 4EC 19, 4JR 9, 4EA 8, 4DQ 6, 6AV 4.

WEST VIRGINIA—SCM, H. S. Hoffman, Jr., 8HD
8VZ did some fine work on schedules using one 60 sec. working 6CDU reports receiving 6PP 36 on 15 and 40, 6CDU reports receiving 6CG 30 on 15 and 40, 6CDU has his antenna working on 30, 6CDU has his xtal control set going now on 40 meters. 6SAO is a new ORS although an old timer coming from Cali­fornia and reports being in bad shape again after two months missed. 6AZM says local ORM makes it almost impossible to work through. 6BWZ says that 6DAU, 6EMN and himself have the west coast going now, 6EMN and himself have the west coast going now, 6CLZ 794, ex-9AD1 of Colo. Springs using a 20A4 in Harley with recto bulbs. 6DSA is a new station but has the tone back of the key using a small 6DQZ 6B and very rare are 500 meters of it. 6DRH says its very difficult to QSR Calif. on 80. 6BMW leads the state in messages this month.

Traffic: 6BFL 97, 6CPX 34, 6BNW 116, 6BNU 10, 6ANO 56, 6DRH 116.

ARIZONA—SCM, D. B. Lamb, 6ANO—6BDF rec­
ports reports receiving some inizona stations in bond and again after two months missed. 6AZM says local QRZ makes it almost impossible to work through. 6BWZ says that 6DAU, 6EMN and himself have the west coast going now, 6EMN and himself have the west coast going now, 6CLZ 794, ex-9AD1 of Colo. Springs using a 20A4 in Harley with recto bulbs. 6DSA is a new station but has the tone back of the key using a small 6DQZ 6B and very rare are 500 meters of it. 6DRH says its very difficult to QSR Calif. on 80. 6BMW leads the state in messages this month.

Traffic: 6BFL 97, 6CPX 34, 6BNW 116, 6BNU 10, 6ANO 56, 6DRH 116.

SOUTH CAROLINA—SCM, C. F. Mason, 6BSH—The SCM reports enthusiasm picking up.

Traffic: 6BFL 97, 6CPX 34, 6BNW 116, 6BNU 10, 6ANO 56, 6DRH 116.

SACRAMENTO VALLEY—SCM, C. F. Mason, 6BSH—The SCM reports enthusiasm picking up.

Traffic: 6BFL 97, 6CPX 34, 6BNW 116, 6BNU 10, 6ANO 56, 6DRH 116.

STANFORD DIVISION—SCM, C. F. Mason, 6BRS—The SCM reports enthusiasm picking up.

Traffic: 6BFL 97, 6CPX 34, 6BNW 116, 6BNU 10, 6ANO 56, 6DRH 116.

HAWAII—SCM, F. L. Fullaway, oh6CFQ—The an­
nouncement that 6CLZ is going to try some new QSL cards was greeted by a full house. 6CMJ has a 20 meter Zepp that works FB. 6DJM thinks that all get along.

Traffic: 6BFL 97, 6CPX 34, 6BNW 116, 6BNU 10, 6ANO 56, 6DRH 116.

QST FOR APRIL, 1928
back soon. 3BZ attended the board meeting at Hartford and has the usual tinkering with his \text{t}x\text{a}t set. He and 3CKL are enroute Charlotte convention.

Traffic: 3KU 126, 3CEB 38, 5JT 22, 5WM 9, 3TW 64, 3JO, 4IO, 5OBS 8, 5AO 10, 5NM 2, 3EI 4, 3CKL 21, 5CA 119.

**ROCKY MOUNTAIN DIVISION**

COLORADO—SCM, C. R. Studman, 9CAA—\text{g}E\text{AAM}
called 3DZ now has the usual routine on his receiver and is
still looking for a mercury arc rectifier. \text{3DQD} is on the
transcontinental route now and says traffic has been
routP Charlotte convention, on a transcontinental route now and says traffic is
in Hartford attending the Directors meeting. 9EJW
is going to try 80 meters—maybe. 9DQV has been
Field. They
Hi. 4IDGJ has been on but says no traffic. 9EEA was
working in first days but says no traffic. 9CAW finally got his receiver
is as active as ever. 3BRC is rebuilding for 40 meters.

Traffic: 9EAM 284, 9CAA 98, 3DDQ 67, 9ENM 20, 9DRV 18, 3DQY 7, 9CDE 5, 9CAW 16.

**SOUTHEAST DIVISION**

LABAMA—SCM, A. D. Trumb, 5AJP—\text{6AKK}
sent in a fine one about Birmingham. 5AX
is old and with indoor antenna system. 5BP is off the air until
his license returns. 5MI is on again with only 50 watts. 5SO
with the old reliable Bell and Ansley are on now with an 852 with 2000 AC. 5ARG, the
ship has been on since long and has a 5AXN and seems to be working out splendid on a 210. 5AXN has a 200 watt Telefunken
generating fine and working all countries. 5WQ
not on good but is the world's fire. 9DR has been too busy with the international tests to do
much traffic work. 9CAW finally got his receiver working in the first class shops but the way of the
transmitter jumps all the way from WIR to WIR. HI. 9DQJ has been on but says no traffic. 9EEA was
in trouble tuning the first days but says 9DR is as active as ever. 9BRC is rebuilding for 40 meters.

Traffic: 9EAM 284, 9CAA 98, 3DDQ 67, 9ENM 20, 9DRV 18, 3DQY 7, 9CDE 5, 9CAW 16.

**WEST GULF DIVISION**

SOUTHERN TEXAS—SCM, E. A. Sahin, 6YK—\text{17}
One of our new stations is 5RV of San Antonio. We are glad to get your most interesting report,
OM. 5AN, Robert. The Field. They have a fifty watt set under the call of 5FR. 5AS, the old Mopar on, is xing on 20 with indoor antenna system. 5BP is off the air until his license returns. 5MI is on again with only 50 watts. 5SO
with the old reliable Bell and Ansley are on now with an 852 with 2000 AC. 5ARG, the
ship has been on since long and has a 5AXN and seems to be working out splendid on a 210. 5AXN has a 200 watt Telefunken
generating fine and working all countries. 5WQ
not on good but is the world's fire. 9DR has been too busy with the international tests to do
much traffic work. 9CAW finally got his receiver working in the first class shops but the way of the
transmitter jumps all the way from WIR to WIR. HI. 9DQJ has been on but says no traffic. 9EEA was
in trouble tuning the first days but says 9DR is as active as ever. 9BRC is rebuilding for 40 meters.

Traffic: 9EAM 284, 9CAA 98, 3DDQ 67, 9ENM 20, 9DRV 18, 3DQY 7, 9CDE 5, 9CAW 16.

GA-S.C-Cuba-Porto Rico-Isle of Pines—SCM, H.
Loft, 4KU, sends us the routine on his receiver
and only made 99 points in the international
tests and his best DX was on-65A. 4KY had a
new report and has five skeds arranged. 4AS sends
traffic for the So. Florida Fair. 4KD has been
received a fine letter of recommendation from the Corps Area Signal
Officer about the low wave work he has been doing lately. 4FE lost his place as transmitter and is
rebuilding pending the arrival of a new one. 4PA is
being reported in England with a 201-A with 160
watts on the plate.

Porto Rico: 4KD sends us the dole on the PR gang
but claims that they are not coming through as they should. 4AAK handled news of Lindbergh's Caracas
and Thomas. 4TJH says traffic is coming along
generally ahead. 9ENM is kept busy training HCLs to
become has via the code class. 9DRV is on 20 now and 3500 AC. 4RXV, has been
experiencing and so was not on much. 9CM has to
to cover her set up every time it snows so it
won't get wet. 9CAT put in an hour in a motor generator set
and was able to set the world on fire. 9DR has been
too busy with the international tests to do
much traffic work. 9CAW finally got his receiver working in the first class shops but the way of the
transmitter jumps all the way from WIR to WIR. HI. 9DQJ has been on but says no traffic. 9EEA was
in trouble tuning the first days but says 9DR is as active as ever. 9BRC is rebuilding for 40 meters.

Traffic: 9EAM 146, 4AAM 17, 4AB 24, 4KY 186, ARN 78.

PORTO RICO—SCM, C. D. Tatum, 4KU—\text{3EDZ}
Spending the first days but says 9DR is as active as ever. 9BRC is rebuilding for 40 meters.

Traffic: 9EAM 284, 9CAA 98, 3DDQ 67, 9ENM 20, 9DRV 18, 3DQY 7, 9CDE 5, 9CAW 16.
CANADA

MARITIME DIVISION

N

OVA SCOTIA—SCM, W. C. Borret, 1D—
This is the first time for three months that the Nova Scotia Section has been included in the Maritime version due to the fact that only 1AE has taken the trouble to send in his report. The SCM cannot make up reports from his imagination. 1AE has schedules with 4IU, VCE and VBY and has done most of his working on 25 meters. 1AR, 1DJ, 1DD, 1AC, 1AW, 1CC, 1DQ are all located in Halifax at present but activity is rather small. People are on the move for a young convention. The SCM would welcome suggestions from Nova Scotia members of the ARRL as to how to revive interest.

Traffic: 1AE 42.

ONTARIO DIVISION

ONTARIO—SCM, W. V. Sloan, 9JG—9JG GOES OVER THE TOP DURING INTERNATIONAL TESTS AND LEADS DIVISION BY SCORING OVER 90 POINTS. VCB AND VBY, FAR NORTH OF QUEBEC, ARE BOTH HAVING MUCH SUCCESS USING THE VACANADIAN STATIONS MAKING REGULAR USE OF 62.5 METERS. Southern Dist: 3IA turns in a rather busy month and Tea is getting out very well. 3DI is working actively on a new tucker plate converter. 3DZ has been busy most of the month on 20 meters. 5AD would like schedules on 40. He is on the air very little. Central Dist: 3EL has at last got his N. E. 250 on the air and is getting out in good shape. 3DY has been on the wrong end of a good set this past month and has been prevented from hamming much because of business QRM. 3BL has been as busy as usual, but this month we have no details. 3AL, again enters the BPL with 60 deliveries. 3BL has rebuilt and has skeds on 80, 3GO says 20 is FB and worked se-2AS in daylite. 5BR's total dropped this month due to very few people on the island and it is hard to originate msgs. 5AD has a new ORS and is rebuilding the for the spring rush. 5A9, tested out on the 14th and will be on regularly soon. The gang at 9AJ are going to build a new clubhouse. 4GL is always ready to boost ether again, 5CT is thinking of rebuilding again. 3DI says he has got a new trans that is coming. 5B,T is getting the shack fixed up. 5CO says it is hard to get skeds. 5ARR is on 60 and worked some nice DX. 4FA is a new ORS and is rebuilding his QRM. 4FB is second best and has skeds on 80. 5GO says 20 is FB and has worked many stations on this band. 4DD has been travelling with 200 miles a day. 4GB reports a new man active in BCL but this month we have no details. 3BE is on the air and getting out very well. 4FC has been messing around with phone and reports working New York with it. 4GI is on the air very little during the past month and 3XQ has been in Montreal for most of the month. Northern Dist: 3IN on 40 has a new rig on 25 and 3XI is working with a 320 tube. 3BY has been thinking of changing his attention to secondaries fed by his crystal controlled set. The Hamfest was held at station 5AU and our newest station, 5JG, has already been heard in a number of emergency sets for his company. 5AD expects to be using once on 20 meters soon. 2FO has sold out his entire outfit, but still insists that he is not through with the game. 2AC is changing his set from YL to OW. Congratulations. 3BJ has been QSO England.

Traffic: 29PB, 2AL 17, 2BR 19, 2BH 13, 2BG 6.

VANALTA DIVISION

ALBERTA—SCM, A. H. Asmussen, 4GT—4AH after rebuilding, turned in a fine msg total due to having skeds on 80 and 40 meters. 4BV is third and has worked some nice DX. 4PB is a new ham and turns out in good form for a young enthusiast. The SCM would welcome suggestions from their code practice skeds. 4BV is the New Sec. of the Area.

Traffic: 4AH 66, 4PF 27, 4CU 29, 4FR 20, 4CC 16, 4AD 11, 4AF 9, 4HM 9, 4HA 8, 4GJ 6, 4GD 6.

BRITISH COLUMBIA—SCM, E. S. Brooks, 5JG—5JG again enters the BPL with the delivery. 5JG is a runner up and has skeds on 80 and 4G8 says 20 is FB and worked se-2AS in daylite. 5BR's total dropped this month due to very few people on the island and it is hard to originate msgs. 5AD has a new ORS and is rebuilding the for the spring rush. 5A9, tested out on the 14th and will be on regularly soon. The gang at 9AJ are going to build a new clubhouse. 4GL is always ready to boost ether again, 5CT is thinking of rebuilding again. 3DI says he has got a new trans that is coming. 5B,T is getting the shack fixed up. 5CO says it is hard to get skeds. 5ARR is on 60 and worked some nice DX. 4FA is a new ORS and is rebuilding his QRM. 4FB is second best and has skeds on 80. 5GO says 20 is FB and has worked many stations on this band. 4DD has been travelling with 200 miles a day. 4GB reports a new man active in BCL but this month we have no details. 3BE is on the air and getting out very well. 4FC has been messing around with phone and reports working New York with it. 4GI is on the air very little during the past month and 3XQ has been in Montreal for most of the month. Northern Dist: 3IN on 40 has a new rig on 25 and 3XI is working with a 320 tube. 3BY has been thinking of changing his attention to secondaries fed by his crystal controlled set. The Hamfest was held at station 5AU and our newest station, 5JG, has already been heard in a number of emergency sets for his company. 5AD expects to be using once on 20 meters soon. 2FO has sold out his entire outfit, but still insists that he is not through with the game. 2AC is changing his set from YL to OW. Congratulations. 3BJ has been QSO England.

Traffic: 29PB, 2AL 17, 2BR 19, 2BH 13, 2BG 6.

PRARIE DIVISION

MONTANA—SCM, D. B. Sinclair, 4PV—The only points made here during the Tests were 3 gained by 4PV when he clicked with cw-1CW. 4DU rounded nb-2RD on 25 meters regularly, using 10 meters for plate supply. 3BT has been straining his attention to best phone work and DX is lost in the "Valle of Despond." 3BU is a newcomer who is expected on the air very soon. 3DI has a new crystal controlled set. 3BM is working 4O, and 29. Eastern Dist: 3XJ has had to go to Montreal in line of business but Mrs 3XM is now on the air. 3CIJ is a newcomer who is expected on the air very soon. 3DI is on the air very little during the past month and 3XQ has been in Montreal for most of the month. Northern Dist: 3IN on 40 has a new rig on 25 and 3XI is working with a 320 tube. 3BY has been thinking of changing his attention to secondaries fed by his crystal controlled set. The Hamfest was held at station 5AU and our newest station, 5JG, has already been heard in a number of emergency sets for his company. 5AD expects to be using once on 20 meters soon. 2FO has sold out his entire outfit, but still insists that he is not through with the game. 2AC is changing his set from YL to OW. Congratulations. 3BJ has been QSO England.

Traffic: 4OP 29, 4CT 18, 4BY 12, 4GG 5, 4GP 8, 4PV 104.

SASKATCHEWAN—SCM, W. J. Pickering, 4FC—4HS has been appointed ORS but will be off for about three weeks studying and will be on later with more power and looking for traffic. 4CK sends in a picture of bis shack. 3CP has built a whole new rig and gets very good DX using two 201A's. 4CU is third and has worked some nice DX. 4PB is a new ham and turns out in good form for a young enthusiast. The SCM would welcome suggestions from their code practice skeds. 4BV is the New Sec. of the Area.

Traffic: 4AH 66, 4PF 27, 4CU 29, 4FR 20, 4CC 16, 4AD 11, 4AF 9, 4HM 9, 4HA 8, 4GJ 6, 4GD 6.

SASKATCHEWAN—SCM, W. J. Pickering, 4FC—4HS has been appointed ORS but will be off for about three weeks studying and will be on later with more power and looking for traffic. 4CK sends in a picture of bis shack. 3CP has built a whole new rig and gets very good DX using two 201A's. 4CU is third and has worked some nice DX. 4PB is a new ham and turns out in good form for a young enthusiast. The SCM would welcome suggestions from their code practice skeds. 4BV is the New Sec. of the Area.

Traffic: 4AH 66, 4PF 27, 4CU 29, 4FR 20, 4CC 16, 4AD 11, 4AF 9, 4HM 9, 4HA 8, 4GJ 6, 4GD 6.

QUEBEC DIVISION

QUEBEC—SCM, Alex Reid, 2BE—This month's Hamfest was held at station 2AD, a very enjoyable time being had by all. The movies of last summer were shown again and had repeated many times. Also, the Girl from France drew a great deal of attention from 2HV and 2BG. We wish to thank 2AD for the wonderful evening he gave us. Also, and also 2AC for his donation of cigarettes. 2CA, our newest station, has already been QSO-ed 6RG. 2AX has added a new transmitter to his collection and worked a few for designers in one day. 2BR has added another 210 and also uses tube rectification. 2HV is QIRW installing a number of emergency sets for his company. 2AD expects to be using once on 20 meters soon. 2FO has sold out his entire outfit, but still insists that he is not through with the game. 2AC is changing his set from YL to OW. Congratulations. 3BJ has been QSO England.

Traffic: 29PB, 2AL 17, 2BR 19, 2BH 13, 2BG 6.

QST FOR APRIL, 1928
AUSTRALIA

We have recently received a copy of another magazine that is devoted in its entirety to amateur radio. "CQ" is issued by the New South Wales Radio Transmitters' League and distributed free to its members each month. No. 1 of Vol. 1 is a twelve-page brochure containing much interesting material. Our best wishes for a long and active life go to "CQ" and the N. S. W. R. T. L., an organization that has added one more emblem in the form of a diamond to the long list already in existence.

"We have been alternating between very hot spells followed by copious rainfalls all over the eastern Australian states for the past couple of months and DX is patchy. "During these last few weeks there has been a noticeable advent of European stations at around midnight our time. Signal strengths have been quite good and many Australians have worked EG, EB and others. On the nights these stations have been heard well, I have noticed that low-powered outfits find it difficult to raise NU stations. I worked el1NO one night at midnight our time after vainly trying to raise some NU stations for half an hour.

"Signals from AC stations are coming in well but the AJ signals have not been heard for two months until last week. At stations are now QSO Australians nightly and receive us mostly on indoor antennas which gives them a better signal static ratio. FO signals have been consistent for some months but are hard to raise owing to their habit of working each other after DX calls. Phone experiments have come strongly to the fore in all Australian states probably owing to the many spells of bad QRN and patchy DX.

"Short-wave sets are now being observed here and there on ships trading to Australia. Broadcast programs on short-waves have been exceptionally fine these last three months. The English station, 5SW, at Chelmsford has been relayed nightly by Australian 2FC and is well worth listening to.

"The matter of power as used by amateurs is an interesting study. Australians consider 100 watts as very big business indeed, the average man who works all continents being parked round about the 40-watt mark while the majority are using between 10 and 20 watts. It is cause for much comment when NU cards come in with descriptions of quarter-kilo-watt tubes, etc. The favorite here is the 210 although a few of the high powered chaps are using the English T250. Many orders have already been placed for the UX-852 but, so far, only a few specimens are in operation. None has, as yet, reached Queensland."

—Russell F. Roberts, OA4PN.

ENGLAND

"The following is some information on DX doings in England.

(Continued on Page 68)


"Calls Heard"
2940 Winchester Ave.
Ashland, Ky.
Editor, QST:
What we need is a new "Calls Heard" section. Give these birds who work in "no hams land" a chance to see their calls in print. Once should he enough to take the kick out of sneaking a call outside of the band or doing without a wavemeter of some sort.

During the last several years, I have noticed that there are quite a few hams that think that if their signals are not at the very bottom of the band that DX will be nil. Most of our wavemeters are none too accurate at the best so why take any chances on getting down to the exact bottom when a half a meter above it will be just as good and maybe a lot better for your hide.

Let everyone take it upon himself to be a cop of the air and make a list of all calls that are heard either below or above the band and save them for the infamous "Calls Heard" section. If you find your call listed in this section, don't be a sorehead but rather consider that someone has done you a favor (which it really is). Remember the Amateur Spirit!

-H. R. Lickens, 9ACS.

(Attached to this letter was a list of fifteen calls of stations operating off wave. All were heard more than once during one afternoon and evening. Would you like to see such lists?—Assist. Tech. Ed.)

Testing and Off Wave
40 Norfolk Road
Chestnut Hill
Brookline, Mass.
Editor, QST:
In connection with station operation there are two things in particular that we amateurs should concern ourselves with more than we seem to at present; namely, testing and off-band operation. Listen in any night around six o'clock and count the number of stations on the 40-meter band who are not working or calling, but just testing, making series of long dashes while, I suppose they see just how many tenths and a fraction thereof, register on their antenna ammeters or whether their "growler" gives them a steady note. Necessary? Possibly, but think of the suffering listeners and at least do that kind of testing out of busy hours. There are too many times now when we hear that familiar remark, "sorry OM nd QRM" without adding unnecessary QRM. I shudder to think what the reduced 40-meter band will sound like if this keeps on.

Off-band operation should be inexcusable. If a wavemeter cannot be bought for lack of funds, it costs little to make one accurate enough to assure operation within the allotted limits. The unfortunate part of it is that in most cases it is the newcomer who violates this regulation and does not realize how he may be spoiling foreign DX for someone else. Undoubtedly, he is blissfully unconscious of the fact that he is right on top of the foreigners who come in now just above and below our 40-meter band. The great majority of us are pretty careful about this but remember that the off-band station sticks out like a sore thumb and is a sure mark for criticism and worse.

Whenever I hear a station CQing above the 40-meter band where I listen frequently, I very often call him and tell him he's over the top and this is usually a sufficient hint for a rapid QSY. He gets no QSL card out of me, though, for that QSO although I do QSL all others 100%. Recently I did this to a "lid" station evidently with no result. I doubt if he could copy five per and for all I know may still be pounding away there on 45 meters blissfully unconscious of his error. For these kind we shed a bitter tear.

-Miles W. Weeks, w1LVW.

For 1929
105 South Marquette Street
Ironwood, Mich.
Editor, QST:
After reading the ins and outs of the Washington Radiotelegraphic Conference, especially with reference to the amateur and then reading comments on same in the succeeding issue of QST, I am prompted to express an opinion.

There is no doubt that we fared badly from the standpoint usually taken by the amateur but on the other hand, I hope that one distinct advantage will be made clear by the rules as laid down by the powers that be, and that will be that we will, in the future, have to have high efficiency transmitters operated with just as high a degree of intelligence if we expect to get results. It means that the day of the broad tuning, poorly adjusted transmitter with the sloppy wave is over. I further
AT LAST!
A Real Radiophone Transmitter
—at a reasonable price!

Employs
Low Power

Surprisingly
Long Range

Easy to Build

Easy to Operate

For All Low Wave Work

The Aero Radiophone Transmitter
—Ready to Plug Into Electric Light Socket

Here is a low power radiophone transmitter that every true radio fan will want to own. An extremely efficient circuit, designed by some of the best known parts manufacturers, that is producing wonderful records on the government licensed low wave bands. Simple to operate, easy to build, its cost is no more than that of a good broadcast receiver!

500 to 1000 Miles on Phone—Several Thousand Miles on Code

The New Aero Radiophone is a thoroughly tried and proved transmitter. As installed at station 9DBM, Chicago, the results on 20 meters have been remarkably good. Reports varying from R-5 to R-7 have been regularly received from these typical stations: 1BBM, North Harvard, Mass.; 1ASF, Medford, Mass.; 1SW, Andover, Mass.; 2BSC, Glen Head, N. Y.; 3AKS, Philadelphia; 3CE, Baltimore; 4MI, Asheville, N. C.; and 8CVJ, Auburn, N. Y. In every instance the quality of speech has been reported to be very fine.

Adapted to code work, the Aero Radiophone Transmitter has produced outstanding results. From a location not of the best, all U. S. districts have been worked with CW on the 40-meter band, as well as NCSZZ, Vancouver, B. C.

Outstanding Performance Assured by Carefully Selected Parts

Only the best quality parts have been incorporated into the Aero Radiophone Transmitter. Products of the following manufacturers—all with a national reputation—are specified exclusively:

- Aero Products, Inc., Chicago, Ill.
- Allen D. Cardwell Co., Brooklyn, N. Y.
- Herbert H. Frost, Inc., Elkhart, Ind.
- Polymet Mfg. Co., New York, N. Y.
- Westinghouse-Micarta, Chicago, Ill.

Investigate NOW—Write for FREE BOOKLET

The Aero Radiophone Transmitter is worthy of your careful investigation. Send your name and address at once for complete illustrated, descriptive literature showing schematics, and listing parts, prices, etc. Simply ask for Supplement A. Do it today, and learn how easily you can get into the fascinating field of radiophone transmission.

Aero Products Inc., Dept. 16R, 1772 Wilson Ave., Chicago, Ill.

NOTE

The parts for the Aero Radiophone Transmitter are standard parts and are available at all dealers—when completed is ready to plug into your electric light socket. All have been carefully chosen to give the maximum in transmitter performance. Complete drilled and engraved foundation units are also available.

Say You Saw It In QST—it identifies You and Helps QST
R. R. PANEL
Radio Meters
R. R. Panels No. 346 with resistance of 1000 ohms per volt to measure "B" Eliminators, Bias Resistors and Batteries. They are accurate to 2½ per cent plus or minus.

**Panel Voltmeters**

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Type</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>No. 325</td>
<td>For reading DC voltages, 0-6 volts</td>
<td>$1.65</td>
</tr>
<tr>
<td>No. 326</td>
<td>For reading DC voltages, 0-8 volts</td>
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<tr>
<td>No. 327</td>
<td>For reading DC voltages, 0-10 volts</td>
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<td>No. 318</td>
<td>For reading DC voltages, 0-12 volts</td>
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<td>No. 333</td>
<td>For reading DC voltages, 0-15 volts</td>
<td>$1.65</td>
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<tr>
<td>No. 334</td>
<td>For reading DC voltages, 0-20 volts</td>
<td>$1.65</td>
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<tr>
<td>No. 335</td>
<td>For reading DC voltages, 0-30 volts</td>
<td>$1.65</td>
</tr>
<tr>
<td>No. 336</td>
<td>For reading DC voltages, double reading, 0-8 volts, 0-100 volts</td>
<td>$2.25</td>
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**Panel AC Voltmeters**

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<td>No. 351</td>
<td>For reading 0-15 volts AC</td>
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<td>No. 352</td>
<td>For reading 0-10 volts AC</td>
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<td>$2.25</td>
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**Panel Milliammeters**

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<td>No. 311</td>
<td>For reading 0-10 milliamperes DC</td>
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<td>No. 325</td>
<td>For reading 0-25 milliamperes DC</td>
<td>$1.85</td>
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<tr>
<td>No. 380</td>
<td>For reading 0-50 milliamperes DC</td>
<td>$1.85</td>
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<td>No. 390</td>
<td>For reading 0-100 milliamperes DC</td>
<td>$1.65</td>
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<td>No. 399</td>
<td>For reading 0-300 milliamperes DC</td>
<td>$1.65</td>
</tr>
<tr>
<td>No. 394</td>
<td>For reading 0-400 milliamperes DC</td>
<td>$1.65</td>
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**DC Pin Jack Voltmeters**

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<tr>
<td>No. 306</td>
<td>For No. 25 and No. 28 Radiolas, 0-6 volts DC</td>
<td>$2.50</td>
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<tr>
<td>No. 308</td>
<td>For No. 25 Radiolas, 0-10 volts DC</td>
<td>$2.50</td>
</tr>
<tr>
<td>No. 307</td>
<td>Desk type voltmeter with cord, 0-6 volts DC</td>
<td>$2.50</td>
</tr>
</tbody>
</table>

**Tube Checker**

No. 210 For experimenter, professional set builder, dealer and service man. Consists of 0-6 DC voltmeter, 0-10 DC milliammeter, grid bias switch, rheostat, socket and binding post, instruction sheet | $6.50   |

**Cord and Plug**

No. 21 for connecting meters in A and B load of a receiver without any disconnections. Terminals correspond with posts on No. 210 tube checker | $1.85   |

**"B" Eliminator Meters**

No. 346 For testing B battery eliminators, grid bias voltage across resistors, batteries, etc.; 0-300 DC scale | $4.50   |
| No. 347 For same as No. 346, except scale is 0-500 volts | $5.50   |
| No. 348 For testing AC current supply line, portable, 0-100 volts | $4.50   |

*Write for Free Catalog*

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250 FULTON STREET, N. Y. C.

Please send at once your meters, catalogue numbers, for which I will pay the postman the price as advertised in QST, plus a few cents extra for postage.

NAME ..................................................  
ADDRESS .................................................  
CITY ........................................... STATE  
BRUNO "Book of Hook-Ups," 25 cents

---

believe that if every amateur should henceforth so adjust his transmitter that it send out a good, very sharp, clean cut wave, and of a good tone, we would find that we were not much more crowded in the forty-meter band than before. I certainly believe it is possible to find plenty of room for all in the wave bands given us under the new regulations if we go about it correctly.

Proceeding along this line, I am telling every operator with whom I communicate if his wave is broad and also anything else which happens to be the matter with his signals. In practically all cases so far where frank comment was given, it was taken in the constructive spirit in which it was given. Why can't all amateurs give a frank, yes, even hard-boiled criticism of the other fellow's signal? We all need it.

*L. W. Van Slyke, 9EMB*

---

**Ten Per**

Editor, *QST*:

I would like to add a few words to this "Beginner vs. Old-timer" controversy. It's all very well to say that we should help the beginners but when one has traffic to move or only a short time available to operate, "use QRS" doesn't sound very encouraging.

Why don't those chaps Mr. Robbins mentions as being "barely able to get their ten per" stay off the air another month or so until they have had a little more code practice instead of cluttering up the air to no purpose and then kicking about the "speed demons." Where are these latter anyway? As far as I can see, the 25 to 30 word man is a scarce article in the amateur bands these days. I am afraid that conditions have changed in the other direction and the average amateur speed has deteriorated. That is why I disagree with Mr. Hanson as to the best way to treat the BCL who wants to "graduate." It is far better to help him a little in learning the code properly than to wait until he gets on the air and have to put up with his QRM and QRS.

Most of us have had experience with the two-faced type of BCL Mr. Hanson refers to. Surety, however, they are in the minority and we dodge more trouble by friendship in the BCL ranks than we incur in spite of such friendship.

*W. F. Reeves, nC5CT*

---

**Tangible Sympathy**

P. O. Box 211
Boissevain
Manitoba, Canada

Editor, *QST*:

About ten months ago I became interested in amateur radio and since then have read each issue of *QST* from cover to cover. I note that there are some who feel that they have not been getting a square deal. Perhaps a few words concerning my own experience will help to give them a
On the transmitting end—too

In the largest broadcasting stations of the country, in amateur transmitting and receiving sets as well as in high grade radio receivers for home use—you will find Faradon Capacitors the condensers of proven durability.

Twenty years of electrical engineering skill combined with highest quality materials have made Faradon Capacitors the standard of electrostatic condenser long life and reliability.

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Established 1907

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Improved Reception

There is marked improvement in your radio reception when new Cunningham Radio Tubes are performing their special tasks in the various sockets of your radio.

Don't use old tubes with new ones—use new Cunningham Tubes throughout.

E. T. Cunningham, Inc.
New York Chicago San Francisco

Better and brighter outlook on the matter.
While I cannot handle much more than ten per as yet, I find that all the amateurs with whom I have clicked so far have been very patient. To my "QSC?" they would reply, "Keep at it OM, we all had to learn. Glad to click with you any time and glad to QSR." Do you blame me for feeling that they are all regular fellows?

Just a couple of days before Christmas, our home was gutted by fire and we lost everything even to our clothing which was rather hard on us because of the cold weather. Shortly afterwards we received a check from the Winnipeg Radio Traffic Association as a tangible expression of their sympathy. Is this not a combination of kindness and regular fellowship in the amateur world?

—Stuart R. Talbot, WE4AR.

Attention! Ocean-Hoppers

U. S. Military Academy
West Point, N. Y.

Editor, QST:

During 1928 there will undoubtedly be more trans-oceanic flights and the fliers will be torn between their need for radio and their desire to save weight. If they decide to take radio, and for their own safety they should, there will be further quandary: whether to use short waves or long.

Because the long waves around 600 meters are immediately picked up by surface ships, they are the most useful. That is, provided any ships are nearby. The ocean is quite a large place and, off the main steamer tracks, surprisingly lonely. If the airplane gets into one of these blank spots, long-waves are of no avail.

For short-waves, on the other hand, the limits are much wider. Even a low-power

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MORE SPECIAL OFFERS

UNI-RECTRON POWER AMPLIFIERS

MODEL AP-935

As the Uni-Rectron stands it is a super power amplifier, which can be used in connection with any radio set and loud speaker. Binding posts are provided for input to the Uni-Rectron and output to the speaker. Requires no batteries for its operation. It obtains its power from the 110 Volt, 60 Cycle alternating current lighting circuit of your house.

The UX-210 super power amplifying tube and the UX-216B or 281 rectifying tube are used with this amplifier, which cannot overload. From the faintest whisper to the loudest crash of sound—R.C.A. Uni-Rectron amplifies each note at its true value. High and low notes are all treated alike.

The volume and quality delivered will be a revelation.

Also by removing the input and output transformers it can be used as a source of power for an oscillating or transmitting tube, furnishing power for all circuits, grid, plate and filament and is the cheapest form of Power Supply for Amateur Transmitting purposes ever offered.

LIST PRICE $88.50

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SPECIAL at $19.75

JEWELL HIGH RESISTANCE VOLTOMETER

0-250 VOLTS D.C. (3 Readings)

A high grade, accurate, reliable instrument.

Just what you want for checking the true operation of your “B” Eliminator or any source of plate voltage which cannot be obtained from ordinary low resistance type meters.

Can be permanently placed in the set which will enable the user to apply desired plate voltage accurately to each circuit of his receiver. By means of the front switch three readings can be obtained without disconnecting any wires, namely; the detector circuit, the radio frequency or intermediate circuit, and the maximum or output circuit including last audio tube. Requires little current to operate due to its high internal resistance. Flush Panel Mounting. Zero Adjuster.

New and packed in original cartons. List $22.00 Ea. SPECIAL at $4.75

TIMMONS Combination Power Amplifier and “B” Supply

This high quality compact unit used a U. X. 216B or 281 tube for rectifying and a U. X. 210 super power audio tube as an amplifier which gives distortionless and true natural reception with wonderful tone quality and volume.

Besides being a super power amplifier this Combination also is a complete “B” Battery Eliminator furnishing all the “B” current required by the regular tubes of the set. No adjustments required and no output transformer or similar auxiliary equipments needed. For use with A. C. current 110 volt, 60 cycles.

They have been approved by Popular Radio and Popular Science Laboratories. Every unit is new, packed in original factory sealed carton.

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KENOTRON RECTIFYING TUBES

(TYPE T.B. 1)

MFD. BY GENERAL ELEC. CO.

These rectifying tubes operate on a filament voltage from 8 to 10 Volts and draw 1½ amps. They will safely stand an A.C. input voltage up to 750 Volts and pass plenty of current and voltage for the plate of the Transmitting Tubes. They are also very efficient rectifiers for use in “B” Battery Eliminators.

PRICE ONLY $1.25

AMERICAN SALES CO., 21 Warren St., New York City
TRANSMITTING TUBES

We rebuild them and guarantee them. We also guarantee that they will arrive to you from our Factory without damage. Special crates are the solution of the Problem.

We Build a 50-Watt Tube

Type 203, using a Tungsten filament at 10 Volts and normal plate current of 150 Mils at 1500 Volts on the plate. It is low priced at $20.00.

We Make Rectobulbs

a hi-voltage Rectifier Tube—handles power up to 250-watt tubes—a small investment gives you a carefree plate supply—the note from the Rectobulb Rectifier is distinctive and pleasing and gets results—they handle 250 Mils at 3000 volts and have a UX base with plate Terminal on top end.

Also low priced at $15.00 each (includes fuses)

We Produce Inductrons

a short wave coil—sealed in a Vacuum and with a UX base for plug in—simple, durable and efficient for your receiver: coil for each band at $2.50 each.

WE REPAIR UV-203 at $15
UV-204 at $50
UV-203A (Tungsten Fil) $19
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Water cooled Tubes and Rectifiers: ask for prices.
All work Guaranteed against defects.
No charge for Crates when cash accompanies order.

NATIONAL RADIO TUBE CO.
(6EX) 3420 18th St. San Francisco, Cal.
(A ham institution)

transmitter will carry across the Atlantic with R3 when a high-power outfit can only duplicate the performance with R6. And R3 is loud enough, if many people want to listen to it. A low-power short-wave transmitter aboard a trans-ocean plane will almost certainly be picked up by stations on both shores. But it will miss the nearby ships, if any, and landlubbers a thousand miles distant cannot do much about a plane down on the water.

The ideal system would be a combination of both long and short waves. Immediately the air-going brethren raise their eyebrows and say, "more weight." But very little more weight. Say that a fifty-watt set is going to be used on long waves. The generator must supply 150 to 200 watts of filament and plate power anyway. An extra 30 watts will not overload it. A simple but stable (large capacity across tube elements) 7.5-watt oscillator will weigh something like a gallon or two of gasoline, including its single wire Hertz antenna in the wings. As both transmitters run together and use the same key, there is no extra trouble in their operation. The diagram illustrates the essentials of the idea. I think it worth the serious consideration of anyone who contemplates flying an ocean this summer.

—William H. Wenstrom, 1st Lieut., Signal Corps, U. S. A.

Short Circuits

Editor, QST:
I have recently made a discovery which I think should be passed along for the benefit of those who, like myself, wear metal-rimmed spectacles. Since being forced to wear them, I have had trouble in hearing DX signals. I now have discovered that my ears have been shorted out by the metal frames and that a piece of spaghetti over each of the ear hooks removes this difficulty and makes an efficient and low-loss pair of eye pieces. Of course, in some cases there is a high resistance short through the skull, but institutions are provided for such extreme cases.

—Don Mix.

Appreciative

Box 5
Niagara-on-the-Lake
Ontario, Canada

Editor, QST:
I am a beginner and wish to use this medium for expressing my thanks to all those who have been QSO nc3AY. Without an exception, these operators have been both courteous and willing to lend a helping hand.

Whether it is that the letters appearing in the "Correspondence" section of QST are having their effect or not we will probably never know but I must say right now that I have yet to meet a snobby operator.

—Albert Davey, nc3AY.
A World-Wide Service

Every civilized nation in the world uses products from the Dudlo factories

MAGNET WIRE and COILS

made in this plant at Fort Wayne, Indiana, are built into electrical units employed in all forms of communication and transportation as well as in the thousands of electrical conveniences in modern homes and commercial buildings everywhere. The Dudlo insulated magnet wire produced in a single month would encircle the globe a hundred times.

Electrical and Radio Manufacturers may draw upon the broad experience gained from this international service by coming to Dudlo engineers for assistance on their wire and coil problems.

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NEW A Complete Line of SHORT WAVE PILOT Precision Equipment

COILS The most beautiful set of plug-in coils you’ve ever seen, with a method of mounting that saves space and makes wiring easy.

CONDENSERS New spaced-plate variable condensers for tuning, and regular types for oscillation control. Low-losses, precision construction.

MIDGETS Low-loss midget condensers in three sizes, for all tuning and circuit controls. Handsomest little midgets you’ve ever seen.

SOCKETS All types for all purposes. Finest designs and workmanship. Special types for all tubes.

DIALS Drum types with wheel or knob controls, illuminated vernier dials, and plain types. Most complete line ever offered.

RESISTANCES All values in rheostats, potentiometers and resistances, from 4 ohms to 3,000 ohms.

QUALITY These and the many other new PILOT parts are precision-made, of the finest materials, designed in accordance with latest scientific practice.

PRICES PILOT precision parts are amazingly low in price. Look at PILOT prices and you will see your radio dollar grow to a two-spot.

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RADIO DESIGN QUARTERLY 103-Q BROADWAY, BROOKLYN, N.Y.
Special designs for new traffic receivers using Pilot short wave equipment, and broadcast sets with A. C. and battery tubes. All details, diagrams, beautiful photographs. Edited by M. B. Sleeper. SEND 25¢ FOR FOUR ISSUES. No extra charge for foreign countries.

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Street ...........................................
City ........................................... State .................................

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WNP The Hotchkiss School Lakeville, Conn.

Editor, QST:
I had the privilege of being a member of the Rawson-MacMillan-Field Museum Expedition in 1926 and again during the summer of 1927. As you probably know, Commander MacMillan and his men are now in Labrador for the winter.

During both summers that I was in the North your men did us all a very great service in making it possible for us to communicate almost regularly with our friends at home. Since my return I have received numerous messages from my shipmates who are now in the North through members of the American Radio Relay League.

I am writing to ask you to extend to those members of the League who have been so helpful to us my hearty thanks and appreciation of their kind and helpful service to us. I am sure that all the members of Captain MacMillan’s crew feel the same appreciation.

With hearty good wishes to all the members of the American Radio Relay League.

—Joseph N. Field.

I. A. R. U. News (Continued from Page 58)

"5HS has hooked up with foA3Z on 23 meters after trying for months. He is still working the fifth and sixth districts regularly. 2HK has now got a crystal set going and finds it FB. He has not much time to operate it, though. 5YK says he is working general tests with NU but cannot find any real DX on 23 nowaday. 5TX has been QSO foA3Z on 23 meters with ten watts input. He has now got a 32-meter permit and says NU is local. Other 23-meter stations who always seem to be NU are 2BM, 2NH, 5BY, 6IA and 6VP. 2NH and 5BY also work on 45 meters a great deal as does 6RB who is working quite a few skeds with the U. S. A. 6QB-6LT has been raising ’em on both 23 and 45, his best DX being 6PB in Hudson Bay while using only nine watts. FB 2HJ managed to hook nu1AQT on 23 meters —his first and, so far, only NU. He has not yet gotten over the shock. The U. S. A. gang has been coming over on 40 very consistently but the 20-meter band seems dead all week although there are a good many on Sundays. There seems to have been a burst of activity among the F0s on 20 lately and A3Z is no longer the only one heard. However, there are very few stations in other DX countries that are audible. At a recent meeting of the R. S. G. B. we had the pleasure of a talk from xo6MA who told of his adventurous trip on the E. R. Sterling.

"Just one other thing. I understand that there was a bunch of U. S. hams among
Your Sigs QSA with THORDARSON TRANSMITTING EQUIPMENT

FILAMENT SUPPLY TRANSFORMERS

T-2180—Secondary: 5 volts, center-tapped. Capacity: 15 V.A. Dimensions: 3\(\frac{3}{8}\)"x2\(\frac{1}{4}\)"x3\(\frac{3}{4}\)" high. Weight, 2\(\frac{1}{2}\) lbs. Price $5.00

T-2230—Secondary: 7.5 volts, center-tapped. Capacity: 85 V.A. Dimensions: 3\(\frac{3}{4}\)"x3"x3\(\frac{3}{4}\)" high. Weight, 3\(\frac{3}{4}\) lbs. Price $7.50

T-2382—Secondary: 12 volts, center-tapped. Capacity: 175 V.A. Dimensions: 4\(\frac{1}{2}\)"x5"x6" high. Weight, 12 lbs. Price $15.00

T-2370—Secondary: 1.25 volts, no center tap. Capacity: 20 V.A. Dimensions: 3\(\frac{3}{8}\)"x2\(\frac{1}{4}\)"x3\(\frac{3}{4}\)" high. Weight, 2\(\frac{1}{4}\) lbs. Price $5.00

T-2445—Secondary No. 1: 1.5 volts, no center tap, 12 V.A. Secondary No. 2: 2.65 volts, center-tapped, 10 V.A. Secondary No. 3: 5 volts, center-tapped, 5 V.A. Dimensions: 2\(\frac{3}{4}\)"x5\(\frac{3}{4}\)"x4\(\frac{3}{8}\)" high. Weight, 5\(\frac{1}{2}\) lbs. Price $10.00

T-2071—Secondary No. 1: 30 Henry, 150 M.A. 3000 V. insulation, open frame. Dimensions: 2\(\frac{3}{4}\)"x2\(\frac{1}{2}\)"x3\(\frac{3}{8}\)" high. Weight, 5 lbs. Price $10.00

T-2073—Secondary No. 1: 30 Henry, 500 M.A. 3000 V. insulation, open frame. Dimensions: 4\(\frac{1}{4}\)"x5\(\frac{1}{4}\)"x9\(\frac{1}{2}\)" high. Weight, 4 lbs. Price $16.00

T-2099—Double Filter Reactor, each reactor 30 Henry, 120 M.A. 1000 V. insulation, compound filled steel case. Dimensions: 3\(\frac{3}{4}\)"x4\(\frac{1}{8}\)"x5\(\frac{3}{4}\)" high. Weight, 8 lbs. Price $14.00

PLATE SUPPLY TRANSFORMERS

T-2385—Secondary: 550 V. and 750 V. each side of center tap. Capacity: 100 V.A. Dimensions: 5"x5\(\frac{1}{2}\)"x6" high. Weight, 8\(\frac{1}{2}\) lbs. Price $16.00

T-2387—Secondary: 1000 V. and 1500 V. each side of center tap. Capacity: 300 V.A. Dimensions: 7\(\frac{1}{2}\)"x5\(\frac{3}{4}\)"x7\(\frac{1}{2}\)" high. Weight, 20 lbs. Price $22.00

T-2388—Secondary: 1500 V. and 2000 V. each side of center tap. Capacity: 500 V.A. Dimensions: 7\(\frac{1}{2}\)"x6\(\frac{1}{2}\)"x8\(\frac{1}{2}\)" high. Weight, 27 lbs. Price $30.00

T-2389—Secondary: 1500 V. and 2000 V. each side of center tap. Capacity: 1000 V.A. Dimensions: 7\(\frac{1}{2}\)"x7"x9\(\frac{1}{2}\)" high. Weight, 40 lbs. Price $40.00

FILTER AND PLATE REACTORS

R-196—30 Henry, 80 M.A. 1000 V. insulation, shielded. Dimensions: 2\(\frac{1}{4}\)"x2\(\frac{1}{4}\)"x3" high. Weight, 2 lbs. Price $5.00

T-2353—6 Henry, 150 M.A. 3000 V. insulation, open frame. Dimensions: 3\(\frac{3}{4}\)"x3\(\frac{3}{4}\)"x3\(\frac{3}{4}\)" high. Weight, 3 lbs. Price $2.50

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RADIO INSTITUTE OF AMERICA
Dept. D-4 326 Broadway, New York City

Mr. C. Conte whose regular list of “Calls Heard” appears elsewhere in this issue tells us that conditions during the month of January were favorable. Reception of signals from the U. S. A. was better than it has been in quite some time. Best conditions occurred on the 14th and 15th and R6 signals from 6AHP, 6BGH, 6CCL, 7DF, 7DL and 7GJ were the best that were heard. It is a very rare thing for him to receive signals from the sixth and seventh districts. This looks as though conditions were improving and that DX may be back again soon.

GERMANY

“During the past month conditions seemed to be more favorable here in Germany for European and DX work on the 40-meter band, whilst on 32 meters we noticed many dud nights.

“Concerning the Washington resolutions, we fear that the traffic in the band from 7,000 to 7,300 Kc. will be rather difficult to manage and we would propose that the 75

to 85-meter band which is now nearly abandoned for such be used for European night work. Night time DX work should be allowable in the 40-meter band while during daylight we could do our European work within these precious 300 Kc. In addition to work in these bands, strenuous efforts are necessary for the thorough investigation of conditions on 20 meters, at
Royal personages in China ride in a palanquin shielded from the public gaze.

Listen to the Stromberg-Carlson Sextette Tuesday evenings at 8o clock E.S.T. through the NBC and Associated Stations: WJZ, WBZ-WBZA, WBAL, WHAM, KDKA, WIR, KYW, WBB, WRE, WMJ, WCCO, KVOO, WTAA, KPAC, WOAI, WHAS, WMC, WSB, WBT, KOA.

TOTAL SHIELDING protects Stromberg-Carlson TONE

Home from the theatre—with your companions of the evening! The realistic tone of the Stromberg-Carlson will bring you dance orchestras as though the players were in the same room.

The full beauty of Stromberg-Carlson’s famous tone so admired and so envied, could never be attained without shielding—scientific “Total Shielding”—correct electrically and mechanically—shielding designed by the pioneer manufacturers of shielded receivers. This shielding completely isolates each radio frequency and detector stages—allowing the building up of the enormous amplification needed for tonal exactness.

Music is reproduced as it was produced at the broadcasting studio—every original vibration, from lowest bass to highest treble overtone given its true timbre and value.

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Stromberg-Carlson Receivers complete for A.C. house current operation East of Rockies $295 and up; Rockies and West $315 and up; Canada $365 and up.

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Stromberg-Carlson Telephone Mfg. Co., Rochester, N.Y.

Stromberg-Carlson

Makers of voice transmission and voice reception apparatus for more than thirty years.
A Complete Push-Pull Power Stage

Increasing Clarity, Reality and Volume

Here is an AmerTran wired unit that meets the demand for a power stage that may be easily assembled in the average receiver.

It contains an AmerTran type 161 input transformer *wired to two power tube sockets, a 50,000 ohms mounted resistance, and an output transformer of the type required by the power tubes and speaker. AmerTran has considered all factors before offering this new power stage to the public, and that is the reason for the fine results obtainable. It is designed for specific tubes and speakers, and used as instructed, will produce a very high standard of performance.

For best tone quality, this power stage should be preceded by an AmerTran DeLuxe audio transformer, and the output connected to a high-grade speaker. The parts are firmly secured to a strong metal base, provided with mounting holes, and the whole unit is neatly finished. Complete information together with data on other AmerTran products will be gladly sent free on request.

*AmerTran Input and Output transformers have finest high permeability alloy core laminations and excellent frequency characteristics.

American Transformer Co.
174 Emmet St., Newark, N. J.

"Transformer Builders for Over 28 Years"

the same time not neglecting the new 10-meter band that deserves special attention.

"It might be of interest to many to know that three Munich amateurs are about to begin experiments in the use of picture telegraphy on short waves. They suppose that they will be able to transmit their QSL cards to any amateur who is in a position to receive and interpret their signals which employ the Dieckmann system. Anyone interested in the matter is requested to write to ek4UAH directly or through the QSL Section, D. F. T. V., Berlin W. 57, Blumenthalstrasse 19.

"Some of the Hamburg amateurs are busy grinding their own quartz crystals. Quite good success has been obtained generally and interest in this work is increasing every day, newcomers this month being 4ABI and 4AN.

"We wish the three London amateurs the best of success in their tests on skip distance and wish to say that we are always ready and pleased to cooperate with all OMs abroad arranging schedules for experimental or scientific work."

---

NORTHERN IRELAND

"DX conditions generally seem to have improved and become more stable during the last month. NU signals come through well on most nights and the 20-meter band seems to be regaining its popularity. The South American stations are also starting to come in well between 30 and 40 meters and the South Africans are sometimes very good on the 20-meter band. Conditions concerning India and the Far East have been improving since December."

"6YW has been doing excellent work on 32 meters with very low power and a badly screened aerial. His DX includes nxiXL, (on 45 meters) AWL in the Mediterranean, aq1LM in the Arctic, as well as a report of being called by nu8BFQ.
6WG has been working NU stations regularly with about ten watts input which is obtained from a hand-driven generator. 5WD has made a good start from his new QRA which is 6 Springmount, Captain Street, Coleraine, N. I. He, also, is using a hand-driven generator to supply power to his transmitter which is on 45 meters.

"There has been much good work done by the other low-powered stations but most of them find it difficult to attract attention from the NU stations when working on 45 meters. GMU has been working 2KX regularly on schedule and conditions have improved sufficiently to allow occasional phone work to be accomplished. It is expected that 2KX will come home to England during April. 2IT is working occasionally on 21.5 meters and is always QSA in the U. S. A."

---

E. Megaw, gisMU.

---

IRISH FREE STATE

"The Wireless Society's station signing gw12B has been doing good work lately,
32 Pages Bigger!

The new edition of the RADIO AMATEUR'S HANDBOOK has 32 pages more than the last edition. That's because additional information has been inserted in all parts of the book and everything has been brought right up to date. Two hundred and sixty-six pages of dope, data and details—all for one dollar, postpaid anywhere.

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Address .......................................................................
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301 pages, 6x9, 227 Illustrations
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2. It gives the principles involved in the functioning of all forms of radio apparatus;
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This standard manual gives the latest and best basic data on all phases.

Some of the Topics
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Quickly puts 25 New Hams in 35-40 per class. Five
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None C. D. D., Foreign add 50 cents.

C. K. DODGE, MAMARONECK, NEW YORK.

having made contacts with stations in the 1st, 2d, 3d, and 5th NU districts on a wave of
45 meters. A loosely coupled Hartley transmitter feeding a third harmonic inverter "L" antenna is used. Its plate supply comes from a 500-volt battery-driven dynamotor and the input is normally 10

The station of the Grenfell Mission at St. Anthony, Newfoundland, ne8AE, has been worked on 45 meters with an input of
between nine and ten watts. A schedule
has been arranged between these two stations.

Excellent DX conditions have prevailed
on the band between 40 and 45 meters during
the first half of January, stations in the 4th, 5th and 9th NU districts having been
heard with signal strengths up to R7 between midnight and 0100 G. C. T. using
a O-V-1 Reinartz receiver. We wonder why
these stations never seem to call, "Europe"
or even "DX." NulBQT was worked as
early as 2140 G. C. T. and from this time
onward, signals from NU stations have been
arriving in Dublin at fair strengths.

"Gw18B has been keeping his schedule
with nxlXL in spite of terribly hard luck
with his hand generator which has burned
out repeatedly of late. He has also worked
ne8AE, aaYX1 and a Canadian, all on the
45-meter wave.

"Gwn1C has worked Egypt, fl, ac and as
stations on 45 meters as well as WNP on
23. 11D continues to increase an already
big list on NU stations in the 20-meter band.
His best, so far, is a ninth district station.

"11B has been cutting some fine crystals
and although he reports but very little
transmitting activity, we have heard
nulBQT calling him on 40 meters. There
seems to be but little work being done
among other stations with the 20-meter
band being the quietest. It is expected that
12B will be active on 23-meters shortly and
will, of course, be seeking tests with NU,
NC, etc."

-H. Hodgens, Hon., Sec.,
Wireless Society of Ireland.

ITALY

"Italian amateurs have been particularly
busy during the month of January in their
experiments with phone transmission on
the 45-meter band. Almost every day at
1300 G. C. T. some fifteen of our stations
located in all parts of Italy are carrying
on friendly phone conversations. Remark-
able results have been obtained with very
low power by 1AS, 1AM, 1BS, 1DY, 1SA,
1GN, 1NO and 1MA.

"Special experiments on duplex telephony
were carried on between 1GN, 1FP and
1AM and the results obtained were excel-
 lent. 1NO did some good DX work with
fPM, xxxpMA at China and the Zikawei
Observatory station at Shanghai operating
on 24 meters.

"We are extremely interested in the In-
ternational Tests to be run in February
NEW RELAYS for your Transmitter

PR-5
Operates on 6 volts D.C. adjustable to all positions. 1/4" pure silver contacts. Lacquered brass finish. 3 x 5 1/4" x 1/2" Bakelite base. Maple sub-base. Recommended for 250 watts or less.

PRICE $9.00

PR-9
Operates on 6 volts D.C. Adjustable to all positions. 3/8" pure silver contacts. Highly polished nickel finish. Engraved Bakelite base. Maple sub-base. Recommended for 250 watts or over.

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THESE RELAYS ARE EXTREMELY FAST. THEY DO NOT LAG NOR DRAG.
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RECHARGEABLE "B" BATTERY WITH CHARGER
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Rheostats ............ .75c each
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Jaxley Mfg. Company
Dept. Q, 9 So. Clinton St. Chicago, Ill.
The RX-02fi has the exact taper of resistance for a volume control when placed in the antenna circuit, or across the primary of an R. F. transformer. One of these two Radiohms and the Centralab Power Rheostat are essential resistances for all "AC" circuits. They help to maintain the delicate balance of voltages throughout the circuit and in no way affect the balance between plate and filament current, so necessary to maximum efficiency.

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SOUTH AFRICA

"The South African Radio Relay League has been requested by the Postmaster General to put forward suggestions for a scheme to assist the Minister of Defense in providing Africa with a secondary means of radio communication in the event of trouble or disaster. A special committee at headquarters has been formed and is actively engaged in drawing up a scheme along the lines of the A. R. R. L. Official Relay Stations for submission to the South African government. As this has been one of our strong desires ever since the inception of our organization, we are, naturally, very happy over this turn of events.

"DX conditions have been excellent, being at their best around 1700 G. C. T. Boyce of AT7A reports contacts with ai2KT, a12KW, o65CM and a22YI. 20-meter transmissions are coming through well with such stations as ai2KT, a11B, eg5ML, nulSZ, lASM, lBW and 8CFR being heard most consistently.

"The accompanying photo is of foA3Z, the station operated by OM Hill at Port Elizabeth. The transmitter employs a 203-A tube in a tuned-plate tuned-grid cir-

and it is expected that quite a number of ZL stations will participate."

—F. Pugliese, e11FP,
Sec. Italian I. A. R. U. Section.
VITROHM Transmitting Grid Leaks and Rheostats now cover the entire line of transmitting tube circuits. The prices on these amateur products are reduced materially. Your dealer should stock Vitrohm Transmitting Products. If you have difficulty in obtaining them, write us direct.

<table>
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<tr>
<th>Catalogue Number</th>
<th>Product</th>
<th>Resistance</th>
<th>Dissipation</th>
<th>Current</th>
<th>Max. Tube Rating</th>
<th>Price</th>
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<td>507-2</td>
<td>Grid Leak*</td>
<td>5000 ohms</td>
<td>44 watts</td>
<td>90 m.a.</td>
<td>100 watts</td>
<td>$2.00</td>
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<td>507-3</td>
<td>Grid Leak*</td>
<td>5000 ohms</td>
<td>200 watts</td>
<td>200 m.a.</td>
<td>1000 watts</td>
<td>2.80</td>
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<td>507-4</td>
<td>Grid Leak†</td>
<td>50,000 ohms</td>
<td>200 watts</td>
<td>60 m.a.</td>
<td>1000 watts</td>
<td>6.50</td>
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<td>Grid Leak†</td>
<td>20,000 ohms</td>
<td>200 watts</td>
<td>100 m.a.</td>
<td>1000 watts</td>
<td>4.25</td>
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<td>Grid Leak*</td>
<td>10,000 ohms</td>
<td>200 watts</td>
<td>135 m.a.</td>
<td>1000 watts</td>
<td>4.00</td>
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<td>507-66</td>
<td>Grid Leak*</td>
<td>15,000 ohms</td>
<td>200 watts</td>
<td>120 m.a.</td>
<td>1000 watts</td>
<td>6.00</td>
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<td>507-63</td>
<td>Rheostat†</td>
<td>50 ohms</td>
<td>50 watts</td>
<td>1 amp.</td>
<td></td>
<td>5.50</td>
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<tr>
<td>507-59</td>
<td>Rheostat†</td>
<td>20 ohms</td>
<td>80 watts</td>
<td>2 amp.</td>
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<td>5.50</td>
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<tr>
<td>507-83</td>
<td>Rheostat†</td>
<td>12.5 ohms</td>
<td>60 watts</td>
<td>2.2 amp.</td>
<td></td>
<td>5.50</td>
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</tbody>
</table>

* Center-tapped
† De Forest P or R. C. A. 852 Tube
De Forest H Tube

Ward Leonard Electric Company
37-41 South Street
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Power Tube Work
REPAIRING AND REXHAUSTING
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Easily attached. Ask for type F. price, $4.00. Type 28 Illuminator, 50c.

NATIONAL
TYPE F ILLUMINATED VELVET VERNIER DIAL
W. A. Ready, President

He has won the S. A. R. R. L. trophy for the second time in the recent competition for which is confined to stations in South Africa.”

F. P. Marks, foA5F.

NEW QRAS
agRIL—Georgia Tiflis NAVTLUG, Radio RIL, U. S. S. R. (by D. S. Hutchinson.)
auRABS—Tachkent, Turkestan. (eb4ZZ.)
WWD—St. George Island, Pribilof Isds. off Alaska. (nc6AW.)
nz2FG—Frederico Gonzalez, Box 384, San Jose, Costa Rica.

Calls Heard
(Continued from Page 39)

J. Bernfeld, 14 Richmond Road, Wimbledon, London, S. W. 9, England.
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<tr>
<th>Type</th>
<th>Resistance</th>
<th>Watts</th>
<th>Price</th>
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<tbody>
<tr>
<td>998</td>
<td>30,000*</td>
<td>200</td>
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<td>998</td>
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<td>992</td>
<td>15,000</td>
<td>20</td>
<td>$1.00</td>
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Also many other sizes for plate, grid, and eliminator work. Send for list. If your dealer can't supply you, order direct.

*Prices on application.
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  - Condensers 600 mfd, 500 volt, $1.75
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  - 2000 volt, $2.75
  - Guaranteed 1000 volt, $2.75
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  - 1000 volt, test 3000 volt, $2.75
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Crystal grid will be included to your order in the amateur bands add diese, and ten dollars respectively to the above prices.

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Do you know a friend who is also interested in Amateur Radio, whose name you might give us so we may send him a sample copy of QST? .........................

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Thanks!

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West Gulf Division Convention

The HAMS in the West Gulf Division are widely scattered over a large territory, and holding a divisional convention isn’t nearly so easy or simple as in some of the sections more densely populated with hams. However, for all that they lack in numbers they more than make up in enthusiasm and real old time ham spirit. This convention, sponsored by the University of Oklahoma chapter of Alpha Sigma Delta, national radio fraternity of hams at college, Norman, will go down in history as one of the liveliest and most successful get-togethers ever held anywhere.

Early on the morning of Friday, February 10th, the gang began to gather at the Post Office in Oklahoma City in anticipation of license exams. Many could be seen practicing up on circuit diagrams, wondering the meaning of QSC, or getting a last minute cram of questions and answers, but all for no good, for it seems that the R. I. got his dates mixed up or something, and failed to arrive. However, that didn’t worry the gang long, for the next event was a big sightseeing trip in special buses. The point of greatest interest to most of the gang was perhaps the carrier current system, repeaters, etc., of the Southwestern Bell Telephone Co., who very kindly conducted us through the plant and explained how several conversations in each direction were carried on over a single pair of wires, which also served to operate an automatic printing telegraph for news and market bulletins. It seems that they have a fool-proof “anti-snaffling” system, for (as was unintentionally demonstrated when someone carefully removed a tube from its socket) the least disturbance of the works causes a loud gong to ring continuously until order is restored. Hi!

Other places visited included KFJF, the 1-Kw station with ten kilowatt modulation, 5QF, 5AFX, 5AGP, 5ZAV, and the high-line carrier current phone system of the O. G. & E., Co., with which we were permitted to “work” similar stations over the state. The rest of the meetings were held in the Engineering Buildings of the University at Norman the gang all going to Norman in a body Friday afternoon, on a special interurban and in autos.
The Jewell triple range A.C. voltmeter, Pattern No. 77, presents an instrument which will be found very convenient in checking and testing in connection with the new A.C. operated sets and accessories.

This instrument has a combination range of 0-3-15-150 volts. The scale is silver etched with black characters and the movement is mounted in a metal case on a bakelite base. Convenient means are provided for table or wall mounting, or the instrument may be used in portable work, for which it was especially designed.

Write for Special Circular No. 1145.

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New Prices Effective April First, 1928

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1715 Kcs. to 1825 Kcs. $15.00
1825 Kcs. to 2000 Kcs. $15.95
2000 Kcs. to 2500 Kcs. $17.50
2500 Kcs. to 3000 Kcs. $22.00
3000 Kcs. to 4000 Kcs. $22.90
7000 Kcs. to 7500 Kcs. $10.00

The frequency of the crystal will be given accurate to better than a tenth of one per-cent. Immediate delivery.

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"THE CRYSTAL SPECIALISTS"
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Re the next World Champion! The Candler System of Training in High-Speed Telegraphing shows how. Theo. McElroy, World's Champion Radio Operator, endorses no other system. Read what he says—"At the Pageant of Progress, Chicago, I copied 56 words per minute for 6 minutes, establishing a new radio record, which I still hold. I owe my Skill Speed and Steady Nerve both in sending and receiving to The Candler System. What this system has done for McElroy and thousands of others—it will do for YOU.

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How to be a commercial Radio Operator

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QST Apr 1928

By this time everyone was well acquainted, and the first formal meeting, Friday night, was presided over by division director Frank M. Corlett, and was primarily a traffic meeting. Louis Falconi, 5ZA, the first Hoover Cup winner, told us how traffic was handled in the old spark days. Lyman Edwards, 5FJ and R.M. of Okla., gave several humorous anecdotes of his first trip as a "lid" commercial operator on the Great Lakes. All the SCMs present then gave brief talks on the organization of the Communications Department, particularly in their sections.

Saturday morning was given over entirely to contests and stunts, of which the Oklahoma City "Oklahoman" says "the picnic part of the affair included contests to determine the fastest undresser, champion static spitter, biggest and worst liar, and champion permanent wavet!" 5ZAV won the prize for best explanation of the action of a crystal detector, based on his extensive independent research and difficult mathematical derivations, and entirely unbiased by opinions of other famous scientists.

The main technical meeting Saturday afternoon included talks by Prof. F. C. Tappan and Prof. O. W. Walter of the Electrical Engineering department, Mr. Roy Allen who told of new R.C.A. tube developments; 5ZAV, 5APG, 5AKN, 5AJ, and 5ZA.

The banquet Saturday night opened and closed with rousing cheers for Alpha Sigma Delta, the organization that made this wonderful convention a reality. Prizes were awarded by 5AQ to all contest winners, several hundred dollars worth of real ham apparatus having been contributed by QST advertisers. The grand prize, a UX 852 watter bought and contributed by Alpha Sigma Delta, was won by 5ANK of Dallas. Happy boy!

---Pat Schultz, 5AQ-SAO.

A letter headed "A Hot One" appeared in the correspondence columns of QST for April, 1927. This letter has been the cause of an undue amount of bitter feeling. Such is entirely out of place in any amateur game. Moreover, further consideration discloses the letter to have been too personal in its wording; also lacking in consideration for possible reception conditions at the stations concerned, which conditions might well have accounted for the contretemps as related. We regret the publication of the letter.

Transformers

Of course Acme builds them. Acme products are nationally known.
Furnish us with your blue prints and specifications for prices.
We invite your inquiries.

Member R.M.A.
The Acme Electric & Mfg. Co.
Established in 1897
1653 Rockwell Ave., Cleveland, Ohio

Say You Saw It In QST—It Identifies You and Helps QST
THE life blood of your set—plate power. Powerful permanent, infinitely superior to dry cells, lead-acid, B, S eliminators. Trouble-free, rugged, abuse proof, that's an Edison Steel-Alkaline Storage, B-battery. Upset electrically welded pure nickel connectors insure absolute quiet. Lithium-Potassium solution (that's no eye). Complete, knock-down to 100 Henry 150 M.A. $6.00. All parts are Frank Murphy, Radio 8ML, 1837 Rockwood Rd., Cleveland, Ohio.

HAWLEY Edison element battery and parts standard for over five years. Look at our patent pending connector—no thin wire to drop off—ontains 20 times more metal than regularly used. Heavy shock proof cells, fibre holders, etc. Everything for a rapid-fire "H" supply. Complete assembled 100 volt "B" $10.00. Knockdown to 100 Henry 150 M.A. $6.00. All parts are Frank Murphy, Radio 8ML, 1837 Rockwood Rd., Cleveland, Ohio.


Ham-ads Notice

Ham-ads Department is conducted strictly as a service to the members of the American Radio Relay League and advertising will be accepted under the following conditions.

1. "Ham-ads" advertising will be accepted only from members of the American Radio Relay League.

2. The signature of the advertiser must be the name of the individual member or his officially assigned call.

3. Only one advertisement from an individual can be accepted for any issue of QST, and the advertisement must be the same for the entire issue.

4. Advertising shall be of a nature of interest to radio amateurs or experimenters in pursuance of the art.

5. No display of any character will be accepted, nor can any typographical arrangement, such as all or part capital letters, be used which would tend to make one advertisement stand out from the others.

6. The "Ham-ads" rate is 10 cents word.

7. Closing date: the 25th of second month preceding publication date.

definition of words or phrases used in this dictionary

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The life blood of your set—plate power. Powerful permanent, infinitely superior to dry cells, lead-acid, B, S eliminators. Trouble-free, rugged, abuse proof, that's an Edison Steel-Alkaline Storage, B-battery. Upset electrically welded pure nickel connectors insure absolute quiet. Lithium-Potassium solution (that's no eye). Complete, knock-down to 100 Henry 150 M.A. $6.00. All parts are Frank Murphy, Radio 8ML, 1837 Rockwood Rd., Cleveland, Ohio.
FOR sale—brand new 500 watt short wave transmitter, excellent parts used throughout. Includes four 52db, microphone, speaker, power supply circuit for $55.00 or make an offer. Write for description. Edward Cullen, Jr., 1162 St. Lawrence Ave., Bronx, N.Y.C.

QL cards, 90 cents per 100, Samples. Russel Karr, 2733 S. California Blvd., Cleveland, Ohio.

ANNOUNCING our completely new line of meters for amateur use. Our special, 0-15AC voltmeter, $2.75, 0-10 and 0-4AC, $2.30 each, milliammeters 0-10, 0-50, 0-100, or 0-400 full scale only $1.85 each. These meters are used in our complete 5-watt transmitter—tube, transformer, keyer, etc., for: 20-40 meters, each $5.00. 20-40 meter receiver and one step $17.50. Aerovox 1000-volt tested 1 mfd. condensers $1.00. Potter 5000-volt oil filled transformer $3.50, and mfd. $3.25. "Ham-List" 4c. Robert Curtis, 1109 Eighth Avenue, Fort Worth, Texas.

CURTIS-Griffith 250-watt power-filter transformers 550-550 each side $10.50. Two 550-150 transformer-tube, 2½-volt filter $30.00; Thoradson Power Transformers 550-750 each side $16.00; 1500-1500 each side $22.00, Illuminum square foot $5c, Lead square foot $5c. Potter 2-mfd. 1000-volt condensers $2.75. ARRL Handbooks $1.00. Amateur Callbooks $1.00, New "Ham-List" 4c. James Radio Curtis, 844C, 1109 Eighth Avenue, Fort Worth, Texas.

BUILDING out—unsold parts, complete 5-watt set and parts, Write for list. m&ON, Box 205, Montgomery, Ala.

POIT sale. Suhl synch rectifier, good condition, $20 each. PPR, Valparaiso, Indiana.

G&I? QSL cards—guaranteed power oscillators: 50 meter band, calibrated 1/10%. Limited number at $12.50 each. Satisfaction or money back. E. G. Watts, Jr., 1024 Southwest Ninth St., Miami, Fla.

HAMS: Genuine brand new and guaranteed RCA UV205 50 watt tubes. $10.98, Stromberg-Carlson 3½ mfd. working voltage 500 Volts filter condensers $1.35. Readite panel meters 0-18 V.A.C. $2.00, 0-100 or 0-400 milliamperes 90c. Postage extra. "Hamshure" 3c. Kenneth Hanifan, Waterville, Ohio.

FADA power rheostats three ohms, carry 2½ amps, Keep fluorescent center tap balanced. 50 cents postpaid. 2CE, Robert Curtis, 1019 Eighth Avenue, Fort Worth, Texas.


QLS cards: 100 plain cards, 95c; 150, $1.20; 200 Govt. cards, $2.50; radiogram blanks, stationery, etc. H. M. Selden, Cranenville, Penn.

SELL Westinghouse 3 unit 900V 290W MG 110V 60 cycle single phase drive $16.00. Field rheostat, $6.00. sCMY.


BURNT out plate and filament supply transformers re-wound equal to new and returned C.O.D. for one-half the price of a new one. Burnt out Audio transformers re-wound for $7.50. 25 cycle and 60 cycle plate and filament supply transformers to your order, rated output guaranteed. Filter chokes of any size to order, best materials used in all work. If it is a transformer that you need, we can build it. Junk, brochure, and information seekers save stamps. Nat G. Scott, New Albany, Mississippi.

U. S. Navy five watters type 1162, plate voltage 550 to 750, filament, $7.5 to 8.5. While they last $1.30 each. Chokes guaranteed to pass 160 mls at 750 volts, wound with Duddo wire, price only $2.35 each. Western electric 500 volt condensers $1.00 each. UX210 type tubes $5.25. Away with your old 110 volt receiver tube 25.00. RCA UX250 the new 25 watt tube $12.00. Neon tubes with a standard base and a guaranteed working life of over 2000 hours $1.85 each. 7½ bars $1.00. All shipments made promptly C.O.D. Joe Bush, 179 Berkshre Place, Irvington, N. J.

HEADQUARTERS for hams—Mueller 150-watt input tubes $16.00. UV 5-S-watters $5.15. Complete 5-watt transmitters—tube, transformer, keyer, etc., for: 20-40 meters, each $5.00. 20-40 meter receiver and one step $17.50. Aerovox 1000-volt tested 1 mfd. condensers $1.00. Potter 5000-volt oil filled transformer $3.50, and mfd. $3.25. "Ham-List" 4c. Robert Curtis, 1109 Eighth Avenue, Fort Worth, Texas.

CURTIS-Griffith 250-watt power-filter transformers 550-550 each side $10.50. New Thoradson Power Transformer, two 7½-volt filter $30.00; Thoradson Power Transformers 550-750 each side $16.00; 1500-1500 each side $22.00, Illuminum square foot 5c, Lead square foot 5c. Potter 2-mfd. 1000-volt condensers $2.75. ARRL Handbooks $1.00. Amateur Callbooks $1.00, New "Ham-List" 4c. James Radio Curtis, 844C, 1109 Eighth Avenue, Fort Worth, Texas.

Selling out: New RCA UX250 15 watt tube is here. Immediate delivery for $10.75. Extra heavy 99.6% pure aluminum Company of America aluminum 10c sq. ft. We have any ham stock you need. Manual tubes, super-syn, Valcoplex, Vintage condensers, Mercury arcs. Flechter filter condensers (35% off), UX222 $5.75, Westman RF amp. assembled $13.75. Write for anything not listed and our money savings prices. 9ARA, Butler, Mo.

BREAKDOWN at 6000 volts means new condenser free. 0.02 Fixed transmitting condensers; made of copper; clean glass; electrically stable; tested 1 mfd. 100 volt $1.75 postpaid. R.C.A. 852's $30. 28GM-6724 Ridge Boulevard, Brooklyn, N. Y.

SELL—7½ watt transmitter, bargains. If you're not interested in quality do not write. H. P. Brewer, Oaklawn, Iowa.

HANDY'S Handbook specifies these condensers for that Precision Wavechanger.—Brand new General Radio Type 535. Navy 300 watt General Electric Laboratory Tube Precision Type 235-G, List $18.50, Price $7.50. Also new Acme 500 watt Plate Transformer $29.00. See new OHA's, 9BET.

WRITE for list of radio parts. 4ABB, Greenville, Tenn.


TRANSFORMER RECLAIMING SERVICE. Stop throwing away valuable burnt out transformers. I replace with original factory windings—every job carries previous guarantee of transformer. Most leading manufacturers make electric meters for this service. $1.26 to $1.30. Correct equipment and a new one couldn't be superior. Also sell reclaimed transformers. Write your needs. H. A. Sears, 9 S. Reed Ave., Moshulu, Ala.
HELLO HAMS-Here is Ben with some real Ben's buys.

They are here now at Ben's-


SCUX, Millington, Mich., prints QSL cards the way you want them. 300 plain, two colors, $3.15 postpaid. Write for other prices and samples.

Jeffries plate transformers, 1000 watts, 550-825-1100-1500-2200 each side, $21.50. 1000 watts 2300-3000 each side $27.00. Folder on request. 125 watt filament transformer 9-12 volts $8.35. Carl Schwennd, 7427 Alameda Blvd., Los Angeles, Calif.

Louise B. Kersge units rewound and magnets recharged $3.00. 21 hrs. service. Henry Wagner, East Chicago, Indiana.


Q R A SECTION

50c straight with copy in following address form only:

TCX—F. O. Moreson, 171 Cherry St., Maiden, Mass.

1WY—Miles W. Weeks, 40 Norfolk Road, Chestnut Hill, Brookline, Mass.

2BUO—Werner H. Olpe, 14 Brooklyn Ave., Jamaica, Long Island, N. Y.

SAGE.—B. J. Chromy, 1602 Hobart St., N. W., Washington, D. C.

YARD—J. D. Boone, 3710 Parker Ave., Norfolk, Va.

5MU—San Francisco Radio Club, 484 Bright St., San Francisco, Calif.

BBW—George K. Bernhardt, 1067 Parsons Ave., Columbus, Ohio.

BDB—John Hajduk, Jr., 13 Shingiss St., McKees Rocks, Penn.

5YET—Raymond F. Knoeckel, 1427 Wisconsin Ave., Milwaukee, Wis.

5XTT—H. B. Howell, Box 1411, Ketchikan, Alaska.

441N—Russell F. Roberts, Cambridge Street, West End, Brisbane, Queensland, Australia.

5HR—Ruben Simas, Rua Riachuelo 91, Curitiba, Brazil.

THE following stations belong to members of the A.R.R.L. Headquarters gang. Mail for them should be addressed care A.R.R.L., Hartford, Conn. When operating IMK they use personal sines as indicated.

IMK Headquarters, Chief 1BO C C. Rodimon "rod"

Ham operator, R. B. Parmetel"bud"

1AL E. F. Westman "eo"

1BB W. B. Eantor "nb"

1BD F. E. Handy "fi"

1BH W. B. Warner "kb"

PACENT ELECTRIC CO., INC.

91 Seventh Ave., New York, N. Y.

Say You Saw It In QST—It Identifies You and Helps QST

PACENT DUO-LATERAL COILS

TODAY—as eight years ago—PACENT coils are the popular choice of experimenters, engineers and laborato-

arys. A complete line always on hand together with mountings.

Write for data and prices.

PACENT ELECTRIC CO., INC.

91 Seventh Ave., New York, N. Y.
Announcing the

TABLE TYPE
CLAROSTAT

E'ery ham knows the all-important need for accurate, efficient tuning adjustments. The CLAROSTAT is here to fill that need. It can give you an automatic tuning range as well as accurately adjustable position, all at the same time. This makes the CLAROSTAT an invaluable equalizer for stable, accurate output. For tuning power amplifiers, it is superior to any other device. For tuning receivers, it is a practical and economical means of avoiding the use of two or more tuners. If you are interested in adjustable tuning, take a careful look at the CLAROSTAT. In a word, the CLAROSTAT is the solution to all your tuning problems. Any radio company can supply you. Ask your radio dealer to show you the Table Type Clarostat, as well as Volume Control, Standard and Power types. And don't hesitate to write us for literature and for whatever dope we can give you.

FORE YOUR CONVENIENCE
QST'S INDEX OF ADVERTISERS IN THIS ISSUE

Transmitting Apparatus

MODERN RADIO SETS USE REL PARTS

250 Watt Master Oscillator Power Amplifier Short Wave Telegraph Transmitter employs REL parts throughout. Heavy aluminum frame construction with total shielding between amplifier, oscillator and power control circuit.

Wherever you see super transmission you'll find REL Quality Parts. Heavy duty Transmitting Condensers, the famous Inductances, flatwise wound on glass, Tube Holders, such as the UX352 Holder pictured above, that assure absolute rigidity and perfect contact. A complete line of REL Transmitting Kits adaptable to all popular types of tubes is available at moderate prices. Bulletin "T" describes the Kits. REL is steadily producing new developments of importance to all in the Short Wave field.

REL owns and operates experimental Station NU2XV on 15.1, 30.2, and 60.4 meters

Radio Engineering Laboratories

REL 100 Wilbur Avenue, Long Island City, N. Y. REL

Say You Saw It In QST—It Identifies You and Helps QST
Let us Send You This Book!

For "B" Eliminators, Power Supply and Filter Circuits, nothing compares to the Amrad Mershon Condenser, which is self-healing, absolutely unaffected by weather conditions, and has extremely high capacity in extremely small space.

Let us send our new book, showing hook-up and explaining the many uses of Mershon. Address Department 28

The AMRAD Corporation
Medford Hillside, Mass.

J. E. HAHN, President
POWEL CROSLEY, JR., Chairman of the Board

Say You Saw It In QST—It Identifies You and Helps QST
INDUCTANCE UNITS

The Perfect Inductances for All Low Wave Work

FOR RECEIVING

AERO LOW WAVE TUNER KIT
Completely interchangeable. Adopted by experts and amateurs everywhere. Range 15 to 130 meters. Includes 3 coils and base mounting, covering U.S. bands, 20, 40 and 80 meters. You can increase or decrease the range of this short wave tuner by securing the AERO Interchangeable Coils described below. All coils fit the same base and use the same condensers. Use Code No. INT-125 in ordering.

INTERCHANGEABLE Coil No. 0
Range 13 to 29.4 meters. This is the most efficient inductance for this low band. Code number INT-0. Price .... $4.00

INTERCHANGEABLE Coil No. 4
Range 125 to 250 meters. Fits same base supplied with low tuner kit. Code number INT-No. 4. Price .... $4.00

THE NEW AERO INTERCHANGEABLE COIL No. 5
Normal range 235 to 550 meters. However, by using .0001 Sangamo fixed condenser across the rotor and stator of the .00014 variable condenser, the maximum wave band of this coil is increased to 725 meters. This gives you coverage of the following bands: Airplane to Airplane, Land to Airplane, Ship to Shore (Great Lakes) Ship to Shore (Atlantic and Pacific Oceans). Code number INT-No. 5. Price ............ $4.00

NOTE This new Aero Short Wave Kit is wound with No. 16 wire on secondary, making it even stronger, and cutting down the resistance appreciably.

FOR TRANSMITTING

KEY 2040 KIT
Kit contains 2 AERO Coils, 17 to 50 meters each, 1 AERO Antenna Coil Mounting Base, 1 AERO Grid Coil Mounting Base, 2 AERO Essential Choke Coils.
Price $12.00

KEY 4080 KIT
Kit contains 2 AERO Coils, 35 to 80 meters each, 1 AERO Antenna Coil Mounting Base, 1 AERO Grid Coil Mounting Base, 2 AERO Essential Choke Coils.
Price $12.00

KEY 9018 KIT
Completely interchangeable with either of above kits. Range 90 to 180 meters. Contains 2 coils and mounting base.
Price $12.00

COMPLETE AERO TRANSMITTER KITS

PLAN FOR D. X. RECORDS NOW!
Order these coils direct from us if your dealer hasn't them and start now for wonderful records. Specify code or key numbers when ordering. Or write at once for complete descriptive literature.

AERO PRODUCTS, Inc.
Dept. 16
1772 WILSON AVE., CHICAGO, ILL.
For years the Burgess Organizations have been doing a great deal of experimental and research work looking toward the advancement of radio art. The aircraft radio communication tests on high frequency, recently conducted by 9XH-9EK, while somewhat spectacular brought out some heretofore unknown phenomena. All of this information as well as the results of many other experiments of interest and value have been made available, in the form of Burgess Engineering Circulars distributed freely, to those who are interested in experimentation.

We feel that some of this work has resulted in real benefit to radio in general and to the radio amateur in particular and whatever measure of success our work has had is a spur to renewed efforts along these lines.

Radio Engineer