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Editorials ........................................ 7
Naval Reserve Control Stations ................. 8
How Uncle Sam Checks Your Frequency
Irving L. Weston, W1BHB and Ralph J. Renton, W1ICU 9
An A.C. Operated Vacuum-Tube Voltmeter . William Wagner 14
Further Notes on the Zeppelin Antenna
Don Edmondo Ruspolti, IIIMM 17
How Is Your Tone Color? ....................... Edwin Ehlinger, W8BBP 19
Election Results .............................. 20
A New Type of Peaked Audio Amplifier . Howard Allan Chinn 21
WWV Standard Frequency Transmissions . 23
Making Records of Amateur Signals . H. W. Dreyer, W1ANC 24
Coming—The Fourth International Relay Competition 26
W1MK’s Dynatron Frequency Meter ............. R. P. Parmenter 35
An Electrically-Operated “Bug” . Charles E. Scymour, W9FMN 37
Second All-Section Sweepstakes Contest ........ F. E. Handy 39
Standard Frequency News and Schedules .... 42
The Neglected Current-Squared Galvanometer
Paul E. Griffith, W9DBW 43
Experimetners’ Section .......................... 45

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— A NEAT HOMEMADE CABLE PLUG — MAKE THE FILAMENT
VOLTMETER DO DOUBLE DUTY— THE SIMPLEST AUDIO-OSCIL-
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CONDENSERS— REPAIRING FILTER CONDENSERS— A NOVEL
CRYSTAL HOLDER.
W9DXP, Chicago, Ill. .......................... 49
Good Practice ................................... Jack Paddon 52
I.A.R.U. News .................................... 53
Calls Heard ..................................... 55
Correspondence Department ....................... 56
Hamads and QRA’s .............................. 92
QST’s Index of Advertisers ......................... 94

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<tr>
<th>State/Region</th>
<th>City/Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ATLANTIC DIVISION</strong></td>
<td></td>
</tr>
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5
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.
THE whole high-frequency world realizes now that, in addition to daily and seasonal changes in the performance of a certain frequency, account must be taken of a long-time change in atmospheric conditions seemingly dependent upon solar activity and therefore believed to be a cycle of approximately eleven years’ duration. Elaborate transmission measurements made last year are of little value in predicting performance next year. The whole story of course isn’t yet known, for high-frequency transmission is not yet eleven years old. In the meantime more than one expensive station has been planned and built only to find that the change in atmospheric conditions between the original tests and the completion of the station was enough to upset all calculations, making rebuilding necessary. Most decidedly there is here another factor which must be considered in picking a frequency for a certain job.

The amateur angle is intensely interesting to examine. Our first transatlantic two-way working, in 1923, was on wave lengths of around 110 meters. The first fifteen stations to succeed in this work, on both sides of the ocean, all had wave lengths between 108 and 118 meters. Although powers of several hundred watts were not uncommon, signals were audible 25 feet from the ‘phones in this early work. Gradually shorter waves were tried, drifting down to 110 meters, 90 meters, 80. It was a long time before anybody tried 40. Contrast that with our practice in recent years and you realize with a start that for years we have thought of DX only in terms of the 7-mc. band and the 14-mc. band, and sometimes even the 28-mc. band. Now the average amateur of five years’ experience will tell you that DX on these frequencies was at its best about 1928 and that it has been growing steadily worse ever since! This has been a bad year for 14 mc. The commercials have found it a terrible year, with much of the ‘dope’ upset. This winter the 7-mc. band has frequently gone dead as early as 9 p.m. on the east coast, even at transcontinental distances. On the other hand, the signals in the 3.5-mc. band have been tremendous, DX has been surprising, and there has been some nice transcontinental work on those frequencies. European amateurs are boosting the 1.7-mc. band, and a letter in The T. & R. Bulletin reports R7-8 signals between England and Czechoslovakia with 3-watts power on that frequency. What does all this mean? We suggest that it means the return of DX on the lower frequencies. Try this experiment: Draw yourself a sine curve, one cycle of which represents the sun-spot cycle of 11.1 years. Mark one ‘positive’ loop Summer 1923, the date of the last sun-spot minimum. The next ‘positive’ loop is then Summer 1934, when the next minimum occurs. The intervening ‘negative’ loop is then seen to be End of 1928, at which time it is known that there was a maximum of solar activity. Where are we now on this curve? It is apparent that we are entering the region of most rapid change, crossing the ‘node’ this coming autumn. That is to say, while there will be irregularities, to be sure, it is reasonable to predict that we approach in 1934 a duplication of the conditions in 1923, that for the next several years the DX value of 7 mc. and 14 mc. will steadily decline, and that by about next winter we should be able to resume transocean two-way communication in the 3500-4000 band!

Regard now, fellows, our 1715-2000-kc. band, valuable but neglected, at present carrying probably less than 5% of our activity. If ‘80’ develops DX potentialities, as seems probable, then ‘160’ will become equally serviceable for our domestic uses — shortly it will do for us those things we normally expect of ‘80.’ In fact, if ‘80’ takes...
on too much of a DX complexion, as seems likely, it will show skip characteristics and become temporarily valueless for short-range schedules, while "160" will be just the proper stunt. The activity now ensconced in the 3500-4000 region is the heart of the whole A.R.R.L., one that no one would voluntarily disturb, but it is something to think about that short-distance traffic "skeds" may for a while become impossible in that band. The profound ratiocinations of the Editor, then, indicate that everybody interested in present-day "80" operation ought to turn a speculative eye on "160" and start moving into that grand but little-occupied region.

This ought to be of particular interest to the 'phones. They are badly crowded now and they are beginning to get into trouble for out-of-band operation in the aircraft channels near the low-frequency edge of the 3500-4000 band. The whole of the band from 1715 to 2000 kc. is open to 'phone and it is the widest of all the amateur bands, wider even than all of the "80" band. Moreover, the data indicate that the 'phone men can expect DX to improve in the "160" band every winter for the next three or four years and to continue excellent for several years thereafter.

It looks as though we should expect that by the winter of 1934-35, "80" will be doing "40's" wont, with "40" good for daylight work like "20" is supposed to be now. Under those conditions the 1715-2000-kc. band may well become the most valued location for the throbbing heart of amateur radio, our traffic system. It is worth hearing about. It would be fine to see a greater occupancy of that band by amateurs generally, and it should look particularly inviting to the 'phone men right now.

K.B.W.

Naval Reserve Control Stations

Most of the Naval Reserve control stations are primarily amateur stations which also have a Navy status when working in the Reserve. This amateur identity, of course, is not apparent in their Navy calls. The following list, corrected to June 2d, will be helpful in identifying the amateur owner behind these stations:

<table>
<thead>
<tr>
<th>Naval District</th>
<th>Master Control Station</th>
<th>Amateur Call</th>
<th>Alternate Call</th>
<th>Amateur Call</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>NDA, Medford, Mass.</td>
<td>W1KN</td>
<td>NDR, Augusta, Me.</td>
<td>W1B1G</td>
</tr>
<tr>
<td>3rd</td>
<td>NDF, So, Manchester, Conn.</td>
<td>W1QP</td>
<td>NDB, New York City (Navy)</td>
<td>W3AIB</td>
</tr>
<tr>
<td>4th</td>
<td>NDM, Camden, N. J.</td>
<td>W3AIP</td>
<td>NDC, Wilmington, Del.</td>
<td>W3RI</td>
</tr>
<tr>
<td>5th</td>
<td>NDE, Baltimore</td>
<td>W4NY</td>
<td>NDR, Norfolk, Va. (Navy)</td>
<td>W4B1</td>
</tr>
<tr>
<td>6th</td>
<td>NDI, Atlanta</td>
<td>W4NKP</td>
<td>NDU, Jacksonville</td>
<td>W4B1G</td>
</tr>
<tr>
<td>7th</td>
<td>NDL, Orlando, Fla.</td>
<td>W4HQ</td>
<td>NDZ, Oklahoma City</td>
<td>W5APG</td>
</tr>
<tr>
<td>8th</td>
<td>NDD, Pensacola, Fla.</td>
<td>W5ZN</td>
<td>NDD, Kansas City, Mo.</td>
<td>W6ER</td>
</tr>
<tr>
<td>9th</td>
<td>NDS, Chicago</td>
<td>W6ND</td>
<td>NVY, Los Angeles</td>
<td>W6NR</td>
</tr>
<tr>
<td>11th</td>
<td>NDT, San Diego, Calif.</td>
<td>W7BQ</td>
<td>NH, San Francisco</td>
<td>W6NC</td>
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<td>12th</td>
<td>NDO, Oakland, Calif.</td>
<td>None</td>
<td>None</td>
<td>None</td>
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<td>13th</td>
<td>NDQ, Seattle</td>
<td>None</td>
<td>None</td>
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<tr>
<td>15th</td>
<td>NDI, Balboa, C. Z.</td>
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<tr>
<td>D. of C.</td>
<td>NKF, Washington</td>
<td>None</td>
<td>None</td>
<td>None</td>
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</tbody>
</table>

All these stations use 404 5ke. Station NKF, when using this frequency, acts as senior control station for all stations listed. Station NDH acts as senior control station for the West Coast.

Strays

A little-considered source of seemingly mysterious QRM in a ham receiver lies in the tungsten filament of the common light bulb — and while the light burns as usual! One explanation is that a spot in the filament burns out but the ash, residue or what’s left, forms a path for a little arc and passes enough current to keep the bulb lighted, though close inspection will disclose the presence of a decided flicker. When the light is turned off it’s a dud from then on, so to trace QRM from such a source pull the main switch on the lights near the receiver for a moment. If a bulb stays out — that was it. — W6OCKS

Research Paper No. 227, “Note on the Electrical Resistance of Contacts between Nuts and Bolts,” details the results of an investigation undertaken by the Bureau of Standards on this subject. It may be obtained from the Superintendent of Documents, Washington, D. C., for ten cents (stamps not accepted).
How Uncle Sam Checks Your Frequency

The Department of Commerce Monitoring Station at Hingham, Mass.

By Irving L. Weston, W1BHB,* and Ralph J. Renton, WICU**

The following is a description of the monitoring station, located at Hingham, Mass., which is the first of ten such stations to be placed in operation at various points throughout the United States. The object of these monitor stations is, as the name implies, to monitor or police the radio channels. While most of the observations have been confined to broadcasting activities, arrangements are being made to establish regular daily schedules at Hingham, Mass., to cover all radio activities.

By special request, the Hingham station has checked the frequencies of a number of high-frequency transmitters located in all parts of the world. To a limited extent, the frequencies of amateur transmitters have been checked and in several instances licenses actually have been suspended for off-frequency operation and also for failure to comply with the regulations in other respects.

POWER SUPPLY

Power is supplied from storage batteries. Two banks of batteries of 14-ampere-hour capacity, and 280 volts per bank, comprise the high-voltage plate supply. The filament supply is obtained from four 162-ampere-hour 8-volt batteries. The batteries are charged by motor-generator units. Each high-voltage bank is charged by its motor-generator unit, which is rated at 300 volts and 1 ampere capacity. A 12-volt 50-ampere unit charges the "A" batteries. The "B" batteries are floated on trickle charge while in use, audio filters being provided in the charging circuits. The "A" batteries are provided in duplicate sets so that two batteries may be charging while the other two are in use. Radio-frequency filters are installed in the armature and field circuits of each generator to eliminate interference which would be caused by sparking commutators.

RECEIVERS

Two receivers are employed. The first, which is known as "B" receiver, has a range from 100 to 1500 kc., or from 3000 to 200 meters. It has four individually tuned stages of radio-frequency amplification, regenerative detector and three stages of audio-frequency amplification. Type '10 tubes are used in the radio-frequency amplifier and detector. Two UX-841 tubes are used in resistance-coupled amplification, and the last stage of the audio amplifier is a type UX-842 tube using impedance coupling. Loop antennas are used on this receiver when it is desired to use the directional properties of the loop in eliminating or reducing interference from distant static and from stations operating on the same or adjacent channels. A set of three loops covers the frequency range. A 150-foot antenna is used where greater pick-up is desired. Three sets of plug-in coils are needed to cover the frequency range.

The second, or "C" receiver, has a range from 1500 to 30,000 kc., or 200 meters to 10 meters. It has three individually tuned stages of screen-grid radio-frequency amplification, regenerative detector, and three stages of audio-frequency amplification, the audio amplifier being exactly like the audio amplifier used in the "B" receiver. Type '22 screen-grid tubes are used in the radio-frequency amplifier and the detector is a Type '10 tube. Two dynamic loud speakers are used, one for each receiver. Five sets of plug-in coils

February, 1931
are needed to cover the following frequency ranges:

<table>
<thead>
<tr>
<th>Coil</th>
<th>No. 1</th>
<th>No. 2</th>
<th>No. 3</th>
<th>No. 4</th>
<th>No. 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1500-5700</td>
<td>2700-5000</td>
<td>5000-8800</td>
<td>8800-16,500</td>
<td>16,500-30,000</td>
</tr>
</tbody>
</table>

THE ANTENNAS

The antenna used for the "C" receiver is to be a Conrad vertical type with a two-wire radio-

A SAMPLE FROM A TYPICAL DAILY LOG SHEET

frequency feed line. The long antenna is sometimes used on this receiver with a ground con-

As shown in Fig. 1, the 150-foot single-wire antenna is strung from the top of a 58-foot pole. The Conrad vertical antenna will consist of one-inch copper tubing supported by stand-off insulators on the pole. The feed line is taken from the calculated electrical center of the antenna, which is not the dimensional center because the capacity to ground is greater for the lower half of the antenna than for the upper half. The feeder is transposed by transposition insulators every six feet between the antenna and the receiver.

The standard of frequency is a piezo quartz crystal, temperature-controlled to well within .1 of one degree Centigrade. Under actual operating conditions over a period of six months the temperature did not vary more than .01 of one degree Centigrade. This crystal is ground for a frequency of 30,000 cycles and is certified by the Bureau of Standards. The third harmonic of this crystal locks into synchronism with a 90,000-cycle multivibrator. The third harmonic of a 10,000-cycle multivibrator locks into synchron-

FIG. 1 — THE OUTDOOR RECEIVING ANTENNAS

The 150-foot antenna is used mostly with the "B" receiver. The vertical Conrad antenna is designed particularly for high-frequency reception with the "C" receiver.

The oscillator and amplifier tubes are included in a shielded compartment adjacent to the heated chamber. Type UX-841 tubes are used for both oscillator and amplifier.
The multivibrator unit contains eight Type '10 tubes. Two of these tubes are amplifiers, one amplifying the input from the crystal oscillator and the other amplifying the output of the multivibrator. The 1000-cycle multivibrator and the 100-cycle multivibrator each employ two tubes. The remaining two tubes are used in the circuit which is common to the 90,000-cycle and the 10,000-cycle multivibrators. In this circuit a switch adds or subtracts capacity which makes this circuit operate either at a 90,000-cycle or a 10,000-cycle fundamental.

When two frequencies are combined, a third frequency is produced which is the difference between the two. This principle is made use of to obtain an audio beat, the frequency of which can be reduced to zero. A variable oscillator with a frequency range of 30,000 to 35,000 cycles beats with the output from the crystal oscillator which is fixed at 30,000 cycles, thus producing a beat which is variable from 0 to 5000 cycles. Two variable precision condensers in parallel tune the oscillator. One condenser is a vernier, the full scale range of which is only 250 cycles. This unit has a Type '12-A tube as oscillator, another as amplifier, and two Type '22 tubes as input and output coupling tubes. The latter tubes are necessary so that changes in the circuit constants of the coupled circuits will not affect the oscillator.

Into the beat indicator unit is fed the audio-frequency output from the receivers, the beat-frequency audio oscillator, the heterodyne frequency meter, and the 100-cycle multivibrator. A variable pad controls the amount of energy which may be used from each source, exactly as a fading panel is used in a broadcasting station to mix the energy from several microphones.

The output from this pad is fed into the grid circuit of a highly self-biased Type '12-A tube, which acts as a vacuum tube voltmeter. A 1-ma. milliammeter in the plate circuit of this tube gives a visual indication of the beat produced between two audio frequencies which may be introduced from any of the units connected to the input of the beat indicator. The beat may also be heard on a pair of phones plugged into the beat indicator.

The heterodyne-frequency meter consists of two units, a Colpitts oscillator and detector and four-stage resistance coupled audio amplifier. A Type '12-A tube is used as oscillator. The last amplifier is a Type '71-A tube. The detector and

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Details of the theory and construction of multivibrators are given in the article Standard Frequency Station W1XP, QST Jan. 1930. — Ebronn.

three stages of audio amplification employ UX-864 tubes. A split precision condenser tunes the grid and plate circuits of the oscillator tube and a set of plug-in coils covers the frequency range of 100 kc. to 2000 kc. In parallel with the split variable condenser are two fixed condensers. The scale of the condenser is thus "spread out," giving greater accuracy in setting and reading the meter.

CALIBRATION

Before the apparatus can be used to measure an unknown frequency, the beat-frequency audio oscillator and the heterodyne-frequency meter must be calibrated.

The large condenser of the beat-frequency oscillator is calibrated with the vernier condenser set
at an arbitrary value of about half scale. The frequency range of the oscillator is 5000 cycles and it is calibrated by beating it with the 100-cycle multivibrator and thus obtaining a calibration point every 100 cycles from 0 to 5000 cycles.

The 10,000-cycle multivibrator is now used to calibrate each coil of the heterodyne-frequency meter. Calibration points are obtained every 5000 cycles and a table is made up.

This table lists the frequency, the corresponding condenser setting, and the cycles per scale division of the condenser dial between each 5000 cycle point.

Now, using either the calibrated heterodyne-frequency meter or the 10,000- and 90,000-cycle multivibrators, the oscillating detector of each receiver is calibrated in order to make it relatively simple to tune in a station of known frequency. Calibration curves are mounted on each receiver.

**FREQUENCY MEASUREMENTS**

Suppose a broadcast station to be tuned in on "B" receiver. The calibration of the detector circuit dial shows the frequency to be approximately 500 kc. Coil A-10 of the heterodyne-frequency meter is then plugged into the meter, since the calibration shows that 500 kc. falls within the range of that coil. The audio output from the receiver is fed into the beat indicator. The heterodyne-frequency meter is tuned to zero beat with the carrier wave of the station and when zero beat is approached a visual beat will be apparent on the milliammeter in the plate circuit of the highly biased tube in the beat indicator or an audio beat may be heard in the phones. It is thus possible to obtain a very accurate setting. The reading of the heterodyne-frequency meter scale is recorded on the data sheet. The channel is thus identified and the calibration gives it as 500 kc.

Now the 10,000-cycle multivibrator is turned on and the heterodyne-frequency meter is tuned to zero beat with its 56th harmonic, the audio output from the heterodyne-frequency meter being fed into the beat indicator in order to obtain a visual and audible beat. The setting is recorded. It is now known whether the station frequency is above or below 560 kc., an increased scale reading on the heterodyne-frequency meter indicating an increasing frequency. Therefore, if the setting of the meter for zero beat between it and the station is higher than the setting for zero beat between it and the multivibrator harmonic, then the frequency of the station is above 560 kc., and vice versa.

The number of divisions of the scale between the station setting and the multivibrator harmonic setting, times the cycles per scale division (as obtained from the table) gives the frequency deviation in cycles.

To obtain an accuracy of better than one part in 100,000 the audio beat between the station carrier and the 56th harmonic of the 10,000-cycle multivibrator is compared with an audio frequency from the beat frequency audio oscillator. The coupling between the 10,000-cycle multivibrator and the receiver input is adjusted until the beat is of maximum intensity. The audio outputs from the receiver and from the audio oscillator are fed into the beat indicator where the energy received from each is carefully matched by adjusting the potentiometers of the pad. The vernier condenser scale is set at the arbitrary point at which the large condenser was calibrated and the large condenser is varied until zero beat is obtained as before. The point at which the vernier condenser was left will be the "station setting." The calibration of the large condenser will determine roughly the deviation. That is, it will be determined whether it falls between 200 and 300 cycles, 300 and 400 cycles, etc.

The receiver may be turned off now. The output from the 100-cycle multivibrator is now fed into the beat indicator instead of the receiver output. The vernier condenser of the audio oscillator is adjusted for zero beat between it and the

FIG. 2—THREE METHODS OF COUPLING FOR HETERODYNING A STATION SIGNAL BY A SIGNAL FROM THE FREQUENCY MEASURING EQUIPMENT

The method used with the loop antenna of the "B" receiver is especially interesting. The small coil mounted inside the frame of the loop is connected to the multivibrator and heterodyne-frequency meter circuits. The proper ratio of incoming signal to heterodyne signal strength is obtained by adjustment of the position of the coupling coil.
100-cycle point below the "station setting" and also for zero beat between it and the 100-cycle point above the "station setting." Suppose it to have been determined previously that the deviation fell between 300 and 400 cycles. The 300-cycle point and the 400-cycle point then have been determined and, by interpolating, the frequency represented by the "station setting" may be found.

To measure a code station where the carrier is broken up into dots and dashes so rapidly that it is impossible to obtain a visual zero-beat setting, the heterodyne-frequency meter is set as near zero beat as possible with the station carrier and then the frequency of the heterodyne-frequency meter is measured exactly as the carrier frequency of a station would be measured.

Because the energy from the 10,000-cycle multivibrator becomes very small on the extremely high harmonic frequencies, it is necessary to zero beat a harmonic from the heterodyne-frequency meter with the station and then to measure the fundamental of the heterodyne-frequency meter. The station frequency would then be the measured frequency of the meter times the order of the harmonic. In making the measurement, a switch is thrown connecting the 'phones to the receiver. A zero beat between the heterodyne-frequency meter harmonic and the signal is obtained audibly. The switch is then thrown connecting the 'phones to the beat indicator. A zero beat is obtained between the audio oscillator and the beat produced by the heterodyne-frequency meter fundamental and the 10,000-cycle multivibrator harmonic, both visually and audibly. The final adjustment is made by throwing the switch placing the 'phones in the receiver and readjusting for zero beat (audibly) between the heterodyne-frequency meter harmonic and the signal. Simultaneously, a readjustment for zero-beat (visually) is made between the audio oscillator and the beat produced by the heterodyne-frequency meter fundamental and the 10,000-cycle multivibrator harmonic. The 100-cycle multivibrator is now switched on and the measurement of the heterodyne-frequency meter fundamental completed exactly as previously described for a broadcasting station measurement. The final measured frequency is then multiplied by the order of the harmonic, which gives the final measured frequency.

At present a daily watch is kept and a schedule is followed which enables the engineer on watch to monitor the radio channels included between 100 and 30,000 kc. The daily log sheet may contain measurements of stations located anywhere on the map of the world. Frequently this monitoring station is called upon to measure the frequencies of United States and foreign stations which, although separated by thousands of miles, are reporting interference from each other. More and more time is being given to monitoring the amateur bands to check both non-amateur operation in the bands and out-of-band amateur operation. As mentioned at the beginning of this article, several cases have already occurred where amateurs have had their operator's and station licenses suspended for repeated "off-wave" operation.

**Strays**

The list of commercial stations by frequency assignments in the Radio Amateur Call Book Magazine has been thoroughly revised and enlarged in the December issue. This dope is a big help in checking calibrations of monitors or frequency meters. Short-wave broadcasting stations are also included in the new list.

Anent "Protecting the Rectifier" in the November "Experimenters' Section," W9GKG suggests putting the flashlight bulb in the high-voltage line between the rectifier and filter. One bulb will take care of both overloads and shorts in the filter condensers.
An A.C. Operated Vacuum-Tube Voltmeter
By William Wagner*

The vacuum-tube voltmeter is an instrument which is deserving of more attention than the average amateur gives it. It can be used for a large variety of voltage measurements which are outside the scope of ordinary voltmeters, such as the gain of amplifiers, comparative measurements of signal strength, measurement of modulation percentage of a 'phone transmitter; and in fact practically all measurements which require the use of a medium-range voltmeter that does not load the measured circuit. Possibly the name of the device creates the impression that there is something complicated and mysterious about it; such a conception is far from actual, as the following description will show.

While the v.t. voltmeter shown in the photographs requires no great amount of apparatus and is probably more compact than the average monitor, a wide range of measurements can be made with it, and it has been found to be generally useful.

A wiring diagram is shown in Fig. 1. The equipment is mounted on the front of a 9" x 6" x 5" aluminum shield can. The filament current, grid bias and plate supply are obtained from a rectifier as shown in Fig. 1, the filament current being kept at 60 ma. by means of a Clarostat, \( R_f \), or any suitable resistor. The input voltage is controlled by a 500,000-ohm potentiometer, \( R_i \), so that the maximum voltage to be measured will not cause the full-scale reading of the meter to be exceeded. The 400-ohm potentiometer \( R_2 \) in series with the filament has a 24-volt drop across it at 60 ma. This drop is available for grid bias.

A Weston Type 301 (0–1 scale) milliammeter is used for measuring both plate current and grid voltage. This is accomplished by the plug and closed-circuit jack arrangement. This meter can also be used for external voltage and current measurements, since it is connected to a grid-leaf mounting and a third jack.

Grid voltage is measured by placing a resistor, \( R_s \), suitable for the voltage to be measured, in the proper mounting (the left-hand mounting in the front view of the instrument). For instance, to measure 10 volts bias with the above meter a 1000-ohm resistor is required. With the plug inserted in the grid jack, \( J_3 \), the milliammeter will read volts, 10 being full-scale reading with the 1000-ohm resistor.

Plate current is measured by placing the plug in the plate jack, \( J_2 \), the grid jack closing its contacts and keeping the fixed resistor in the circuit to prevent any variation in plate current due to changes in grid voltage. Since the meter has a resistance only of 27 ohms, its removal has but a negligible effect on the grid bias.

The single-pole double-throw switch is used to shunt two different values of resistance across the milliammeter to increase the range. These resistances are made of Nichrome wire which may be obtained from any burnt-out heating element. They may be wound to increase the range to 10 and 100 milliamperes. The resistance required in the shunt is given by the following formula:

\[
R_s = \frac{1}{N - 1} \times R_m
\]

where \( R_s \) is the resistance of the shunt, \( N \) is the multiplying ratio, and \( R_m \) is the resistance of the meter. With a 27-ohm meter reading one milliampere full scale, the correct shunt for a 10-milliampere range will be 3 ohms, and for a 100-milliampere range, 0.272 ohms. When using the meter for current measurements externally, the series resistance mounting is short-circuited by means of a machine screw. When the meter is used for voltage readings the s.p.d.t. switch is left open.

The resistors used are ordinary metallized

* 2300 Auburn Ave, Cincinnati, Ohio.
resistors purchased in the "dime" stores. These were selected from stock by placing different resistors in series with the Weston milliammeter and checking against a standard voltmeter. If one is careful, he can obtain resistors that deviate but slightly from the labeled value.

The jacks are wired exactly as shown to insure proper polarity in all cases. The positive terminal of the meter is connected to the sleeve of the plug, the negative going to the tip.

The transformer which supplies all the power for operating the instrument is an ordinary "B" substitute transformer containing a high-voltage winding and a 5-volt winding for the filament of the Type '80 rectifier. The high-voltage winding need supply only about 100 volts each side of the center tap, although higher voltages may be used. $R_5$ takes care of differences in voltage, since it is always adjusted so that the current through the tube filament is 60 milliamperes.

The resistor $R_4$ is used to set the plate voltage at a definite value. Since $R_4$ is in series with the filament it carries a constant current of 60 milliamperes, and the voltage drop across it is utilized for plate voltage. The actual voltage on the plate will be 0.06 multiplied by the resistance of $R_4$. For example, the plate voltage when $R_4$ is 750 ohms will be 45 volts, etc.

**Some Ways of Using the Vacuum-Tube Voltmeter**

The vacuum-tube voltmeter as described can be used without calibration to measure field and signal strength, as a QSA meter, or for any use that requires the comparative measurement of signals.

With the meter plug in the plate jack, $J_2$, the movable arm of $R_3$ is adjusted until the plate current is zero. The signal to be measured is then applied across the input terminals and the movable arm on $R_3$ is adjusted until the meter reading is of a suitable value. The relative strength of different signals can be estimated by observing the differences in the meter readings as the various signals are applied. Inasmuch as the tube is being worked at the cut-off point, the readings will be proportional to the positive half of the cycle, so long as the peak input voltage does not exceed the bias voltage. When this happens there will be a rapid increase in the meter reading. A sufficiently high grid bias or a lower setting of the input potentiometer will prevent this condition.

It is essential that the controls not be moved, after once being set, for measurements of this type. If this cannot be done, then a definite grid voltage is applied, the plate current adjusted to zero by an external resistor, and the input potentiometer set at a fixed point. The grid voltage and plate current are obtained by placing the milliammeter plug in the proper jacks, as described. When these adjustments have been made, the plug is inserted in the plate jack, the input voltage is applied and the reading noted. The precaution with regard to grid bias and signal voltage pointed out in the preceding paragraph must again be observed.

**Peak Voltage Measurements**

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frequency settings on the receiver. Comparative selectivity can also be determined by noting the change in the meter reading for a given movement of the receiver dial away from the point of maximum signal intensity.

**CALIBRATION**

If it is desired to calibrate the meter, the input potentiometer circuit is opened and the input terminals are short-circuited. A suitable plate voltage is then chosen and the plate current is reduced to zero as before. The grid voltage should be noted, as this will be the maximum allowable applied input voltage. The short-circuit across the input terminals is then removed and the input voltage is applied. This voltage can be obtained from a bell-ringing or a filament-supply transformer, different voltage windings being used as well as different combinations of these windings. A rheostat of suitable range in the primary circuit of the transformer will be useful to allow convenient adjustment of the secondary voltage in small steps. The input voltages are measured by means of an a.c. voltmeter, and are plotted against the milliammeter readings on cross-sectional paper to obtain the calibration curve. A higher plate voltage is then used and the same method followed, using higher input voltages. These a.c. input voltage values are r.m.s.

For further information on the v.t. voltmeter and practical applications of its use, the reader is referred to the following:


**Strays**

The membership list of the League is not available for commercial circularizing but may be made available, in an area not exceeding one division, for pro-amateur and non-commercial purposes, upon the application of any member and at his expense. Thus for some years past the headquarters office has supplied lists of names or has addressed envelopes for convention committees, candidates in A.R.R.L. elections, etc., whenever requested to do so. The service is available of course to all candidates in elections, or for other worthy pro-amateur purposes. The actual cost of materials and labor is charged. Because this section of our office is heavily burdened, however, we require at least two weeks' notice to do the work.

A.R.R.L. Headquarters has again outgrown its space and in early January moved to larger and quieter quarters. The new location is on the other side of an imaginary line which divides Hartford from West Hartford, and so the new QRA is 38 LaSalle Road, West Hartford, Conn. We now have much better facilities for handling the ever-increasing volume of work at Headquarters. In an early issue we expect to present a more extensive write-up of the new quarters and of the personnel which handles your headquarters work.

W9ARE has been keeping his Type '10 tube out in the sun so it will acquire plenty of Vitamin D - X for the coming International Contest.

When using stranded drum dial wire be sure to tin the wire so that the point where it is to be cut is in the middle of the tinned area. If this is not done the strands will unravel for as much as six inches each side of the cut.

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**FIG. 1. — THE V. T. VOLTOMETER CIRCUIT**

- $R_1$ — 500,000-ohm potentiometer
- $R_2$ — 400-ohm wire-wound potentiometer
- $R_3$ — Multiplier resistor; see text for details
- $R_5$ — 750 ohms; see text
- $R_6$ — Standard Clearstat
- $R_8$, $R_9$ — Shunt resistors for milliammeter. (See text)
- $R_4$ — Multiplier resistor for milliammeter
- $J_1$, $J_2$ — Closed-circuit jacks
- $J_3$ — Open-circuit jack
- MA — 0-1 milliammeter

It is essential in all of these measurements that the current in the filament circuit of the tube be kept at 60 milliamperes, or at some fixed value near this. The plate voltage can be maintained at a definite value by passing this current through fixed resistors ($R_i$ in the diagram).
Further Notes on the Zeppelin Antenna
A Novel System of Feeder and Antenna Adjustment

By Don Edmondo Ruspoli, I1MM*

MUCH has been written in QST and elsewhere on the Zeppelin antenna, which has become extremely popular in America and Europe. Our only reason for returning to the subject is that we have been using it lately at Italian station I1MM, with some very simple improvements which have proved helpful. As we have not seen them described as yet, we hope that this writing may prove useful to the readers of QST.

The first of these methods aims at allowing quick changes from one amateur band to another. As an illustration we will suppose that work has to be done on both the 7000- and 14,000-kc. bands, although the principle will be applicable to 3500- and 28,000-kc. bands as well.

For operation on 7000 kc. the simplest form of the Zepp is the one with the half-wave radiating section and quarter-wave feeders. For the 14-mc. band, the same radiator will be quite satisfactory, working now on its second harmonic as a full wave antenna; the feeders, however, will be wrong since they must be approximately equal to an odd number of quarter wavelengths. The simplest way out of the difficulty is precisely the one which is never used, i.e., to have the feeders 10 meters long for 7-mc. work, and shorten them to 5 meters for QSY to 14 mc. The objection arises: How am I going to take a walk on other peoples' roofs several times in the middle of the night and let feeders in and out of my station window to alter their length each time it is necessary to change frequency?

This is not necessary; just have the feeders 5 meters long to begin with, and make provision right in the operating room for switching an extra 5 meters in or out at will. A suitable arrangement is shown in Fig. 1.

This method has been tried quite successfully at I1MM; all the 7-mc. work, including phone with New Zealand, has been done for over a year with 5 meters of feeders forming a sort of loop inside the operating room and results have been apparently identical to those previously obtained with the whole 10 meters stretched outside, as is usually the case.

The feeders of the Zepp antenna have very small external fields, so they can be bent around in a circle or a zig-zag without any measurable loss ensuing if they are kept fairly close together and two or three feet away from walls and apparatus.

Feeders here are 4 inches apart on the indoor portion and 7 inches on the stretch outside the house. The leads have plugs and sockets which make feeder changes a very short and simple process.

If another band was to be worked as well — for instance 28-mc. — a second loop of \( \frac{3}{4} \) meters could be used alternatively with the 5-meter loop. In this case the antenna would oscillate on its fourth harmonic, and the feeders would be \( \frac{3}{4} \) of a wavelength or 7½ meters long.

Many variations could be made on the principle

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*6 Piazza Belle Arti, Rome, Italy.

February, 1931
outlined. Of course this method is useless unless the radiating section is the right length for the wave chosen. Changes may be made only to frequencies harmonically related.

DETERMINING ANTENNA LENGTH

Another point which has been studied at 11MM deals with the cutting of the Zeppelin antenna the correct length. Data have been given in QST for these measurements and by following them, excellent results can be obtained. But if work has to be done on one specific frequency, as in the case of crystal control, there is a satisfaction in knowing that the antenna has been cut with almost absolute correctness.

The data referred to do not allow for differences due to individual location, where surroundings affect the natural frequency of an antenna to a varying degree. In some locations space may be limited and the antenna, instead of being stretched out as is preferably the case, will be bent to an angle or otherwise crowded into the available area, with the consequence that the correctness of the data may be noticeably impaired. It is to overcome this difficulty that an effort has been made to get the radiator in exact tune in its own regular working position, independently of the tuning of the feeders.

When a Zepp is tuned to resonance by means of its feeder condensers, what is really tuned is the whole system, comprising radiator and feeders. Resonance can be obtained with the radiator a good deal off its correct length. When this is the case, the current mode which should fall on the antenna-feeder junction is displaced outwards along the antenna or inwards along the feeder. The result is non-symmetrical distribution in the feeders with increasing of their external fields, radiation, and losses by absorption.

Ideal conditions for the Zeppelin radiator are as if it were oscillating alone, with no feeders connected, at its natural frequency or at a harmonic; that is, with a voltage maximum at each end. In the feeders the distribution should be the same as if they were tuned to resonance, by means of the condensers, with no antenna connected; that is, with a voltage maximum at the open end of the feeder, and a voltage node near the point where it is excited. Only in this case is the external field around the feeder system small and the losses low.

The proper way of obtaining perfect resonance in both sections is to tune them separately. With other methods the tuning of the antenna system simply means introducing an error in the feeder distribution in order to conceal one existing in the radiation section.

The procedure adopted here is as follows:
1. Prepare the antenna and feeders according to orthodox data, but with an insulator inserted at the antenna-feeder junction, as in Fig. 2. The antenna can be connected or disconnected across the insulator.
2. With the antenna disconnected as at A, pull the antenna up in its regular working position. Turn on the transmitter with very low power (or antenna meters may burn out) and very loose coupling. Tune the feeders to resonance and note the readings on the dial of the feeder condensers.
3. Let down the antenna, connect the free end to the feeder around the insulator (Fig. 2B), and pull up tightly as before. Turn on the transmitter again with the frequency the same as before, using enough power to get good readings. Tune the antenna condensers to resonance. If the condensers now give resonance at the same readings as with the antenna disconnected, the antenna

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FIG. 1.
```

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FIG. 2.
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QST for
length is exactly right. If the capacity has to be increased, the antenna is too short. If capacity has to be reduced the antenna is too long. The method will show up errors of a very few inches.

Is such precision necessary, and will there be a difference in results on actual distance tests between the incorrectly and quite correctly cut system, if the former has had its incorrectness apparently compensated for by tuning the feeder condensers?

We will not venture to answer the question definitely. Much depends, of course, on how good the guess has been in the first case. We believe the difference would not be noticeable in many cases. But in favor of striving for exactness, there is this to be said: Uncertain elements will always be present in radio work in sufficient quantity to satisfy the poetically inclined, even if efforts are made to suppress a few of them; when small errors are allowed to exist, they easily combine to make large ones and interfere with results; the method outlined is an excellent check against errors of measurement; and, lastly, that if the antenna is to be worked on harmonics the method will be of the greatest assistance in preventing one harmonic of the antenna-feeder system (having a current node at the feeder-radiator junction) from being confused with another having an inefficient field distribution.

One more point of interest about the Zeppelin antenna is that radiating portions can be connected to both feeders.

In this case it possibly would no longer be called a Zeppelin, but merely a particular form of voltage-fed antenna; or it might be nick-named a "Double Zeppelin." For example, for 7-mc. transmission, one branch could be 20, and the other 40 or 60 meters long. The branches could be disposed for different directional purposes and they could be tuned by the method outlined above, first separately, then together.

How Is Your Tone Color?

By Edwin Ehlinger, W8BBP*

* 25 Auburn Ave., Utica, N. Y.

The other day as I was putting the finishing touches on my new a.c. receiver, that well-known DX mongrel, A.A. of A., better known WSAFG, paid me one of his characteristic flying visits.

Asparagus Adanti of Auburn had no sooner made a solid two point landing in my favorite chair than he made his usual stock remark.

"Ed," he said, "I want you to do a favor."

"What?" I asked suspiciously.

"I want you to do something special for me. I've come all the way up here to see you because you're the only person I can trust to do it properly."

"I'm sorry, Asparagus, OM," I said, "but I intend to use that extra 210 in a new push -"

"Who wants your old 210?" he broke in testily. "It's something big I want you to do." He pulled a package of cigarettes from his pocket and, knowing that I didn't smoke, offered me one.

"You know, Ed," he said, scratching his match on the core of my filament transformer, "college takes up practically all my time now."

"I'll bet," I replied sympathetically.

"It certainly doesn't leave me much leisure. I wouldn't bewail such a condition were it not for the fact that a few days ago the Federal Radio Commission asked me to serve in the capacity of an unofficial adviser and" — he paused dramatically — "I accepted."

"Oh, so you want me to give you some advice, eh?"

"No," said Asparagus, "I want you to write a QST article for me."

"Oh, yeah?"

Asparagus picked up a '24 and waved it menacingly.

"At Union," he growled, "we do not use slang."

"Oh, yeah?"

Asparagus raised his arm to dash the '24 against my cranium, but thought better of it, and slipped it into his own pocket.

"Hey!" I yelled. "That's my tube."

"Be quiet and listen to what I tell you," he commanded. "You're going to write a QST article for me. I'll give you a rough verbal outline (Continued on page 88)."
Election Results

Three New Directors Come to the A.R.R.L. Board

As a result of the 1930 A.R.R.L. elections, three new directors take office on the A.R.R.L. Board of Directors. Mr. L. G. Windom succeeds Mr. D. J. Angus in the Central Division, Mr. R. J. Andrews replaces Mr. Paul M. Segal from the Rocky Mountain, and Mr. H. W. Kerr takes the place of Mr. Louis R. Huber from the Midwest.

In many cases the elections this year were marked by spirited campaigning. It is evident that amateurs showed a great deal more interest in who their spokesmen are on the Board than they have shown in many a year. That, we think, is a very fine sign, and quite the proper attitude. The story by divisions is as follows:

CENTRAL DIVISION

Mr. Loren G. Windom, WSGZ-WSZG, of Columbus, Ohio, succeeds Mr. D. J. Angus, W9CYQ, of Indianapolis, who was serving the remainder of WSZZ's term. The new director has been an active amateur for fifteen years and his calls are well known on the air. By profession he is an attorney at law. He is an O.R.S. and the Fifth Corps Area Radio Aide in the A.A.R.S. The balloting:

<table>
<thead>
<tr>
<th>Candidate</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. G. Windom</td>
<td>967</td>
</tr>
<tr>
<td>D. J. Angus</td>
<td>647</td>
</tr>
<tr>
<td>E. Linder</td>
<td>81</td>
</tr>
</tbody>
</table>

HUDSON DIVISION

In the Hudson, Dr. Walsh, W2BW, scored a marked victory over Mr. George L. Fuller, W2BSH, of Schenectady, and thus continues on the Board. The count:

<table>
<thead>
<tr>
<th>Candidate</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. L. Walsh</td>
<td>671</td>
</tr>
<tr>
<td>G. L. Fuller</td>
<td>158</td>
</tr>
</tbody>
</table>

NEW ENGLAND DIVISION

Only one candidate was named in the New England Division, the incumbent, Mr. Frederick Best, W1BIG. There was therefore no balloting and Mr. Best has been declared reelected to the Board.

NORTHWESTERN DIVISION

Here there was spirited competition. Mr. Karl W. Weingarten, W7BG, the present director, was returned by a small margin over Mr. John B. Waskey, W7TX-W7UU. The voting:

<table>
<thead>
<tr>
<th>Candidate</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>K. W. Weingarten</td>
<td>181</td>
</tr>
<tr>
<td>J. B. Waskey</td>
<td>143</td>
</tr>
<tr>
<td>H. K. Lawson</td>
<td>83</td>
</tr>
</tbody>
</table>

ROANOKE DIVISION

Mr. W. Tredway Gravely, W3BZ, has been the Roanoke's director since its formation, and a member of the Board before that. The Roanoke again would have no other, and only Mr. Gravely was nominated. Thus, without balloting, he has been declared reelected.

ROCKY MOUNTAIN DIVISION

Mr. Paul M. Segal, the incumbent, was not a candidate, having become ineligible by his removal to Washington. In the voting between Mr. Russell J. Andrews, W9AAB, and Mr. Gerald H. Lovins, W9CSR, both of Denver, the former won by a goodly percentage, although the totals were small. Mr. Russell, a former vice-president of the Associated Radio Operators of Denver, has been in amateur radio since 1919; he is an O.R.S. He is by occupation a tool and die maker, associated with the Mountain Motors Co. at Denver. The count:

<table>
<thead>
<tr>
<th>Candidate</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. J. Andrews</td>
<td>77</td>
</tr>
<tr>
<td>G. H. Lovins</td>
<td>33</td>
</tr>
</tbody>
</table>

WEST GULF DIVISION

In the Midwest Division a special election was held at the same time as the other elections, to select a director to succeed Mr. Louis R. Huber, resigned account non-residence. Mr. H. W. Kerr, W9DZW-W9CP, is the new director, winning over Mr. John H. Amis, W9CET. His term will expire the end of 1931; consequently there will be another election in the Midwest next autumn. Mr. Kerr resides in Little Sioux, Iowa, where he is the editor of a weekly newspaper. He is perhaps best known to amateurs as the publisher of "Grandpa's Regret," unofficial Midwest Division ham sheet. He has been our S.C.M. for Iowa since 1928, and of course is an O.R.S. His station is also the state net control station for Iowa in the A.A.R.S. The count:

<table>
<thead>
<tr>
<th>Candidate</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H. W. Kerr</td>
<td>339</td>
</tr>
<tr>
<td>J. H. Amis</td>
<td>238</td>
</tr>
</tbody>
</table>

QST greets the new directors as such, and knows that it speaks for the membership in expressing appreciation for the loyal services of the retiring directors.

E. B. W.
A New Type of Peaked Audio Amplifier

By Howard Allan Chinn*

The use of a peaked amplifier for obtaining good selectivity in the reception of code signals is quite generally recognized as being worthy of adoption but the majority of present day amateur signals are such as to make it highly desirable that the width of the peak of the amplifier be readily adjustable to meet the existing conditions of operation. Furthermore, the use of radiotelephony demands, on occasion, the availability of a high quality amplifier for faithful reproduction.

One type of peaked amplifier, previously described in QST, utilizes a screen-grid tube and a tuned plate impedance (Fig. 1). It may be converted to one of variable selectivity or made reasonably non-selective by means of several possible alterations.

A suggested means of varying the selectivity of the screen-grid type impedance-coupled amplifier is to insert a variable resistor in series with condenser C. This is a useful arrangement but even with zero resistance in this circuit the selectivity obtainable with a given coil L and condenser C does not approach that which can be obtained with the circuit to

![THE EXPERIMENTAL RECEIVER](image)

be described. By mounting the coil and condenser on plugs and replacing this unit with a "plug-in" resistor of approximately 250,000 ohms the circuit (although having a reasonably good non-selective characteristic) has a tendency to discriminate against the low frequencies. One means of obtaining a stage of high quality amplification in place of the selective screen-grid stage is to use a complicated switching arrangement together with the additional tube and attendant apparatus which permits the switching of the audio input and output to the desired amplifier.

By using a three-element tube in the circuit arrangement shown in Fig. 2 it is possible by simple means to obtain an amplifier with any degree of selectivity or with as good a frequency response characteristic as may be desired for all amateur operation.

The operation of the circuit may be described briefly as follows:

The coil and condenser combination LC is chosen to tune to the audio frequency at which it is desired to obtain the peak. For present purposes it is sufficiently precise to consider this to be determined by the relation

$$LC = \frac{1}{4\pi^2f^2}$$

where

- $L$ = inductance in henries
- $C$ = capacity in farads
- $f$ = frequency in cycles per second

This may be written

$$LC = \frac{25,300}{f^2}$$

where for practical purposes the units are

- $L$ = inductance in henries,
- $C$ = capacity in µfd.
- $f$ = frequency in cycles per second.

* WA1AXV-WLXP, South Dartmouth, Mass.

1 March QST, 1929, page 41.
For 1000 cycles, the product 
\[ LC = 0.0253 \]
and for 500 cycles 
\[ LC = 0.101 \]
from which is obtained the following table:

<table>
<thead>
<tr>
<th>( L ) (henries)</th>
<th>( C ) (µfd.)</th>
<th>( C ) (µfd.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.0506</td>
<td>0.022</td>
</tr>
<tr>
<td>1.0</td>
<td>0.0253</td>
<td>0.101</td>
</tr>
<tr>
<td>2.0</td>
<td>0.0126</td>
<td>0.506</td>
</tr>
<tr>
<td>3.0</td>
<td>0.0084</td>
<td>0.037</td>
</tr>
<tr>
<td>4.0</td>
<td>0.0063</td>
<td>0.0253</td>
</tr>
<tr>
<td>5.0</td>
<td>0.0050</td>
<td>0.0202</td>
</tr>
</tbody>
</table>

The introduction of the large resistor \( R \) in the tuned circuit may seem to indicate the advisability of the use of a more rigorous formula for computing \( LC \). It will be found, however, that the error introduced will not be so great as the deviation from rated values of the commercially available equipment. The 2-µfd. condenser merely serves as an audio frequency by-pass condenser and does not enter into the circuit consideration.

At the resonant frequency the impedance of the series-tuned \( LC \) combination between the points 1 and 4 is relatively low and becomes a pure resistance, the magnitude of which is determined by the quality of the coil and condenser used. That is, the better the coil and condenser the lower the effective resistance. If \( R \) is large compared to this resistance, then at the resonant frequency the greater part of the alternating current component of the plate current will flow down this \( LC \) branch. The impedance drop across the inductance \( L \) will be large, however, because of the high reactance of this coil, and it is this voltage that is impressed on the grid of the succeeding tube.

At any frequency other than the resonant frequency, the \( LC \) path offers considerable impedance to the flow of the a.c. component of the plate current and as the frequency goes further and further from the resonant frequency a greater and greater percentage of the alternating current goes through the resistor \( R \). Therefore, only alternating current of a frequency in the neighborhood of the resonance frequency can pass through the \( LC \) circuit and produce any voltage of appreciable magnitude on the grid of the succeeding tube.

With a given coil and condenser this amplifier can, by proper choice of \( R \), be made to give the same amplification as the circuit of Fig. 1 but with greater selectivity; or if adjustment is made for the same selectivity, the resulting gain will be greater than with the screen-grid type of amplifier. Furthermore, if a high quality transformer-coupled amplifier is desired, it is only necessary to replace the impedance unit by a suitable transformer without necessitating a change of tubes or battery voltages.

In Fig. 3 are shown curves obtained using a Samson No. 3 choke and a Sangamo .007 µfd. condenser. This coil has a straight iron core and a rated inductance of 3 henries. From the table it is seen that a condenser of .0084 µfd. should be used to tune to 1000 cycles per second but manufacturing variations in both the particular coil and condenser used necessitated the use of a .007 µfd. capacitance. The amplification or gain in this case is taken as the ratio of the voltage \( E_2 \) to \( E_1 \) as indicated in Fig. 2. It will be noted that both the voltage ratio and the frequency scales are logarithmic. This gives a more nearly correct representation of the operating characteristics of the amplifier because of the nature of the response of the ear to changes in intensity and frequency.

From the curves it is seen that the selectivity of this amplifier is readily changed by variation of the resistance \( R \). The use of a 10,000-ohm resistor gives a curve which has approximately the same

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**AUDIO PLUG-IN COMPONENTS OF THE EXPERIMENTAL RECEIVER**

The tuned audio-frequency unit is at the left and the audio-frequency transformer is at the right.
amount of peak as obtained when using the same coil and condenser in the s.g. type amplifier. Consequently the use of a 1000- or 100-ohm plate circuit resistor gives an amplifier of much greater selectivity than otherwise obtainable with this coil-condenser combination.

For comparative purposes and to show the relative amplification, the figure also includes the frequency-response characteristic of a Samson transformer while greater than the amplification obtained with the relative amplification, the figure also includes the Symphonic 3-to-1 transformer substituted for the approximately 5000 ohms and it is under these conditions the output impedance of the tube is rated at its rated plate voltage of 135 volts and the amplification is obtained in the neighborhood of 200 cycles per second although the curve is quite flat between 30 and 5000 cycles.

The similarity between this amplifier circuit and the usual transformer coupled amplifier permits its adaptation to present receivers with only minor changes in the wiring. It is essential merely that the first tube be a Type 12-A operated at its rated plate voltage of 135 volts and the normal negative grid bias of 9 volts. Under these conditions the output impedance of the tube is approximately 5000 ohms and it is under these conditions that the data shown were obtained. It is evident that the coil $L$ and the condenser $C$ should be the electrically best available.

In the receiver in which this amplifier is being used the tuned impedance unit and the audio transformer are mounted on bakelite bases 2½ by 3½ inches equipped with four G.R. plugs. In the sub-panel of the set four G.R. jacks are mounted and the units are thus readily interchangeable.

The Bureau of Standards Station, WWV, will transmit accurate 5000-kc. standard frequency signals on the following Tuesdays: Feb. 7, 10, and 24; March 3, 10, 24, and 31. The hours of transmission are from 1:30 to 3:30 and from 8:00 to 10:00 p.m., E.S.T., on each of the above dates. More complete information concerning these transmissions will be found on page 39 of January QST.

The regular monthly transmissions sent from WWV will take place on the following schedule:

<table>
<thead>
<tr>
<th>Time</th>
<th>Feb. 30</th>
<th>March 30</th>
<th>April 30</th>
<th>May 30</th>
<th>June 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>(E.S.T.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00 p.m.</td>
<td>4000</td>
<td>550</td>
<td>1600</td>
<td>4000</td>
<td>550</td>
</tr>
<tr>
<td>10:12</td>
<td>4400</td>
<td>600</td>
<td>1800</td>
<td>4400</td>
<td>600</td>
</tr>
<tr>
<td>10:24</td>
<td>4800</td>
<td>700</td>
<td>2000</td>
<td>4800</td>
<td>700</td>
</tr>
<tr>
<td>10:36</td>
<td>5200</td>
<td>800</td>
<td>2400</td>
<td>5200</td>
<td>800</td>
</tr>
<tr>
<td>10:48</td>
<td>5600</td>
<td>1000</td>
<td>2800</td>
<td>5600</td>
<td>1000</td>
</tr>
<tr>
<td>11:00</td>
<td>6400</td>
<td>1200</td>
<td>3200</td>
<td>6400</td>
<td>1200</td>
</tr>
<tr>
<td>11:12</td>
<td>7000</td>
<td>1400</td>
<td>3600</td>
<td>7000</td>
<td>1400</td>
</tr>
<tr>
<td>11:24</td>
<td>7600</td>
<td>1500</td>
<td>4000</td>
<td>7600</td>
<td>1500</td>
</tr>
</tbody>
</table>

A complete frequency transmission includes a "general call," "standard frequency signal," and "announcements." The general call is given at the beginning of each 12-minute period and continues for about two minutes. This includes a statement of frequency. The standard frequency signal is a series of very long dashes with the call letters (WWV) intervening; this signal continues for about four minutes. The announcements follow and contain a statement of the frequency being transmitted and of the next frequency to be transmitted. 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. 280, which may be obtained by applying to the Bureau of Standards, Washington, D. C. Even though only a few frequencies are received (or even only a single one), persons can obtain as complete a frequency meter calibration as desired by the methods of generator harmonics.

J. J. L

**Strays**

Tube-base receiver coils have a habit of getting mislaid when left loose on the operating table. W4ACB overcame this by getting a socket strip from an old Atwater-Kent BCL receiver and mounting it inside the lid of the cabinet on his ham receiver, plugging the coils not in use in the strip. They're always in the same place now when needed.

A radio catalog informs us that the such-and-such dial is now microphonic. Intended to help out the Type '99 tube, no doubt.

At a recent hamfest it was resolved that all YL's send a lock of hair with every QSL card. (Those hams were single!)
Making Records of Amateur Signals

By H. W. Dreyer, W1ANC*

RECENT attempts at recording amateur signals on the new phonograph home-recording blanks have been so successful at W1ANC that the writer believes other experimenters, including traffic and 'phone men, can make good use of the idea. The apparatus required is generally available, not too expensive and surprisingly good results can be obtained even with a hay-wire set-up. Of course plenty of elaboration can be made on the simple layout to be de-

starts with a homemade detector and one stage audio receiver, using a '24 and a '27 tube. This is coupled to the transmitting antenna (for recording weak signals) as recently described in QST.

A second stage of audio was added after experiments started, and consisted of another '27 coupled by an Amertran second-stage transformer of 3-to-1 ratio. It has about 80 volts on the plate and 1½ volts grid bias.

The output of this second-stage amplifier is fed into a step-down transformer of about 10/1 ratio to match its impedance to the input of the next amplifier, which happens to be the audio end of a standard Victor Type RE 45 radio set (100-ohm input impedance). This amplifier uses one '26 tube feeding a pair of '15 tubes in push-pull. The output is ample for all recording purposes if a fairly good reproducer or pick-up is used as a cutter.

Most of the available cutters are of the high-impedance type, on the order of several thousand ohms. Exceptions are the Victor, the RCA and the Brunswick Panatrope reproducers which are of about 50- to 100-ohm impedance. If a pick-up of the low-impedance type is used it may be fed from the secondary of an output transformer of the sort designed to couple into the voice coil of a dynamic speaker (excepting the type designed for single-turn voice coils). If the high-impedance type pick-up is used, the output transformer should have a high impedance sec-

ondary such as is used to operate magnetic speakers.

The principal advantage of the low-impedance type reproducer is that long leads between amplifier and cutter can be used without damage

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*Box 451, Bristol, Conn.
to quality or without back-coupling to the input which may cause audio frequency oscillation. A shielded cable connection between the amplifier and reproducer will be helpful here.

The other necessary equipment is a phonograph motor and turn-table. The special requirements of the motor for recording are: plenty of power, because it is necessary to load the cutter with a small weight to make it engrave a proper groove; lack of vibration, because almost any vibration of the recording table will appear on the record as background noise; constancy of speed, and control of speed between fairly wide limits.

A Victor electric motor of the watt-hour meter type has been used here and, although it is fairly satisfactory, a little more power would be useful. Some spring motors would probably work very well.

MAKING THE RECORD

For recording code signals it is quitё OK to record as slowly as 35 revolutions per minute, thereby getting about 2½ minutes of recording on the Victor blank which has a pre-grooved spiral of 90 grooves. For high quality 'phone recording, it is better to record at from 60 to 90 revolutions per minute. Of course the record should be played back at the same speed as recorded for natural reproduction.

The tone arm that holds the cutter should be weighted somewhat when recording. A pressure of about 8 or 9 ounces on the cutter point seems to be about right although more can be used if the motor has power enough to turn the record at a steady speed. The blunt steel needles should be used for both recording and reproducing.

Now for the procedure. Listening as you usually do either with 'phones in the first audio or speaker in second audio, tune around until you hit upon something you want to record. You may have your turn-table motor turning over at the desired speed, 94 or 40 revolutions per minute, because after running a few minutes it will settle down to a steady speed. Plenty of light oil on the governor friction surfaces helps to this end.

Gently lower the cutter onto the blank and record while monitoring. When you have recorded all you want of one signal, raise the cutter to stop recording. It is easy to tell where recording has stopped on the record because the recorded grooves have a distinctive appearance quite different from the unused grooves.

If you seem to have trouble getting enough modulation, it helps to warm up the blanks before recording. Higher temperature than about 140° F. is not recommended because the records are slightly though not dangerously inflammable. Certain pick-ups are far more effective in cutting at low frequencies, as 100-150 cycles, than they are at the middle and high frequencies. If you have one of these pick-ups you can improve matters considerably by connecting a condenser in series with the leads for recording. For low-impedance cutters try 0.5 to 4 µfd. For high-impedance cutters try 0.05 to 0.5 µfd. This also frequently helps reduce background hum if it is of low frequency.

Now, as to what uses this process of recording can be put. True enough, you can use it instead of QSL cards, even though the blanks cost a quarter each. Some morning when you work a VK or a ZL, record his signal, send him a record QSL and wait for his reaction. (Don't forget to send him a needle, too.) Unless we are very much mistaken, the first thing he will do will be to start gathering the necessary hay-wire to record signals himself — and next thing you know you'll get a record back from him.

Beginners may find lots of help recording their own fist from a monitor signal. Then again, by prearranged tests, the peculiar distortion caused by echo effects can be studied if records of a certain signal at long distances can be compared with records of the same transmission made at the sending station via his monitor.

Perhaps traffic could be handled à la Rocky Point by first recording at low speed, then transmitting and receiving at high speed, and reproducing later at a lower speed to copy the traffic.

Important traffic such as that handled by the Army or Navy network stations would be recorded as sent, thereby giving accurate checks on all messages.

When experimenting with new transmitters

(Continued on page 38)
Coming—The Fourth International Relay Competition

March 8 to 21 Inclusive—Full Details Next Month—United States and Canadian Hams, Send QSL-entry Card to Hq. NOW—Hams Elsewhere, Take Part on Dates Announced

IN this contest entries are solicited from United States and Canadian amateurs so that we may provide special log forms and official test messages to those who want to participate. Last year many of the several hundred entrants put themselves on record just at the last minute, so it was difficult to equip all concerned with full information and official "test" dispatches before the starting time. Get your entry to A.R.R.L. Headquarters on or before February 28 — this is important!!

In this March contest all amateurs with the prefixes W and VE will be taking part in a QSO party with stations in all other parts of the world including Hawaii, the Philippines, Porto Rico, Alaska, etc. (where K and KA are used). Every amateur in the world is invited to take part.

Refer to December, 1929, QST for the full announcement of rules for the Third International Relay Party, if you happen to be one of the few who don't remember how to take part. Anyway, the rules will appear in full in March, 1931, QST — but enter, and we'll see that you get all the dope. This contest will run along just about the same lines as the previous one (reported in August, 1930, QST), with possible slight changes in the weighted credits for counting contacts with different foreign localities.

There will be newly designed "Certificates of Merit" for every winner in each foreign locality (awarded by list of international prefixes), and for the "high" station in each of the 64 U. S. (mainland) and Canadian Sections! In general the same scoring system will be used as last season, counting one for sending and two for receiving "reply test messages," and multiplying totals by the number of continents worked and the proper factor for each different locality contacted. Hams in remote localities will count one for receiving and two for sending dispatches and multiply scores by the number of different A.R.R.L. Sections worked! As many of the official test dispatches can be sent to a given locality as you can work stations there (but one exchange of messages per station permitted, of course). This contest we trust will help you to add to the list of countries you have worked, quite possibly put you in line for a WAC certificate when the fun is over, too! There were a lot of new WAC's issued after every previous contest.

THIS IS ONE OF THE BIG EVENTS OF THE YEAR. DON'T MISS IT.
Every foreign amateur will have a chance to make an unprecedented number of U. S. and Canadian QSO's!

Every U. S. and Canadian ham should be in on the fun!
Two weeks of opportunity to smash all previous records!
All amateurs in the world are cordially invited to take part.
COME ON IN, OM. Get your station in trim now and plan to grab off some of those certificates. U. S. and Canadian amateurs, get your QSL-entry cards in early. Now!

— F. E. H.
More Power With Better Frequency Stability

Practical Suggestions for Oscillator-Amplifier Transmitter Design

By George Grammer, Assistant Technical Editor

The past few years have seen a sort of about-face in the design and adjustment of amateur transmitters. Prior to 1929 the sole aim of most transmitting amateurs was to get the maximum power output from their sets, whether they employed a single Type '10 tube or a couple of '04-A's. This presented no hard problem, and the fact that the signal occupied many times the space required by a pure wave of constant frequency was of comparatively little practical importance, because there was plenty of room in the bands for large numbers of even the worst types of signals — except in the vicinity of 37.5 meters.

The changed conditions in 1929 brought with them a realization on the part of most amateurs that something had to be done if any kind of satisfactory communication was to be possible — certainly the old order had to be changed or there would be nothing but bedlam. A steady wave of a single frequency, occupying the least possible space in the spectrum, became the order of the day. The fly in the ointment was that such signals could not be produced without the sacrifice of a considerable portion of the possible power output, unless the functions of frequency stabilization and power production were separated and a tube used for each. This of course means the use of an oscillator-amplifier circuit.

It is rather surprising that we amateurs as a whole have been so slow to see the advantages of oscillator-amplifier transmitters. Somehow or other, the impression seems to have gotten abroad that the oscillator-amplifier is not worthwhile unless it is crystal-controlled. There seems to be a further impression that such transmitters are hard to build and difficult to adjust, and that there is something darkly mysterious about them which places them beyond the technical ability of the average amateur.

The truth of the matter is that the self-controlled oscillator-amplifier transmitter is in many respects the ideal outfit. With the oscillator-amplifier transmitter it is possible to get about twice as much power out of a given tube as can be taken from the same tube self-excited, with a similar degree of frequency stability in both cases. For all-band operation the self-controlled oscillator-amplifier set is far less complicated than the simplest crystal-control rig. Properly built and adjusted, it is capable of frequency stability which compares very favorably with crystal control; and there is the further advantage that the frequency can be shifted at will.

It is not generally realized that a power tube used as a radio-frequency amplifier is working under the most favorable conditions. Its plate circuit can be adjusted for maximum power output without sacrifice of frequency stability. Practically all the power output is available for the antenna, since the amplifier's grid losses are supplied by the preceding tube, and its output circuit can be designed for high efficiency. Contrast this with the self-excited oscillator, which must first of all be adjusted for frequency stability, and which must supply its own grid losses. And unfortunately the adjustments for optimum frequency stability and maximum power output do not coincide. It is usually necessary to sacrifice about half the possible power output to obtain the required frequency stability.

The experience of the last two years has shown that with High-C circuits and tubes suitable for high-frequency work it is possible to achieve really excellent frequency stability with self-controlled oscillators so long as the circuit elements are undisturbed and the operating voltages are maintained at fairly constant values. But when coupled to an antenna the frequency of even the most stable self-controlled oscillator is affected by slight changes in antenna constants, such as the vibration of the wires in a breeze.

To overcome this and to avoid loading the oscillator too much — overloading also impairs frequency stability — loose coupling must be used between the antenna and the oscillator. On windy days, however, even the loosely-coupled oscillator is at the mercy of the antenna, so that the use of another tube between the oscillator and antenna simply as a buffer is amply justified even if there should be no gain in power output. The fact that it is possible to obtain more power output is simply a stronger recommendation for the oscillator-amplifier transmitter.

Although there is little authoritative data available on the subject, rule-of-thumb methods have demonstrated that to fully excite an unmodulated radio-frequency power amplifier, the power supplied to the amplifier tube's grid should be about one-tenth the expected power output. For instance, if a Type '03-A tube is to deliver 50 watts to the antenna the tube preceding it must be capable of giving it about five watts; to get 10 watts from a Type '10 tube the grid excitation...
should be about one watt. The choice of the oscillator tube is determined by two requirements — it must be capable of delivering the amount of power required by the grid of the amplifier, and while furnishing that power also must maintain excellent frequency stability. In other words, it must be underloaded.

Years ago somebody started the idea that the oscillator tube should have at least the same power rating as the amplifier. Possibly it was true the way tubes were operated in those days, but it certainly is not true in the light of present practice in transmitter adjustment. There is no reason why a given tube used as an oscillator cannot excite the next larger size of tube as an amplifier; a Type '10 tube can feed a Type '03-A or '52 and a '52 can excite a Type '04-A. Manufacturers' ratings on power tubes are generally rather conservative; in addition, they are based on the plate voltage and plate current specified for the tube. Rare indeed is the amateur who operates a tube at the rated plate voltage and current — especially the smaller sizes of tubes — and 50% to 100% greater power input than recommended is the rule rather than the exception. For instance, a Type '10 tube is ordinarily supposed to be used with 350 volts and 60 milliamperes on the plate. But 500 to 600 volts and 60 to 75 milliamperes is quite common; furthermore, with these larger inputs it is no trick at all to get really good frequency stability — and at the same time more power output than the tube is supposed to give. A Type '10 tube in a well-adjusted High-C circuit will deliver 10 watts or more to the load under ordinary conditions, and this power is ample to excite a Type '03-A, '52 or '60 tube to more than rated output.

**FIG. 1 — SOME RECOMMENDED TUBE COMBINATIONS FOR OSCILLATOR-AMPLIFIER TRANSmitters**

DESIGNING THE OSCILLATOR

One of the nice things about an oscillator-amplifier transmitter is that in planning the oscillator it is possible to concentrate almost entirely on frequency stability. Power output is of secondary importance. Naturally the circuit will be High-C — in fact, as High-C as it can be made. The capacity actually used in the plate tank circuit should be about 500 µfd. on 3500 kc., 400 to 500 µfd. on 7000 kc., and 250 to 350 µfd. on 14,000 kc. As always, any of the ordinary oscillator circuits will work well. The Types '45, '10, and '52 are the best tubes to use in the oscillator, and will fully excite a Type '10, '03-A or '52, and a Type '04-A, respectively. The Type '03-A is not a very good tube to use as a high-frequency oscillator, especially where frequency stability is of prime importance. Fig. 1 shows some recommended combinations.

Aside from the use of a High-C circuit, there are other factors which affect the frequency stability of an oscillator. Among the most important are the adjustment of grid bias and grid excitation. For optimum frequency stability the bias should be high and the excitation should be such that the grid is positive over only a small portion of the cycle. This condition is also one which gives high tube efficiency, although not maximum output. It is necessary to keep down the plate dissipation of the tube to avoid the frequency creep caused by the changing inter-electrode capacity attributable to heating of the tube elements. The practical way of making this possible is to use a grid leak of higher resistance than ordinary, and to adjust the feedback until the note as heard in the monitor is pure and steady. Values of leak resistance on the order of 20,000 ohms will be found desirable in the case of Type '10 and Type '52 tubes, and 50,000 to 100,000 ohms with a Type '45.

The plate supply should be as pure d.c. as the filter can make it, and the voltage on the tube should not fluctuate as the transmitter is keyed. This last requirement cannot be met always, especially when the same plate supply is used for both oscillator and amplifier, but the variations in voltage with keying should be kept at a minimum. The plate voltage on the oscillator tube should not be too low — the percentage variation
in plate voltage, and hence the variation in frequency, is generally less when the plate voltage is high than when it is low. Moreover, the characteristics of oscillator tubes are such that reasonably high plate voltage gives better frequency stability than unreasonably low voltage. It is best to use voltages of the same value as would be used on an oscillator feeding the antenna, and keep the plate current below normal by the use of a high-resistance grid leak, adjustment of the circuit for maximum efficiency, and underloading. This results in better frequency stability and at the same time makes more power available for the grid of the amplifier. The plate of the oscillator tube should never be allowed to show color.

It is generally advisable to allow the oscillator to run continuously while the transmitter is in operation, and key only the amplifier. Several keying methods may be used in this case, but the simplest is regular center-tap keying, which requires separate filament supplies for the amplifier and oscillator. Since different types of tubes, requiring different filament voltages, will be used in most cases, this presents no difficulty. If the same plate supply is used for both tubes, the oscillator takes the place of the "drain" resistor across the plate supply, and helps in eliminating chirps and key thumps.

**THE AMPLIFIER**

The tube which is to supply power to the antenna should of course be adjusted for maximum power output. The ratio of capacity to inductance in the output tank circuit may in this case be made much smaller than is possible in the oscillator circuit, resulting in increased overall efficiency. There are no hard and fast rules to follow; in general, the tank inductance should have about twice as many turns as are used in the oscillator tank, and a tuning condenser with a maximum capacity of 250 µfd. will be large enough. The mechanical construction should be as solid as that used with the oscillator, however, because the amplifier is bound to react on the oscillator to a slight extent and the possible mechanical causes of frequency change must be minimized.

Unless a screen-grid tube is used in the amplifier the circuit will have to be neutralized. A neutralizing system which is incorporated entirely in the amplifier circuit is preferable, because with such an arrangement adjustment of the neutralizing condenser will change the frequency of the oscillator to a much smaller extent than when the neutralizing voltage is obtained from the oscillator tank. The neutralizing system shown in the diagrams works out nicely.

Although it is customary to use battery bias on r.f. power amplifiers in amateur transmitters, a combination of battery and leak bias is recommended because in addition to saving the cost of a large number of "B" batteries, the bias automatically assumes the correct value for the amount of excitation available. It is a good idea to have just enough battery bias to hold down the plate current of the amplifier tube to a reasonable value in case the oscillator quits, and let the rest of the bias be supplied by the voltage drop across the grid leak when excitation is supplied to the amplifier. The leak resistance is not particularly critical, and should be of about the same value as would be used with the tube as a self-excited oscillator. Ten thousand ohms will be a satisfactory value in almost all cases. A single 45-volt block will be sufficient for the battery part of the bias with practically any of the amplifier tubes shown in Fig. 1 except the Types '52 and '60, which should have about 90 volts.

**COUPLING THE OSCILLATOR TO THE AMPLIFIER**

In most oscillator-amplifier transmitters condenser coupling is used between stages, because it requires the least amount of equipment and is the simplest to adjust. One point frequently overlooked, however, is that the coupling condenser is liable to considerable strain in certain circuit combinations.

If series plate feed is used on the oscillator, the coupling condenser must have sufficiently high insulation resistance to withstand the full plate voltage on the oscillator plus the bias on the amplifier, as inspection of such circuits will show. In addition to these d.c. voltages, the condenser is also carrying radio-frequency current. The mica condensers often used for coupling may heat considerably from the r.f. flowing through them, and this sometimes lowers the insulation resistance of the condenser to the point where the dielectric will break down, even though the condenser might test satisfactorily on a much higher d.c. voltage than is actually across it in the circuit. Ordinary receiving condensers will often, though not always, stand up in low-power sets, but only those with high-voltage ratings should be used with sets using anything larger than a Type '10 tube in the amplifier. A regular variable air condenser is perhaps the most satisfactory type, because the plates are generally spaced sufficiently to stand the d.c. voltage — if not, they can be double-spaced easily — and since there is no heating in the air dielectric there is less tendency to break down. Even if the condenser should flash over, however, the short circuit is only momentary and is immediately evident, whereas with a fixed condenser a breakdown may wreck a tube or damage the plate supply before the trouble can be located.

The value of capacity required at amateur frequencies does not seem to be critical. Tests with condensers varying between 70 µfd. and 500 µfd. show that the power output is practically constant over the whole range of capacity; 100 µfd. is a good value to use. The smaller the capacity the less is the reaction upon the frequency of the oscillator when the amplifier plate
tuning is varied, so that there is some gain in over-all frequency stability with the smaller values.

**PRACTICAL CIRCUITS**

Several schematic diagrams are shown in Figs. 2, 3 and 4, together with satisfactory values for the various constants. The amplifier circuits are the same in all three cases, the only differences being in the oscillator circuits employed. In Fig. 2 is the Hartley, in Fig. 3, the tuned-plate tuned-grid, and in Fig. 4, the fixed grid coil version of the t.p.t.g. The connections for a screen-grid amplifier are shown in Fig. 5. The connections may be substituted for the amplifier portions of Figs. 2, 3 and 4, using whichever oscillator circuit may be preferred. The choice of a circuit depends largely on the preferences of the individual. The tuned-plate tuned-grid offers some advantage over the Hartley in that series feed may be used in the plate circuit, and the excitation control is smoother because the grid tuning condenser is more readily adjusted than the filament clip, but has the disadvantage that an extra control is necessary. The fixed grid coil arrangement retains the good features of the tuned-plate tuned-grid and has only one tuning control. Once the correct proportions for $L_t$ are determined this circuit is probably the easiest to handle. No specifications are given for $L_t$ in the Table of constants since the size of the coil will vary with different types of tubes. The coil is adjusted until the tube operates normally over the band for which the plate coil is designed.

In the amplifier circuit the neutralizing condenser, $C_n$, is connected between the grid of the tube and the lower end of the plate tank inductance. The plate supply tap (at ground potential with respect to r.f.) is clipped on about a quarter of the way up the coil, and the voltage drop between this tap and the lower end furnishes the neutralizing voltage. The antenna may be coupled to the amplifier by any of the ordinary methods; a “baffle” shield between the oscillator and amplifier may be used. Such a shield is simply a piece of sheet aluminum or other good shielding metal which is mounted between the two units so they cannot directly react on each other. The shield should be connected to the common filament center-tap lead. If the oscillator is entirely enclosed in a shielding box there should be provision for plenty of ventilation, otherwise the tube and tuning apparatus may heat badly and the frequency creep in consequence.

Satisfactory physical arrangement of the apparatus is not difficult; regular breadboard construction may be employed or the parts may be mounted on a panel. It is extremely important that the parts should be mounted very solidly and made insusceptible to jars and vibration. This point cannot be stressed too vigorously. The inductances, particularly, should be watched in this respect — even a slight quiver will cause the signal to wobble. With the larger coils for the 3500-ke. band it may be necessary to use wooden clamps to keep the turns from vibrating. Poor mechanical construction will ruin the frequency stability of any self-controlled oscillator, and the frequency stability of the oscillator-amplifier transmitter is no better than that of its oscillator.

A description of an oscillator-amplifier using a Hartley oscillator has previously appeared in *QST* and in the Handbook, and with a few minor modifications in the circuit may be arranged as shown in Fig. 2. The single-control transmitter described in December, 1929, *QST*, will work well as the oscillator in Fig. 4, and a similar layout may be used in building the amplifier.

The table shows constants to be used with various types of oscillators and amplifiers. One point which should be remembered by those used to operating High-C oscillators is that when a tube is used as an amplifier and adjusted for high efficiency and output, the r.f. voltage in the tank circuit builds up to much higher values than it does in High-C circuits. On the other hand, the circulating current in the tank is smaller. The net result of this is that the tank inductance need not be made of such heavy material; for example, \( \frac{1}{4} \)-inch copper tubing is a practical necessity.

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with a High-C Type '10 oscillator with 600 volts on the plate, while the same tube used as an amplifier with the same plate voltage will require nothing larger than No. 14 copper wire — and the wire will probably develop less heat than the tubing. At the same time, however, the receiving condenser which stands up well in the High-C circuit will almost invariably spark over when used in an amplifier adjusted for high efficiency, especially during preliminary adjustments when the antenna is not taking power.

The same thing applies in the higher-power amplifiers. A safe breakdown rating for variable condensers used to tune amplifier tank circuits would be approximately twice the d.c. voltage used on the amplifier. That is, with 2000 volts on a Type '52 amplifier, for instance, the condenser should be rated for 4000 volts. A 3000-volt condenser might stand up, depending largely on the finish of the plates and the accuracy of spacing between them, but would probably flash over occasionally. In an amplifier adjusted for high efficiency the instantaneous values of voltage in the tank circuit sometimes reach rather surprising values.

TUNING

Very little need be said about tuning the oscillator, since practically all amateurs are familiar with the adjustment of High-C circuits. First set the frequency at some suitable spot inside the limits of the band on which the transmitter is to work and adjust the excitation until the note is pure and steady. The monitor is indispensable for this work. The adjustments should be made with the amplifier coupled to the antenna and with the filament of the amplifier tube lighted. No plate voltage should be applied to the amplifier, however.

The next step is to neutralize the amplifier. A flashlight lamp connected to a loop of wire will be helpful. The loop should be held close to the tank inductance of the amplifier and the amplifier tuning condenser slowly varied until the lamp glows. The neutralizing condenser should then be adjusted until the lamp goes out, after which the plate tuning condenser should be readjusted until the lamp glows again. This procedure should be continued until it is impossible to make the lamp glow, even with the closest possible coupling between the loop and the amplifier tank inductance. This indicates that the amplifier is approximately neutralized.

At this point the signal should be checked again in the monitor. Very probably the neutralizing process will change the frequency slightly, so that the oscillator should be retuned, if necessary. Now the final neutralizing adjustment is made with the help of the monitor. As the amplifier tank condenser is tuned slowly through resonance the frequency of the beat note probably will change suddenly, indicating that the tuning of the amplifier tank circuit reacts on the oscillator. With approximate neutralization the magnitude of the frequency change will be of the order of 1000 cycles or so, and the neutralizing condenser should be carefully adjusted until there is no sudden change in frequency as the amplifier tank condenser is tuned through resonance.

There may, however, be a gradual change as the condenser is swung over its whole range, amounting to possibly one or two hundred cycles over the whole condenser dial.

With the neutralizing adjustment finished, the plate voltage may be applied to the amplifier. Before doing so, however, the amplifier tank should be tuned as close to resonance as possible, and the antenna should be detuned or the coupling coil removed from the vicinity of the amplifier tank coil. It is best to use the transmitting key instead of a switch to close the plate circuit in these preliminary adjustments, because if the amplifier tank is off resonance the tube will draw very high plate current. If the tuning is right the plate current will be rather low. If it is too high, make small changes in the amplifier plate tuning, closing the key for an instant after each change, until the plate current approaches a reasonable value. After it is low enough to be safe hold the key down and adjust the condenser until the plate current is at minimum. The minimum point will usually be rather sharp. With a properly adjusted transmitter the minimum plate current will be between 15% and 25% of the normal plate current of the tube. The greater the excitation the lower will be the plate current of the amplifier with leak bias.

The next step is to couple the antenna to the amplifier and adjust the antenna tuning for maximum current. This probably will necessitate a readjustment of the amplifier tank condenser, since coupling to the antenna circuit will throw

February, 1931
the amplifier slightly out of resonance. The amplifier tank condenser should always be adjusted for minimum plate current and the antenna tuning for maximum antenna current. As the antenna takes more load the minimum amplifier plate current will of course rise, but there will always be one setting of the plate condenser at which the plate current is less than at any other, and this setting gives the optimum output and efficiency. The loading process may be continued until there is no further increase in antenna current. With a Type '10 tube it is usually possible to load the amplifier until the tube draws 75 to 100 milliamperes—with about 600 volts on the plate—before the point is reached where a further increase in plate input results in no increase in antenna current.

While making the adjustments described above the signal should be checked continuously in the monitor. If the plate supply for the amplifier is adequate, the note will be the same regardless of the plate current, but with an overloaded plate supply or filter there may be some undesirable modulation if the load is too great. Since the quality of the signal is the first consideration, the adjustment which gives the best note with a reasonable amount of power output should be used.

Even though the amplifier is carefully neutralized there probably will be some slight reaction on the oscillator, so that there may be a small change in frequency if anything happens to change the tuning of the amplifier circuit, such as a change in antenna tuning or a change in amplifier plate voltage. These changes are usually small enough to offer no serious difficulty, however. For instance, in a small set using the circuit of Fig. 2, with a Type '45 oscillator and a Type '10 amplifier, tuning the antenna condenser through resonance and completely off resonance on both sides resulted in a total change in frequency of only a few hundred cycles. Such a change in tuning in the antenna circuit could hardly ever occur in practice even though the antenna were swinging badly, so that for all practical purposes the antenna has no effect on the frequency. With the same set the amplifier plate voltage could be varied from zero to 600 volts with a total change in frequency of less than 100 cycles. Since the plate voltage with any sort of decent power supply will never vary within such limits, the change in frequency with power supply regulation can also be considered negligible.

The excellent frequency stability of oscillator-amplifier transmitter makes key-thump elimination much less difficult than in the case of an oscillator feeding the antenna. Practically all key-thump elimination methods depend for their success on the fact that surges can be prevented if the plate voltage on the tube being keyed is made to rise and fall slowly when the key is closed and opened. Because of the negligible change in frequency as the plate voltage on the amplifier is varied it is possible to use lag circuits which give a much greater time delay—and consequently, better click elimination—than would be practicable when keying an oscillator, since there is little tendency toward chirps.

Key thump elimination has been discussed many times in QST, and endless varieties of practical methods have been shown. Suffice to say that so long ascertained well-defined principles are followed clicks can be eliminated—or at least reduced to a very great extent.

There are several places in the circuit where the key itself may be placed. One of the most satisfactory is in the filament center tap of the amplifier tube, as shown in the diagrams. Separate filament supplies for the oscillator and amplifier are necessary with this form of keying, as was pointed out previously. It is not advisable to key in the plate circuit of the amplifier if the same plate supply is used on both tubes because the key must be placed in the positive lead, and in addition it is harder to eliminate clicks with plate keying. Grid-leak keying is not always satisfactory because there is often enough leakage in the key base to allow the amplifier to draw considerable plate current, resulting in a “back wave” which is often nearly as loud as the main wave. If the key is sufficiently well insulated to allow complete cut-off of plate current this form of keying will function as well as any other, and in addition lends itself readily to thump elimination.

SOME GENERAL CONSIDERATIONS

Although at first thought it might seem that the oscillator-amplifier transmitter is considerably more difficult to build and complicated to adjust than the simple oscillators to which most of us have become accustomed, that is not actually so. The oscillator itself presents no difficult-

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FIG. 4—IN THIS CIRCUIT THE OSCILLATOR IS THE FIXED GRID COIL ARRANGEMENT OF THE T.P.T.G.
ties to the amateur who has had any experience at all in handling transmitters. The circuit should not be thought of as being a conglomerate of apparatus which only can be adjusted by arduous experimenting combined with good luck. Each unit of the transmitter should be considered separately, starting with the oscillator, and the amplifier should not be attacked until the oscillator has been put in order. After handling an oscillator-amplifier transmitter there is no temptation to go back to straight oscillators - the clean-cut performance of the separately-excited rig and its greater possibilities in the way of increased frequency stability and increased power output make operating it a pleasure.

The plate supply for the set is important. If at all possible, it is preferable to use separate plate supplies for the oscillator and amplifier. With a low-power outfit this does not represent a great expense — a plate supply such as described in November *QST*° can be built at a very reasonable price and is entirely adequate for supplying plate


### TABLE OF CONSTANTS

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<td>20,000Ω</td>
<td>20,000Ω</td>
<td>5000 v.</td>
<td>10 watt</td>
<td>10 watt</td>
</tr>
<tr>
<td>R2</td>
<td>10,000 ohms......</td>
<td>10 watt</td>
<td>10 watt</td>
<td>10 watt</td>
<td>10 watt</td>
<td>10 watt</td>
<td>10 watt</td>
</tr>
<tr>
<td>R3</td>
<td>100 ohms, center-tapped......</td>
<td>100,000Ω</td>
<td>25,000Ω</td>
<td>25,000Ω</td>
<td>250,000Ω</td>
<td>25 watt</td>
<td>25 watt</td>
</tr>
<tr>
<td>L4</td>
<td>3500 kc. — 12 turns, 2½&quot; diameter...</td>
<td>¾&quot; e.t.</td>
<td>¾&quot; c.t.</td>
<td>¾&quot; c.t.</td>
<td>½&quot; c.t.</td>
<td>½&quot; c.t.</td>
<td>½&quot; c.t.</td>
</tr>
<tr>
<td></td>
<td>7000 kc. — 5 turns, 2½&quot; diameter...</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td></td>
<td>14,000 kc. — 3 turns, 2½&quot; diameter...</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td></td>
<td>31000 kc. — 6 turns, 2½&quot; diameter...</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>L5</td>
<td>3500 kc. — 20 turns, 2½&quot; diameter...</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td></td>
<td>7000 kc. — 10 turns, 2½&quot; diameter...</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>A1</td>
<td>R.F. Ammeter......</td>
<td>0-1.5</td>
<td>0-1.5</td>
<td>0-4</td>
<td>0-4</td>
<td>0-4</td>
<td>0-4</td>
</tr>
<tr>
<td>A2</td>
<td>D.C. Milliammeter......</td>
<td>0-150</td>
<td>0-150</td>
<td>0-300</td>
<td>0-300</td>
<td>0-300</td>
<td>0-300</td>
</tr>
<tr>
<td>A3</td>
<td>D.C. Milliammeter......</td>
<td>0-100</td>
<td>0-100</td>
<td>0-200</td>
<td>0-200</td>
<td>0-200</td>
<td>0-200</td>
</tr>
<tr>
<td>Negative Bias Voltage (Battery)</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>90</td>
<td>45-90</td>
</tr>
</tbody>
</table>

R — Receiver type (approximately 1000-volt breakdown).
T1 — Transmitting type, 2500-volt or higher rating.
T2 — Transmitting Type, 3500-volt or higher rating.
1 — Air condenser of lower breakdown voltage may be used instead.
2 — Voltage rating should be same as plate supply voltage if no voltage divider is used. With series resistance and condensers of these voltage ratings the plate supply should never be turned on until the filament of the tube is hot.

...c.t. — copper tubing.
and filament power to one or two Type '45 tubes. Many amateurs operating medium-power tubes have graduated from the Type '10 class and probably have their old power-supply equipment available. With an outfit using a Type '52 tube feeding a Type '04-A, however, the expense of an additional power supply would be rather prohibitive.

As a matter of fact, there is no objection to using the same plate supply for both oscillator and amplifier if the equipment can handle both loads and maintain its regulation at a reasonable figure. The change in plate voltage as the load is thrown on and off is the determining factor. With mercury-vapor rectifiers, now used almost exclusively for high voltages, the regulation is excellent, and the oscillator in most cases simply provides a constant load for the rectifier-filter system which prevents the voltage from building up to high values — as it will if the load is thrown off entirely when keying — and in the end actually improves the regulation. If the oscillator circuit is carefully adjusted, the changes in plate voltage which do occur as the amplifier is keyed will have little effect on the frequency. Incidentally, a secondary advantage of the oscillator amplifier set is that the continuous load on the plate supply furnished by the oscillator effectually prevents blowing of filter condensers from building up of peak voltages.

The old "m.o.p.a." has been overlooked by too many amateurs who are in a position to try it and profit by its many advantages over self-excited oscillators. The circuit is worthwhile without crystal control — personally we believe it is preferable to crystal control in almost all cases except where it is necessary to work on a spot frequency or where mechanical vibration cannot be overcome. The simple circuits shown here may not, in rigorous tests, equal the performance of the crystal set in every respect, but they fully meet the present-day requirements for transmitters, and most listeners can't detect any difference between them and crystal outfits.

**Strays**

Hams of some years' standing will remember Howard Mason, ex-7BK, formerly department editor of *QST*, and lately operator with the Byrd expedition. He's modest — how modest can be judged by the following clipping from the *Seattle Times*:

"It's all very well to be retiring, but when you are forced to listen to the ovation given by a city like New York to a party of which you are a member — well, that's stretching this retirement business too far.

"That's what happened to Howard F. Mason, Seattle youth who was radio operator for Rear Admiral Richard E. Byrd on the recent expedition to the South Pole, when the party landed in New York.

"Mason made the trip from Seattle to New York to take part in the celebration. Upon his arrival in New York, Mason was given a ticket which was supposedly good for a ride in any one of three cars in the parade that the city was putting on for the explorers.

"The Seattle man was one of the first to leave the city's welcoming boat, the *Macon*, to take his place in the parade. He found the cars — easily.

"It was harder to get into them. The first was filled with Army officers who were sorry, but wouldn't make way for him. The second was full of civilians equally unwilling to relinquish their seats. The third had only two occupants, but they convinced Mason that the vacant seats were reserved.

"Mason then cast about for a vehicle in which to ride to the City Hall, where the official welcoming was to take place. He found none — that is, none but the subway, so he took that.

"At the City Hall his troubles continued. The crowd was too closely packed for him to get through to his companions. When he informed people that he was a member of the Byrd expedition, they only laughed.

"But Mason wasn't going to miss the show.

"The one reliable means of transportation was left to him — the subway. So he took that again, this time to the New York Times office.

"He asked for the radio room.

"There he made himself known to the operators with whom he had communicated for two years from Little America. He didn't know them, but he felt as if he did.

"'May I listen to our reception over your radio?' was his plea.

"He told them of his plight and they assured him he might listen.

"At the end of the program he remarked philosophically: 'I guess I enjoyed it better from here.'"
WIMK's Dynatron Frequency Meter

By R. B. Parmenter

ANY times WIMK has been unable to give frequency readings to stations requesting them, due to lack of time. Since there is not enough room on the operating table for the G.R. precision wave meter and a separate oscillator, it was necessary to lug them out of their cases each time a reading was given. Besides, we always felt a little worried as to just how accurate our readings were when using this method; there were too many things involved. Therefore, in order to fill the many requests for frequency measurements, to check off-wave operation, and to meet the need for a frequency meter of the heterodyne type to help locate scheduled stations, the dynatron frequency meter described was built for use at WIMK.

The dynatron type of frequency meter was considered to be the best of the heterodyne class and this one is very much like those described in the October 1930 issue of QST, particularly the meter built by F. E. Handy. The circuit diagram is shown in Fig. 1. A type '22 tube was decided on since the station is at present equipped with a receiver using d.c. supply and also because a Type '22 is better suited to our purposes than a '24 here at WIMK, the transmitters being only a few feet from the operating position and induced r.f. would surely wreck things if the meter had to be left turned on for long warming-up periods, as a Type '24 tube would have to be.

All of the various parts are mounted on a 3/16" thick bakelite panel 6 1/8" wide by 13 3/4" high, and the whole assembly is mounted in a mahogany cabinet 5 1/2" by 6" by 12", inside dimensions. The Type '22, plate coil, and screen-grid and plate by-pass condensers are mounted on a shelf directly above the tuning condenser. The shelf is 3/8" thick bakelite, 5 3/4" by 3", and is supported rigidly from the front panel by two angles of 3/8" x 1/2" strap iron. One-inch clearance is left between this shelf and the front panel to provide space for wiring and to keep the plate coil some distance from the front panel.

The plate coil is held rigidly in place at the back of the shelf by two small brass angles and is mounted so as to be as free from everything as possible. The General Radio tuning condenser has a fixed-capacity section in the front and is the same as their Type 557 except that metal end plates are used, doing away with the necessity of shielding the front panel. It was necessary to mount the tuning condenser 5/8" from the front panel to fit the shaft to the 6" National dial. The shaft may be sawed off but it is a good idea to mount the condenser back because this further cuts down the possibility of hand capacity.

All supply leads are brought in through a Yaxley socket which is supported from the front panel by two 1/4" brass rods 5 3/4" long, tapped at each end to take a 6/32 bolt. This mounting, as well as the condenser and bakelite shelf mounting are lined up so that all bolts are covered by the 6" dial, which keeps the panel free from unsightly mounting screw heads. All wiring is No. 14 insulated bus wire and is tied together wherever necessary to make it more rigid. It is best to avoid running the wiring near the coil or stator section of the tuning condenser since a slight shifting of the wiring would ruin the calibration. An open-circuit jack is connected across the 0-5 milliammeter so that it may be used for other purposes. A jack is also provided directly across the filament of the tube so that by means of an external voltmeter the filament voltage can be checked and held at 3.3 volts — which helps to lengthen the life of the '22.

Some '22's require a higher space current to make them oscillate than others. In our case we were fortunate to get one that oscillated with as low space current as 2.5 ma. but a space current of 3.8 ma. was found better for producing 14-mc. harmonics of useful strength. While calibrating, the filament voltage is set at 3.3 volts and the space current is set to 3.8 ma., by adjustment of the potentiometer, 90 volts being used on the screen-grid and 45 volts on the plate.

In one set-up at the station a dynatron oscillator using a 3800 kc. coil was used. The signal...
from this oscillator was too great for 3500-ke. measurements even when using "A" and "B" supplies separate from those used for the receiver. It is desirable, of course, not to have too much output because accurate readings are difficult when the oscillator signal is so strong as to block the detector tube of the receiver. Consequently this frequency meter uses a coil that covers the 1750-ke. band and the harmonics, as far up as those in the 14-mc. band, are all of about the same strength. A separate "A" battery is used on the dynatron and coupling to the receiver is obtained through a common "B" supply. It is impossible to use the same "A" supply for the receiver and the dynatron oscillator since the space-current meter is in the "-A" to "-B" lead and the plate current of all the tubes in the receiver would pass through the milliammeter.

In selecting a coil form for the plate coil one should use a form that is quite rigid, having at least a 1/16" wall in the case of bakelite tubing. Wood dowel may also be used but there is some chance of it absorbing moisture. A small diameter is also desirable: about 3/4-inch to one-inch for a 1750-ke. coil and 1/2-inch diameter for a 3500-ke. coil. A larger diameter than this may emphasize band capacity effects and would be likely to affect calibration because of its larger field. The finished coil should be treated with two coats of "airplane dope" to hold the winding in place and make it moisture proof. "Airplane dope" is very good for treating coils, by the way, and clear Duco is also good. Collodion is not so good because it does not soak into the winding readily but tends to lie on top.

The 4-inch National dial is the same as the 4-inch type except for size and can be read to one tenth of a degree. Since this makes very close readings possible, it seemed desirable to draw up the calibration chart so that readings could be taken from it directly without trying to estimate tenths of a degree. About 35 degree coverage was allowed for each sheet of cross-section paper and the complete calibration curve is on three sheets. This may sound like overdoing it but in practice it works out nicely. The dial-setting figures are out on the left-hand side of the sheet and the corresponding frequency at the bottom. One small square on the cross-section paper represents two-tenths of a degree or five squares represent one degree on the dial. One square represents 2 kc. in the 3500-ke. band or 4 kc. and 8 kc. on the 7- and 14-mc. bands, respectively. This permits very close readings from the chart, the nuisance of three sheets of paper for the curve being compensated for by the convenience and accuracy of the readings.

The preliminary calibration was made using the Headquarters frequency-standard set-up. The finished meter covers approximately 3430 kc. to 4035 kc. in the 3500-ke. region, which gives good spread for all bands. Since it is always best (Continued on page 38)
An Electrically-Operated "Bug"

By Charles E. Seymour, W9FMN*

POUNDING brass," to most amateurs, becomes just that sooner or later. At least the mechanical side of it does. With increased receiving proficiency — and sometimes without it — comes a desire to speed up the sending. Unless one acquires the knack of sending rapidly with a minimum of effort, a "glass arm" and a poor fist result. It is for such as these that the automatic key, commonly known as the "bug" key, has been designed. But automatic keys are rather expensive to buy, and there are always other things for the set which seem to be needed more.

With a little mechanical ability it is possible to construct a very acceptable bug key at home, and by exercising a little ingenuity a key can be built which does not depend on mechanical action for making dots. An electrically-operated key will make perfectly even dots for hours on end; further, it can be made to make the dashes, too, if one wants. The telephone company can furnish the vital parts; failing such cooperation, the whole works can be home made with the help of some parts usually to be found in the junk boxes of most stations.

Making an electrically-operated key is quite simple when one gets down to it. A "side-swiper" is the basis of the gadget; the side contacts are brought out separately, one side operating a time-delay relay arranged in buzzer fashion to make evenly-spaced dots at any desired rate of speed, the other side being worked either as the ordinary dash lever on a mechanical bug or operating another time-delay relay adjusted to make dashes of the right length for the dot speed. The first arrangement is the easiest to build, since only one time-delay relay is required.

The writer's key was made from an old telephone relay, a drawing of which appears in Fig. 1. It will be noted that between the iron core and the solenoid winding is a brass sleeve. It is this sleeve which causes the time-delay action; without it the relay, when connected as shown in the diagrams, would act simply as an ordinary buzzer, and could not be slowed up sufficiently to make dots at hand-keying speeds. The principle of operation is quite simple and hinges on the fact that when the current through the coil is broken a current is set up in the brass sleeve which tends to keep the core magnetized.1

Referring to Fig. 1 it will be seen that an adjusting screw is provided on the armature and the core. By removing the screw the action of the relay may be slowed down to about one dot per second. Even slower speeds could be obtained with a thicker brass sleeve. The sleeves are about a sixteenth of an inch thick on the relays in use here.

1 This is explained in more detail in Time Relay Control of Transmitters, QST, July 1929, page 17. If telephone relays of the type described above cannot be obtained, a suitable relay may be constructed as described in this article, using an old telegraph sounder and jack springs. — Editor.
Figs. 2, 3 and 4 show three ways of hooking up the relays. In Fig. 2, the relay need have only one set of contacts, but this system is good only for very slow speeds — below ten words per minute. The relay operates on the buzzer principle except that the time-delay feature results in regularly spaced dots instead of a buzz. A separate keying relay is used on the transmitter; the time-delay relays are only part of the key itself and are not intended to usurp the function of the regular keying relay. With a double-contact relay one set of contacts can, of course, be used to key the transmitter if the current to be broken is not too great for the carrying capacity of the contacts. With the sideswiper to the right the dots will roll out; on the left-hand side dashes are made in the usual way.

In Fig. 3 a separate set of contacts is used to break the circuit of the transmitter relay. This system is used for speeds from ten words per minute up. With a fast relay on the transmitter it is possible to get the dot speed up to where sending at 45 words per minute is entirely practical — if the operator can keep up with the key. In this system, also, the dashes are made manually.

Fig. 4 shows how two relays can be used to produce both dots and dashes. The principle of operation is fundamentally the same as Fig. 3; the only difference is that one relay is adjusted for dots and the other for dashes. A little time and practice will be required to get the proper setting of both relays for various speeds. At the writer's station the normal setting of both relays is for a speed of about twenty words per minute. A switch is provided for shorting out the contacts of the dash relay so that if a slower speed is desired the switch is closed and only the dot relay need be adjusted, the dashes being made manually.

To complete the story, a drawing of the sideswiper is shown in Fig. 5.

No doubt a number of modifications will suggest themselves to builders. Almost any sort of time-delay relay which can be adapted to make dots or dashes at the proper rate of speed can be worked into such a keying system. The relay shown is simply one which happened to be available to the writer.

Making Records of Amateur Signals

(Continued from page 35)
or filters, the monitor signal of any given arrangement can be recorded, a change in adjustment made, and results observed by comparison of the two recordings instead of depending on memory.

Short-wave 'phone BCL's will probably find lots of pleasure recording announcements from VK3ME to prove to their friends that they really do hear him. And lastly, are there not many times when you are vainly trying to decipher some futuristic "bug" fast that you would gladly spend a quarter to send the offender a true record of just what he was putting out in the name of the Continental Code?

W1MK's Dynatron Frequency Meter

(Continued from page 36)
to calibrate the meter right where it is to be used, standard-frequency signals from W1XP were used for the final calibration.

In the future we will be pleased to give a frequency check from W1MK to any station requesting it and satisfactory accuracy can be expected since the meter is checked regularly by signals from W1XP and the other A.R.R.L. Standard Frequency Stations.

As an accompaniment to the renewable filament tubes we have the screw-grid tube advertised recently in one of the radio magazines and pounced upon by W1AUS. If this keeps up we'll be able to buy our tubes in parts — so much for the filament, plate, vacuum, etc., and make up tubes to our own specifications.

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FIG. 4 — IN THIS DIAGRAM TWO RELAYS ARE USED, ONE FOR DOTS AND THE OTHER FOR DASHES

FIG. 5 — HOW THE SIDESWIPER IS CONSTRUCTED

38 QST for
Second All-Section Sweepstakes Contest

Everybody Invited to Take Part February 14 to 28—No Entries Required

By F. E. Handy, A.R.R.L. Communications Manager

WHAT'S it all about? To those who took part in the initial Sweepstakes Contest, held thirteen months ago, no detailed explanation will be required. This will be another competition filled with opportunities for making new contacts and friendships between amateurs in each and every one of our A.R.R.L. Sections throughout both the United States and Canada (including Hawaii, Alaska, P. L., Porto Rico and Cuba, etc.). There will be two full weeks of operating enjoyment. Did you ever sit down before your transmitter and see how many Sections of the A.R.R.L. organization you could contact reliably in fourteen days? Did you ever see how many stations could be worked and messages exchanged in a given time? If you have never tried to work "all Sections" in a given time this will be an opportunity. Any and all stations taking part can add substantially to the list of Sections and states previously worked!

In this Sweepstakes or second National Relay Contest participants can exchange but one dispatch each way with any station for credit in the contest, but may exchange with as many stations as possible. Messages are to be transmitted in complete form with city of origin, number, date, address, text and signature, the text being of ten or more words by plain language count. Messages not complying with this rule will be designated incomplete, and the QSO on which they were exchanged eliminated from the contest. The handling of a radiogram each way is essential to proving each contact a "solid" QSO, the basis for scoring.

Competition: The main competition you will receive in taking part will be that from operators in your immediate Section of our A.R.R.L. organization. Everyone can take part — no entries are required. Of course provision has been made to tabulate Section scores too — to see which S.C.M. has the best organization and teamwork in proportion to the distribution of amateurs or radio-population of the different sections. There's nothing to prevent you from working to be national "high station" if you wish, but certificates will be awarded to the highest or winning stations who run up the best record for each Section. One of the outstanding good points of our first Sweepstakes Contest was the fact that the fellow with low power was able to strut his stuff with the best of them — the certificate winner in one Section actually using just a '01-A with 180 volts of "B" supply! In another Section a station using 3500 kc. 'phone ran up a score of 2592 points, which we mention just to show that 'phone operators can get just as big a kick from the contest as c.w. men. It makes no difference whether you use 'phone or c.w., 1750 kc., 3500 kc., 7000 or 14,000 kc. — use them all if you want to, the choice of frequency, operating hours, and operating judgment exercised will determine where you place. Every man who takes part and reports will help his Section and receive the credit fairly due him in accordance with the rules. The chances are equal for everyone. Hop to it!

Messages: The contest will call for individual originality in making up messages to be sent to each station worked. Rubber-stamp messages will be ruled out of the count, which, as will be seen, might be a serious matter affecting the total and final score provided the QSO ruled out is the only contact made with some Section. The method of grading logs has been designed to credit the number of Sections worked in addition to counting the number of points gained by exchange of messages. As many messages can be sent to a given Section as you can work stations there, boosting the score a couple of points for each station worked. However, the final score will be obtained by multiplying the sum of all the points made by the number of Sections worked, by 68 if some station shall have succeeded in exchanging messages with at least one station in every Section, including his own Section. This will make our contest more interesting and general in character.

The main thing to be remembered is that only QSO's proved by copies of messages received and
sent during the two weeks’ test count. The two necessary messages with a certain station may or may not be handled both on the same day or during the same contact, but they must both be handled sometime between the beginning and end of our message-handling all-Section contest. Most of the messages in our contest will probably be “originated and delivered,” addressed to the station being contacted. However, when regular routine traffic happens to be in need of routing in a particular direction for delivery or further relaying, it should be handled and an extra copy made to be submitted with the report of work done in the contest. There is no excuse for routing messages in the wrong direction unless it is learned that a station can forward them by schedules or traffic routes, though. As in our last contest, off-frequency operation will result in disqualifications. The inclusion of messages with rubber-stamp texts or incomplete preambles will result in deductions from the scores of one or both stations responsible. In all cases in which Sections are smaller units than states, the name of the Section should be included in parentheses in the preamble of originated messages to assist the award committee in identifying them. Thus a preamble might read, “Springfield (Western Mass.) WIBWY . . . Feb. . . .”

Scores: Each received message counts one point, and each transmitted message one point, making a score of two points for each QSO, if a message has been successfully transmitted and received. It is possible, therefore, to score two for every QSO. Two stations in contact must each transmit a message to the other station, as proof of a solid two-way QSO, before any score will be counted for either. Messages count both for the contest and regular traffic totals turned in to Section Manager for mention in QST. The messages may be written by the operators during the QSO addressed to the station contacted, or regular traffic can constitute “contest” traffic. In addition, the total contest score made by exchanging messages is to be multiplied by the number of sections, with which messages have been exchanged. Since there are 68 sections, as a possible multiplier there is practically no limit to the possible scores! After getting a start the score mounts with amazing rapidity!!!!

Certificate awards: “Sweepstakes” signifies “a clean sweep.” The highest scoring stations in our February contest will have virtually “swept the air” and by skillful operating piled up points by many successful QSO’s with individual stations, and with a surprisingly large number of Sections contacted! The Sweepstakes insignia, significant of victory, and including the A.R.R.L. emblem as part of its design, appears in miniature on each of the award certificates, which are executed this year in an entirely new border style. With just a little effort you may win one of the sixty-eight handsomely lithographed certificates, such as is reproduced herewith — and you are sure to make a lot of enjoyable QSOs if you take part! Last year many fellows in all parts of North America reported the fun they had in taking part, and each day checking scores with friendly rivals as the contest progressed. In making the certificate awards and in all matters which concern division of territory in the contest the list of Sections which appear on page 5 of February QST will be followed.

Misapprehensions corrected: It is not necessary that the stations contacted be actually participating in the contest in order to exchange messages and make valid points. While considered desirable it is not absolutely essential that every station you contact send Headquarters copies of the two messages exchanged before points will be counted. Of course logs will be checked by the award committee wherever possible. It is not necessary to submit records and logs on standard League forms — any neatly kept tabulation is acceptable if understandable. There is no rule against making advance schedules by mail or radio if you think these will help. We see no special advantage in this, however. Your own log, verified insofar as possible, will be the basis for computing official scores. Just follow the rules and suggestions herein and follow the standard A.R.R.L. form 1 in making up your messages of ten or more words (text) and you will be safe. You can refer any station that doesn’t know what it’s all about to these pages and urge the operator to read QST “more thoroughly” — but first of all just ask ‘em to show the right spirit by coming through with a message and taking yours to help you over the hard spots and roll up the total. Not a bad idea to send QSL’s to all stations you work with which cards have not previously been exchanged, too — not necessary at all insofar as the contest is concerned, but it adds to the friendly spirit all our operating activities should create and makes a permanent souvenir of each QSO.

In general: Stations having really modern equipment — frequency stability and d.c. notes — will have the advantage and can probably outperform older or “just ordinary” equipment. However, intelligent use of the different amateur bands is one of the essential requirements to win. More than mere stations will determine who will get out certificates. Stations do count, but this is a contest of operating skill, too! The best equipment is only as useful as the ingenuity of the man behind the key can make it.

Choice of operating hours and operating frequencies is probably important. It’s not altogether a foregone conclusion that you should

1 The Sixteenth Edition of the Rules and Regulations of the Communications Department (January 1931) explains message form and A.R.R.L. organization completely. The new booklet also has the complete text of the F.R.C. regulations for amateur stations, and contains a photograph of W1MK. Keep an R. and R. in your station.
read QST's editorial this month and devote all your time to 3500 and 1750 kc. Remote sections can be contacted in daylight on 14 mc., or even on 7 mc. When conditions are spotty on these latter frequencies or QRM is bad there, or when exceptionally good conditions exist on the low-frequency bands, remote sections can be reached best on the lower frequency amateur bands. The most methodical and intelligent use of our up-to-date stations and available operating time will make our efforts show most return — always.

While stations owned and operated by members of the staff at A.R.R.L. Headquarters may participate and while the scores will count for Connecticut, the station owners and operators will be ineligible to receive any prizes or certificates as usual. The Headquarters station will transmit its regular official and special broadcasts at the usual times but whenever possible to exclusively good conditions exist on the lower frequency bands, remote sections can be reached in daylight on 14 mc., or even 17.5 kc. In the remaining time will participate in the contest work to add to the enjoyment and scores of those looking for QSO's.

THE RULES

1. This contest opens February 15 at 0000 G.C.T. and closes March 1 at 0000 G.C.T. Only work falling between these dates and times will be counted. (E.S.T.: Feb. 14, 7 p.m., to Feb. 28, 7 p.m.)

2. Participating stations must each send and receive one complete individually worded contest message of ten or more words with one station in any Section. As many stations as desired may be worked in each collection.

3. The sending and receiving of two messages constituting an exchange in both directions between the contacting stations shall be deemed proof of satisfactory two-way communication only when these messages (or copies) bearing notation of the date and time acknowledged with the call signal and frequency band used by the acknowledging station have been properly filed with the award committee at the conclusion of the contest.

4. Unless messages are composed and transmitted in the proper form with city of origin, station of origin, number, date, address, text, and signature complete and unless the text comprises at least ten words (plain language count) they shall be deemed incomplete. The award committee shall disregard such communications as insufficient evidence of satisfactory two-way communication.

5. A special log or tabulation of QSO's shall be submitted by each contestant showing the number of Sections contacted, the number of stations contacted in each Section worked.

6. Credits: Sending a message counts one point, receiving a message counts one point, but unless a message has been both transmitted and received with each station contacted, no credits shall be entered. The total station score at the conclusion of the contest will be the product of the number of Sections worked and the sum of the credits obtained by all valid two-way QSO's. Credit shall be claimed only of all individual participating stations entering logs and message files and located in a particular Section.

7. Reports, logs, and copies of all messages for which credit is claimed must be received at Contest Headquarters from all stations, except those in the Hawaiian and Philippine Islands, on or before noon March 20, 1931. Entries from those outlying points must be received on or before noon April 30, 1931. Entries should be addressed to A.R.R.L. Communications Department, 38 La Salle Road, West Hartford, Conn.

Let us suppose at the start of the test that W6ETJ contacts W5GS (Eastern Pennsylvania) and sends him a message which he originates, for the purpose of commenting on some phase of the contest perhaps. This is acknowledged, but W6ETJ is unable to get the message which W5GS transmitted, due to QRM and the local power plant, which blankets everything. W5GS tells W6ETJ that he will look for him at the same time later in the contest and puts the traffic on which a full record of the time and date and W6ETJ's call signal and the frequency band has been entered properly, aside, circling the single point entered in the log, since this cannot yet be counted either as a single point or as a contact with a new Section (Eastern Pennsylvania). The third station worked by W6ETJ is W9GJS in Indiana and messages are successfully handled both ways. W6ETJ has now contacted two stations in two Sections. His score (2 + 2) can be multiplied by two for a final result if no more work is done. He works another Western Pennsylvania station, adding two points to the score. (2 + 2 + 2) 2 would now be the final score. Another contact with W9GJS is made on the last day of the contest and W9GJS gives W6ETJ a regular message (of more than ten words) to QSP. This makes it possible to count Eastern Pennsylvania as a section worked, and now it is possible to reinstate the message sent to W9GJS several days before, this counting together with the message just received as two points. Should the contest end, the score would be (2 + 2 + 2 + 2 + 2) 3. W6ETJ contacts with two different stations in his home Section in the same manner both ways with both stations. He thus adds four more points and has qualified as working another (his own) Section. Assume that the contest closes. All the points made in QSO total twelve in number. Stations in four sections have been worked. The score will be 12 x 4 or 48. In actual practice, much larger scores may be expected.

What is the correct form to be used in contest messages?

See the example of proper message form and order in the Sixteenth Edition of the Rules and Regulations of the Communications Department (January 1931) sent free on request. If you haven't this useful pamphlet drop us a postal today. Only complete messages and correct in every respect will count in our January competition. The proper order follows: City and state of origin, station of origin, number, date, check (unless omitted), complete address, text and signature.

In it necessary when sending a message which you originate for delivery at a station which you contact to put in the name, street address, etc., or will the call signal, city and state suffice?

As a general rule, the more complete the address the better. Far too many messages on A.R.L. message blanks are returned here by the postal offices daily because they lacked a sufficient address to warrant delivery. In the course of a year we wear out several call books trying to complete the addresses on such communications. Every message to be relayed through even one station should have the name as well as street and number and all other possible information. However, in the case of messages going direct from originator to address the call signal, city and state will be deemed adequate. Participants may guide themselves accordingly.

How should messages complete in other respects but bearing no signature be sent?

With the words "no sig" after a double dash at the end of the text.

Someone asks what type of message texts should be exchanged in verification of a QSO, if the following examples would do, or if these would be considered "rubber stamp" texts: (1) Do you think we should keep a regular schedule? (2) How many points has your station acquired in these national tests query? The texts are O.K. as they differ materially from each other. Many others questions or facts pertinent to the apparatus in stations, localities, opinions regarding conditions, (Continued on page 44)

February, 1931
Standard Frequency News and Schedules

I T is hard to believe that there are many amateurs who are seemingly ignorant of the A.R.R.L. Standard Frequency System and the activities of its three standard frequency stations. Anyone who makes even a pretense of reading QST must be acquainted with the frequent and universally useful calibration service the system provides. The radio press and even daily newspapers have printed items concerning it. Yet we recently had the experience of having one amateur, as spokesman for a group, tell us that he knew nothing about the standard frequency stations — that he had never heard of W1XP! This is only a single instance, of course, but the continued prevalence of off-frequency operation makes it seem only too likely that there are a lot of other fellows in the same boat.

Rank ignorance can be the only explanation for it. And it is axiomatic that ignorance is never an acceptable excuse where the law is concerned. So talk up the use of standard frequency transmissions, you fellows who are using them and know their value. Tell the off-frequency brother about them, over the air or when sending him an off-frequency report. If he is stubborn and insists that he is right and that the rest of the world, the s.f. stations, the Bureau of Standards, and the Inspection Service, are all wrong — well, that's his funeral.

And these off-frequency chaps are not all beginners, either. Many of them are self-confessed "old-timers" who have allowed their experience to make them careless. Moreover, instances of off-frequency crystal-controlled signals are not unknown. Many fellows seem to have a child-like faith in the statement of frequency they get with their crystals. There are enough things to cause a change in a crystal's frequency — they have been explained repeatedly in QST — so that one cannot be certain of even a crystal-controlled transmitter's location in the radio spectrum unless the frequency is checked from time to time. A good heterodyne frequency meter (such as the dynatron described in October QST) calibrated by standard frequency signals will provide any amateur with a continuously available source of dependable checking frequency. All he has to do is build the meter. The standard frequency stations will furnish the calibration signals.

Here are the schedules of the A.R.R.L. Standard Frequency Stations for the next two months.

DATES OF TRANSMISSION

<table>
<thead>
<tr>
<th>Date</th>
<th>Schedule</th>
<th>Time (a.m.)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb. 1, Sun</td>
<td>BB</td>
<td>4:00</td>
<td>7300</td>
</tr>
<tr>
<td></td>
<td>BB</td>
<td>8:00</td>
<td>7100</td>
</tr>
<tr>
<td></td>
<td>BB</td>
<td>8:16</td>
<td>7200</td>
</tr>
<tr>
<td></td>
<td>BB</td>
<td>8:34</td>
<td>7300</td>
</tr>
<tr>
<td></td>
<td>BB</td>
<td>8:48</td>
<td>4000</td>
</tr>
<tr>
<td></td>
<td>W9XAN</td>
<td>8:00</td>
<td>14,000</td>
</tr>
<tr>
<td></td>
<td>W9XAN</td>
<td>8:08</td>
<td>7100</td>
</tr>
<tr>
<td></td>
<td>W9XAN</td>
<td>8:16</td>
<td>7200</td>
</tr>
<tr>
<td></td>
<td>W9XAN</td>
<td>8:34</td>
<td>7300</td>
</tr>
<tr>
<td></td>
<td>W9XAN</td>
<td>8:48</td>
<td>4000</td>
</tr>
</tbody>
</table>

The time specified in the schedules is local standard time at the transmitting station. W1XP uses Eastern Standard Time, W9XAN, Central Standard Time, and W6XK, Pacific Standard Time. Schedule BB transmitted by W1XP is intended particularly for European amateurs and starts at 2100 G.C.T. Schedule BX is transmitted especially for amateurs in Oceania and the Far East. It is transmitted starting at 1200 G.C.T. by W6XK. Reports on these special transmissions are particularly desired, not only from overseas hams but from those in the Americas also.

Although the frequencies of the transmitting stations are not guaranteed as to accuracy, every effort is made to keep to within 0.01% of the announced frequencies. The frequency standards are calibrated against the National Frequency Standard. Frequent checks on the transmissions (Continued on page 74)
The Neglected Current-Squared Galvanometer

Some Suggestions for Its Use

By Paul E. Griffith, W9DBW*

One instrument that is rarely seen in an amateur station is the current-squared galvanometer. On first thought the scarcity of such instruments in amateur stations might be attributed to their relatively high cost; but after analyzing the situation one sees that it is not so much the cost but rather the lack of appreciation of their many uses which has kept them from being more popular.

The current-squared galvanometer is nothing more than a thermo-couple type meter which has a scale calibrated in 100 evenly spaced divisions of arbitrary value instead of the usual logarithmic scale common to thermo-couple type ammeters. The deflection of the pointer is directly proportional to the square of the current and the scale reading, therefore, is directly proportional to the power in the circuit. Standard types of current-squared galvanometers require 115 to 125 ma. for full-scale deflection and have a radio-frequency resistance of 4.5 ohms. The meter itself, therefore, dissipates less than one-tenth watt at full-scale deflection. Because of its comparatively small current capacity and low resistance, caution must be used in its handling. This applies particularly to its use in making measurements of radio-frequency power, especially in transmitters.

An instrument such as the Weston Model 425 or Jewell Pattern 67 thermo-galvanometer is a most versatile aid in making measurements of alternating currents at practically any frequency used for communication purposes.

A NEUTRALIZING INDICATOR

As a device for use in neutralizing power-amplifier circuit, it is excelled only by much more expensive and elaborate layouts. It is used in place of the usual flashlight bulb and pick-up coils and in exactly the same way. A coil of one or two turns of wire is connected to the terminals of the meter and placed in inductive relation to the plate tank coil of the tube being neutralized. It is surprising how accurately and quickly the minimum current adjustment can be found. One is sure that the set is properly neutralized because there is the visual quantitative indication provided by the meter scale as a basis for judgment. Again, the meter will cause less detuning effect because it needs less current to operate it, the full-scale deflection requiring only 125 ma., or less as compared to the usual 300 ma. necessary to light a flashlight bulb to full brilliancy.

After all stages have been neutralized it is a simple matter to loosely couple the meter to the output tank circuit and go over the transmitter tuning step by step, tuning for maximum scale deflection of the meter always. The meter deflection is very nearly proportional to the power output, because of the current-squared feature, and the fixed resistance of the pick-up circuit. \( P = I^2 R \).

One of these meters with its pick-up coil will take the place of several r.f. ammeters in tank circuits, thus reducing the tank circuit resistance. It will also be available for other uses, such as:

![Diagram of neutralizing indicator](image)

Fig. 1

**S** — Source of alternating current

**G** — Current-squared galvanometer

**Z** — Impedance being measured

**R** — Non-inductive variable resistor

Those mentioned below. By making inexpensive fixed mountings — one beside each plate coil — the meter may be easily supported, enabling one to be sure that any change in deflection is caused by a change in the transmitter and not a change in position of the pick-up coil.

OTHER AUDIO-AND RADIO-FREQUENCY APPLICATIONS

Other uses of the galvanometer are as a volume indicator; as a current indicator in all a.c. meas-

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February, 1931


measurements; as a resonance indicator in wavemeter circuits; and as a means of measuring percentage of modulation.

A special transformer must be used with the meter if it is to be utilized as a volume indicator in conjunction with audio-frequency amplifiers. This may be made from an Amertran Type 854 50-henry choke, or any similar choke with enough room in the core window to permit 80 turns of 50-henry choke, or any similar choke with enough

Figure 2. Percentage of modulation

and wind enough No. 36 d.c.c. wire on it to make the large winding is then connected to the primary of the output transformer of the amplifier and the meter is connected to the small 80-turn winding.

The special transformer previously referred to reduces the plate load impedance of the final stage of the amplifier by about 18.8%, which is certainly far from negligible. It would be better to connect a coupling transformer of the proper ratio to the volume indicator, so that the tone quality of the amplifier would remain unaltered. This, and the fact that at least one stage of amplification is needed to operate it, are the only objectionable features of the device.

There are numerous experiments and measurements found in the books listed in the QST Book Department in which a galvanometer that will measure alternating current of almost any frequency will prove valuable. The current-squared type is not too large to be used in any of these experiments. Of course, a shunt may be used if it proves to be too small.

A handy method of measuring impedance which is not found in many books uses some sort of a.c. measuring instrument. The meter described is very good in this case. To measure the impedance of a coil or condenser, or a combination of both, it is only necessary to apply an alternating voltage of constant amplitude and frequency to it and to measure the current flowing through it. A non-inductive variable resistor is substituted for the impedance unit and adjusted until the same current flows. The value of the resistance in ohms is the value of the impedance in ohms. The circuit of the arrangement is that of Fig. 1.

Perhaps the original use to which the current-squared galvanometer was put was that of resonance indicator in the absorption-type wavemeter. It is still used on long-wave wavemeters; but the heterodyne frequency meter and the piezo-oscillator have displaced such instruments in modern short-wave stations.

As a means of measuring the percentage of modulation, the galvanometer is by far the most rapid instrument, although it is not accurate to a very high degree. A full explanation of the method used in such measurements appeared in QST for May, 1930, on page 48. To make the employment of this method easier and faster, a curve is given in Fig. 2 which was computed from the formula given in the article referred to above. \( R \) is the same as the \( R \) in the article: the ratio of galvanometer reading during modulation to that with no modulation.

Second All-Section Sweepstakes Contest

(Continued from page 41)

DX, traffic or radiophone operation, comments on the characteristics of different amateur frequencies, off-frequency operation, regulations, the interference question, high quality signals, beginners, broadcast or ship operating, organization work, Army or Navy Net operation, station descriptions, QST articles, message procedure, laws, etc., would make excellent texts for messages to be originated in the contest, not to mention the variety of non-radio subjects that could be called upon when operators in remote districts may find themselves short of regular traffic.

Suppose VE2AC QSO's with W9AZY and takes from W9AZY a message originated at W3BWT and addressed to an individual in Chicago. "Can this count as a contest message?"

Yes, providing the message is handled during the period of the February contest, provided that VE2AC turns in a copy of the message in the contest committee with information on station, date, time, etc., according to Rule 3, and provided that VE2AC also gives W9AZY a bona fide message sometime during the two weeks of the competition similarly making a record of this occurrence for the contest judges. This may be either a special message which he originates for W9AZY (or to be further relayed by W9AZY) or a message VE2AC has received in the course of regular relaying for W9AZY or some point beyond.

W9AQT suggests the following method of making an r.f. choke with comparatively little external field to get mixed up with the fields about the transmitting coils. Procure a piece of half-inch rubber tubing from the dime store and wind enough No. 36 d.c.c. wire on it to make a coil about two inches long. Cut off the ends of the tubing about an eighth of an inch from the ends of the winding and bend the whole works into a circle, after the fashion of the old toroid inductances. This choke was found to be adequate at 3500 kc. Practically all of the field is concentrated inside the coil.

QST for

44
Improving Detector Operation

In the conventional detector circuit the grid leak is returned directly to the filament, instead of shunting it across the grid condenser as was common practice a few years ago. The value of the grid leak resistance is rather critical if best detection and smoothest control of regeneration are to be secured, and another problem of no small magnitude is that of obtaining a grid leak of the correct value of resistance which is at the same time quiet in operation.

![FIG. 1](image)

A system which works wonderfully well is to shunt a 400-ohm potentiometer across the detector filament and connect the grid leak return directly to the arm of the potentiometer, as shown in Fig. 1. With this system the grid leak adjustment can be varied easily and the setting found for best detection and smoothest regeneration. The value of resistance of the leak is almost not important, providing it, is somewhere between 1 and 7 megohms. The main idea is to get a quiet leak and then adjust the potentiometer for best results. The detector can be made to go into oscillation just as smoothly as desired.

— Cy L. Barker, W9EGU-W9GZ

Soldering Aluminum

Probably every experimenter has at some time or other wished to solder aluminum. In some cases it may have been accomplished after much sweating, but in the majority of attempts the results were most likely nil. The following method is the only one the writer has ever found to give good results.

The first step is to make the solder, using four parts of tin to one part of zinc. Melt the tin first and when molten add the zinc. Stir well after the zinc has melted and pour out into bars, strips or any other convenient form. These metals are obtainable from a tinshop. The flux is oleic acid, a brown oily organic compound, which should be obtainable from any drug store. The secret of success is this — be sure that the piece of aluminum to be soldered is scraped clean and that the flux is applied immediately after cleaning. If this is not done, the aluminum oxidizes rapidly and of course the solder has no chance to get to the clean metal. The temperature of the iron should be a little higher than that used for ordinary soldering.

This solder will also stick to copper, so a copper wire can be soldered to aluminum if desired.

— C. H. Parker, W6DKF

A Neat Homemade Cable Plug

The credit for the gadget shown in Fig. 2 belongs to Chester W. Ward, W1ARK, of Providence, R. I. It is a home-made cable plug which fits into a 5-prong socket for making battery connections to a receiver. The plug itself is a UY base taken from an old tube, and the cap is a plug of the type used with lamp cords. The rivets which hold the brass parts to the bakelite cap should be drilled out and the metallic members removed. The cap may fit without further alteration in the top of the tube base, as shown in the drawing, but in some cases it may be necessary to file it down a little to make a snug fit. When finished it should be glued in place, and the resulting assembly will be nice-looking and easy to
handle. There is little danger of breaking off connections inside the plug with a cap of this sort. — Curtis G. Docherty, W1BML

Make the Filament Voltmeter Do Double Duty

"Here is an idea which may be quite old, but which I have not seen published.

"The stunt is a very useful one for financially overburdened hams and consists of combining the filament volt-meter and plate-milliammeter. The meter in question is a Weston 15-volt a.c. meter, of 210 ohms resistance and 71 m.a. full scale. If a Type '10 tube is run at rated input the meter may be used just as it is and will work beautifully with only a single-pole double-throw switch in the circuit. For heavier currents as on a Type '50 tube such as I use, I have to add a shunt (which is easily made) so as to have 150 m.a. full scale. This shunt will be about 189 ohms, and since it only carries 79 m.a. of d.c. it can be made of anything handy. A d.p.d.t. switch is used, connected as in the diagram, Fig. 3.

"Of course the meter cannot be left as a plate milliammeter while actually transmitting because of the loss of the center tap. However, this is important because the main use of the plate meter is for adjusting the transmitter and no meter should be forced to stand the jolting incident to keying."


Another method of arrangement would be to connect the meter terminals to a plug, and connect an open-circuit jack across the filament terminals and a closed-circuit jack in the negative high-voltage lead. The shunt, if used, would be connected permanently across the latter jack. The meter would serve very well without calibration as a plate current indicator, but should be checked against a d.c. meter if the actual plate current is to be read. By adjusting the shunt to the proper value (a variable resistor of about 200 or 300 ohms will be handy) the plate current can be read directly; that is, a 0–15 meter can be made to read 0–150 m.a.; a 0–10 meter, 0–100 m.a., etc., provided the meter is one which does not take more current at full scale than the ma. range desired.

The Simplest Audio Oscillator

Every time we get a new office boy here at Headquarters some intensive code practice is in order. The last time this happened the old faithful (?) buzzer decided to act nasty, as is often the case with buzzers, and added some uncalled for sputters of its own to the otherwise perfect code being pounded out by some one of the gang possessed of tickets. Thereupon the versatile dynatron was called upon to furnish an imitation of that nice 500-cycle note that XDA puts out for indignant ham ears.

Anyone possessing a screen-grid tube, a pair of 'phones, a key, tube socket, a 45-volt "B" battery and a source of filament supply for the tube can throw together one of the nicest code-practice outfits you ever saw in ten minutes or less. The circuit diagram is shown in Fig. 4. The pitch of the note will be determined by the inductance and distributed capacity of the 'phones and may be made almost anything desired by shunting a condenser of suitable value (&C in the diagram) across the 'phones. With a pair of Brandes "Superior" 'phones a .001-µfd. condenser tuned it up to about 500 cycles — and it's a clear, steady note that never breaks or sticks.

Two or more pairs of 'phones may be connected in series to allow two or three learners to listen in at the same time. The greater the number of headsets, however, the lower is the tone and consequently less capacity at C is required. To supply a whole class with code practice a better stunt would be to connect the primary of an audio transformer in the circuit in place of the 'phones and feed the output into an audio amplifier of the usual type, connecting an output transformer of suitable output impedance for the number of headsets to be supplied in the plate circuit of the

46 QST for
amplifier. Any number of headsets could be used with this sort of rig and a power tube of adequate rating. A '71-A in the amplifier should be capable of operating twenty or thirty pairs of 'phones without difficulty.

Of course the oscillator can be put to many other uses besides code practice. It can be successfully used in adjusting the peak on a peaked audio amplifier by using the diagram shown in Fig. 5, which is a modulated r.f. oscillator. The radio frequency will be set by the constants of the circuit \( L_1 C_1 \) and the modulation frequency by the circuit \( L_2 C_2 \), both of which may be adjusted independently. \( L_2 \) may be an audio choke, the primary of an audio transformer, or even a head-set. If the r.f. circuit covers the broadcast band the oscillator may be used to test broadcast receivers, line up ganged condensers, etc.

While the circuits shown are for a.c. tubes, the d.c. varieties may be used equally well. Higher plate and screen-grid voltages may help if there is trouble in getting the outfit to oscillate, although those shown were plenty with the tubes tried.

A Cheap Bleeder Resistor

We are all aware of the advisability of having some sort of constant load across the output of the filter to prevent the voltage from building up to high values when the key is open, and to aid in eliminating key clicks. Sometimes a suitable high-voltage resistor comes a little too high for slim ham pocketbooks, and in that case it is necessary to do some home manufacturing. A resistor such as is shown in Fig. 6, suggested by M. A. Williams, W6DYZ, Long Beach, Calif., costs practically nothing and will do the trick.

Procure a piece of quarter-inch glass tubing about eight inches long and make a right-angle bend about three inches from each end, as shown in the drawing. This may be done by holding the tubing in a gas flame at the point where the bend is to be made until it is at red heat and then carefully bending it. Take two jelly glasses and fill them with pure water, connecting them by the glass tube. Water should be siphoned through the tube to make a continuous liquid connection. A piece of wire is placed in each glass to make connections to the high-voltage supply.

The next step is to connect the resistor across the power supply with a milliammeter in series.

Then add a little table salt to each jar, noting the current. Continue adding salt until the current through the resistor is about 20% to 25% of the value taken by the transmitting tubes in normal operation and the drain resistor is complete. A little oil on top of each jar will prevent evaporation.

Homemade Filter Condensers

The high cost of high-voltage filter condensers inspired W9CJB, C. W. Herbert, Festus, Mo., to do some experimenting, with the result that an entirely satisfactory 3000-volt condenser was evolved at small cost.

A ream of onion-skin typewriter paper was bought from Sears & Roebuck for something less than a dollar and provided the dielectric. Each sheet of dielectric consisted of ten sheets of paper, all being held together with paraffin, painted on each sheet with a brush while hot. The condenser plates were pieces of tinfoil cut so that a 1 ½-inch margin was allowed on three sides of each dielectric sheet, the remaining side being brought out to make the connection. The condenser was built up with alternate sheets of paper and tinfoil until all the paper was used. The connection ends of alternate tinfoil plates were brought out on opposite sides of the paper sheets, of course.

While the capacity of a condenser of this sort would not seem to be very great, it proved to be very effective. Used with a High-C Hartley transmitter with a Type '52 tube, a.d.c. note was obtained with this condenser and a 15 henry choke. The voltage was between 2500 and 3000.

W9CJB also suggests a good way to find the
number of sheets of paper to use in each dielectric sheet to stand various voltages. First make two tinfoil sheets and then build up a dielectric sheet from a number of sheets of paper as described above. The single condenser section so formed should then be connected across the power transformer to see whether it will stand the voltage. If the transformer is center tapped and a full-wave rectifier is to be used, the outside ends of the high tension winding should be used for the test. For instance, to build up a condenser to be used with a full-wave rectifier from a transformer giving 1000 volts each side of the center tap, the test voltage would be 2000 a.c. The transformer should be protected by fuses in case the paper breaks down. A little experimenting will determine the number of sheets of paper necessary in each dielectric sheet to withstand the voltage. The thinner the dielectric, of course, the greater will be the capacity of the condenser.

Repairing Filter Condensers

The following letter from H. Guy Moats, W8AE, Pontiac, Mich., needs no further explanation. It may help some of the fellows who have had the sad experience of blowing filter condensers.

"A short circuit recently blew all my filter condensers. It was a case of either rebuild or buy new, so I took a chance at the rebuilding and it turned out to be perfectly satisfactory. The cost is practically nothing, and that is something, these days."

"Here's the idea: The condensers were unwound, the waxed tissue and foil separated and the paper thrown away. I procured a roll of the waxed paper such as is used around the house for wrapping bread and such and cut a number of long strips wide enough to cover the foil, with a margin of half an inch over. Then I placed one strip of foil, after first cutting out the punctured spots and tears, on a sheet of the paper, put two sheets on and then another strip of foil. A single sheet of the paper was put on top and the whole thing wound over a cardboard strip one and one-half inches wide by four inches long, care being taken to prevent cracking the wax on the edges. A warm room is essential for this work, as it softens the wax so that it works easily. While the capacity was lowered somewhat, it did not lose enough to spoil operation of the filter.

"Practically any old condenser bank can be made to do good work by this means so long as the foil is OK."

A Novel Crystal Holder

The ever-useful tube base has been pressed into service as a crystal mounting by K. W. Griffith, W5LX, Little Rock, Ark. Fig. 7 shows how it is done. Further explanation is unnecessary.

A cap of the sort shown in Fig. 5 will make a neat dust cover for the holder.

Strays

If spool form chokes are used do not mount the spool on the baseboard by running a steel wood screw through the center. The steel screw acts as a magnetic core and just about wrecks the usefulness of the choke at radio frequencies.— W3DPJ.

Popular Mechanics Press, Chicago, publishes a booklet entitled "A Billion Ideas," which is a catalog of books covering a wide range of scientific and practical subjects. A handy booklet to have when one wants to learn the name of a good book on radio, mechanical and other subjects and where to get it.

The Radio Manufacturers Association is planning to establish a tube "hospital"—no, not to repair tubes, but to investigate causes of short life and ways of lengthening the average life of tubes. We could tell them about one widespread cause of the high mortality rate among transmitting tubes. The plate usually develops a high fever as one of the first symptoms.

VK5IIG recently sent W9CKQ a carved boomerang as a souvenir of their 500th contact. A regular schedule has been kept for the past two years. That's consistency.
W9DXP, Chicago, Ill.

Unusual Lay-Out; Crystal Control; Effective Three-Band Operation

At about the same time a pistol shot in central Europe started "la grande guerre" in 1914, the owner of W9DXP, then living in Des Moines, Iowa, was bitten by the radio bug, and neither the world nor the owner has ever been the same since that fateful year. The meager equipment procurable at that time was gradually augmented until, just before Uncle Sam got into the scrap, 9AKQ was reaching points all over Iowa with a 2-inch spark coil.

The beloved junk hurriedly hidden in the attic at the start of hostilities was brought to light just as soon as the government said "go," and gradually reached the point where a 1-kilowatt spark set boomed hoarsely under the call 9OA. An interruption of four years followed, while the OM went to college, and then one bright day in May, 1927, the present station was inaugurated. The customary UX-210 gave way to a 250-watt job, which was used with fair success until the need for modern equipment became apparent.

To meet the situation brought about by the narrow bands, it was thought that crystal control offered the best opportunity both as to note, steadiness of frequency, and sharpness. There followed a series of crystal-controlled sets using almost every one of the known powers and types of tubes, until the present arrangement was built up. This new transmitter has proved so entirely satisfactory in every respect that it is thought it will do for some time to come.

The transmitter, power supply and control switches are on the bench at the left. The operating table is at the right.

When designs for the transmitter were considered, the bread-board type of construction appealed greatly, but this transmitter is so large that bread-board construction would very likely be a messy looking job, so an arrangement combining the electrical and mechanical advantages of a "straight four" bread-board type and decent appearance was sought.

How it was worked out is readily apparent from the photograph. The tubes and coils rest on a shelf 10½ inches wide and four feet long, which permits wiring the set much as a diagram is drawn, while the condensers and a couple of meters were mounted below the tube-and-coil panel, which not only hides them and the wiring, but also makes for convenient connections.

The power supplies are behind the large panel back of the tubes and coils, keeping the r.f. and a.c. wiring separated, and again allowing good appearance. The control panel of the transmitter, containing filament rheostats and starting switches, is hung below the bench, where it affords easy connections to the set and convenience to the operator.

In designing this transmitter, a flexibility was desired that would allow the use of the three principal bands on short notice, which is one of the reasons for using four stages in the set. With this thought in mind, and remembering that the only stage where power losses are really important is the final amplifier stage, none of the coils, with the exception of the power amplifier coil, were made plug-in. By varying the clips on the other coils, the first three stages are made to operate on two or three bands as required, while the last stage is made as "low-loss" as possible.

For the 14- and 7-mc. bands it was decided that a 3.5-mc. crystal would be most satisfactory, and for 3.5-mc. operation a 1.75-mc. crystal was chosen. Utilizing one crystal for all bands would require two stages of neutralization for 3.5-mc. work, and a 3.5-mc. crystal that would operate...
on 14 mc. would be too near the 3.5-mc. 'phone band for satisfactory telegraph work on that band. Since a UX-860 is used in the last power amplifier stage, no neutralization is necessary in that stage.

The oscillator stage uses a UX-210 tube, with a coil and condenser combination that will tune to 1840 or 3545 kc. by moving a clip on the coil. The frequency doubler, which also acts as a buffer stage, uses another UX-210 with a coil and condenser that will tune to 3680 or 7000 kc. Both these tubes are run by a plate transformer delivering about 600 volts, the output of which is rectified by a UX-280. A resistor drops the voltage on the oscillator to 325 volts while the doubler operates at about 525 volts on the plate.

The first amplifier stage consists of a Western Electric 211-D 50-watt tube, and a condenser-coil combination that may be adjusted to 14, 7, or 3.5 mc. In spite of "dead-end" losses in this stage on the higher frequencies more than enough grid excitation is provided for the final power amplifier. Plug-in coils are used in the power amplifier. These two stages operate from a common power supply, consisting of a plate transformer delivering 1500 or 2000 volts as desired, a pair of mercury-vapor Rectobulbs, and a brute-force filter. A 100-watt, 10,000-ohm resistor drops the voltage to 1000 volts for the 50-watt stage.

The various meters along the panel behind the tubes are plate milliammeters and filament voltmeters, while the meter near the oscillator tuning condenser is the oscillator tank meter. The plate voltmeter, which may be switched to any stage, is on the lower panel at the left, while an a.c. line voltmeter is on the power-control panel.

Looking at the rear view of the transmitter, from left to right are the power supply for the two 210's and the filament transformer for the Rectobulbs, behind which is the filament transformer for the two 210's. Next come the Rectobulbs, beside the plate transformer for the amplifiers. On top of the plate transformer is the keying relay with a condenser across its terminals. The two 2-mfd. 3000-volt filter condensers come next, with the keying resistors resting on top of them. The 10-henry Acme choke has been replaced by a 36-henry Thordarson choke since the photograph was taken. At the extreme right is the filament transformer for the power-amplifier tubes, while above it is the screen-grid resistor. The 100-watt resistor used in the 50-watt stage is just to the right of the filter condensers, and is mounted on the back of the panel.

The keying system is of interest, and is the only system that has ever completely eliminated the clicks at this station. In the diagram of the transmitter it will be noted that there is a split resistor across the plate supply for the amplifiers. The negative power supply is connected to the grids of both the 50-watt tube and the screen-grid tube through the bias battery. The ground connection is taken off between the resistors \( R_1 \) and \( R_2 \) through a 1½-henry choke. When the key is up, the grids of the 50-watt tube and the 860 obtain a bias from the plate supply which completely blocks them, but when the key is down, the only bias left is that supplied by the batteries, which are adjusted for proper operation of the tubes. The resistor \( R_2 \) is shorted by the key, connecting the negative plate supply to the filament center tap. With the high grid bias removed, the tubes operate in the normal manner and the set puts out a signal. The condenser across the keying relay and the 1½-henry choke constitute a thump-filter which is ample, since keying in the grid-circuit is less likely to produce clicks than keying in the plate. Keying the fifty-watt stage as well as the power amplifier stage probably also helps in the elimination of clicks. The oscillator and doubler-buffer run continuously, of course. The resistors across the plate supply keep the peak voltage from reaching a high value and protect the filter condensers from line surges.

The transmitting antenna is a Hertz with a single wire-feed line, as described in September...
1929 QST. It is built for 3500-kc. operation, harmonics being used for the other bands.

The receiver is a four-tube screen-grid peaked-audio affair as described in QST for November 1928. For traffic handling and ease of operation it would be hard to beat, although an experimental a.c. screen-grid detector receiver recently built has greater sensitivity. The spark coil in the original set has been replaced by an Aero "Hi-Peak," which greatly increased the volume and selectivity of the set. An accurate frequency calibration signals shows that it holds calibration well.

The signal is checked at every transmission by the monitor, shown in another photograph. By utilizing a Yaxley jack switch, the 'phones are switched to the monitor when transmitting

(Continued on page 74)
Good Practice
The Right and Wrong of Ground Circuits

By Jack Paddon*

Good practice — or good technique if you prefer the term — is that almost instinctive ability to do the small or rather basic parts of one's work in exactly the right manner. No matter how brilliant a new technical conception, how cleverly the mathematics are worked out or how well the apparatus is built — if its development and production are not based on good practice, there will be trouble. Good practice is the frame of mind that prevents one from putting an r.f. choke in the antenna field; good practice is the quality that makes you instinctively see to it that the soldered joint you have made is an honest "flowed" joint and not two wires glued together with a spot of rosin.

Grounds are a matter of the greatest importance in all electrical work; in radio — particularly at ultra-high frequencies — their importance is illimitable; and yet grounds are very generally taken for granted. I propose to set forth here several points of good grounding that, while they may seem stupidly simple, will well repay consideration.

We all know a good ground should be a water pipe, a plate buried in moist soil, etc. Starting from that point we will sniff about a bit more.

1. The lead from the ground should be at least size twelve B&S and be run from the grounding point to a convenient lug or big binding post in the shack — which, as far as the shack is concerned, is now the ground point.

2. Take an individual line from each piece of apparatus that is to be grounded to the central ground point, i.e., one from the receiver, one from the monitor, another from the transmitter, etc. (Fig. 1.)

3. A line grounding a piece of apparatus must never carry current. If, for instance, you want to ground the C-bias battery of your m.o.p.a. run a separate line to your main ground. Don't shoot the ground return of your by-pass condensers along the same line. Fig. 2 will give a general idea.

4. The matter of shielding is a highly compli- (Continued on page 76)

*Societe Material Acoustique, 1 Boul. Hausmann, Paris, France.
I. A. R. U. NEWS

Devoted to the interests and activities of the

INTERNATIONAL AMATEUR RADIO UNION

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Conducted by Clinton B. DeSoto

IT WOULD seem that interest in the amateur world is returning to the 3.5-mc. band, judging from the increased amount of international activity found on this band at present, and that promised for the balance of the winter. In this month's reports alone we learn that amateurs in two countries, Great Britain and Norway, have applied to their governments for the permanent grant of operating privileges in the 3.5-mc. region. It is likely that both these requests will be granted. Australia reassures us that her present grant will probably be extended indefinitely. Several European stations in other countries have notified us that they are in this band exclusively at present. This activity and interest is gratifying. It has been realized for some time that the knee of the solar activity curve has been passed, and that a gradual return to conditions prevailing during the early days of high frequency communication can be expected. That low frequency DX will soon be "looking up" is borne out by recent results in this region. Many East coast United States amateurs are being heard consistently in Europe, and, as has been previously reported in these columns, New Zealand amateurs have been successful in logging many signals from the North American continent.

Granting that conditions for international work on 3.5 mc. have been poor for some years, it is true also that the comparatively slight use of this band outside the United States and Canada has been one of the principal reasons for lack of interest in its international possibilities. The news that other countries are permitting their amateurs to use 3500 kc., and that amateurs are availing themselves of the privilege, is therefore a most encouraging sign.

Aside from its international possibilities, too, "eighty meters" should quickly prove its value for national communication. For years this band has been the principal traffic and relay channel in the United States. Now, Australians, troubled with the difficulty of establishing local contact, have also taken up its use, and with great success. European tests, which are reported in this issue in some detail, indicate the extreme utility of these waves in their own Continental scheme of things.

So it becomes apparent that this renewed international interest in 3.5 mc. is an excellent thing. Naturally, we are all muchly interested in the results we hope will be attained. It will be of value to all of us, then, if amateurs everywhere will report on international work done in this band. United States amateurs can help by advising us of their foreign contacts, while those hearing or working signals from this country are urged to report them to Union headquarters.

THE FOURTH INTERNATIONAL RELAY COMPETITION

March 8 to 21, 1931 (inclusive)

Every amateur should get into this contest and endeavor to win the certificate for his country. Complete details will appear in QST for March, 1931. It will follow the lines of the previous International Relay Competitions. Amateurs whose delivery of QST is delayed are referred to this department of the January, 1930, issue for the rules of the contest.

Considering the number of requests that have come in recently for QSL Bureau addresses, it seems about time that we run a corrected and re-
vised list of these forwarding agencies once again. Cards for the following countries may be addressed as indicated and, if possible, will be delivered to their proper destinations.


Austria: D.A.S.D., Blumenthalstrasse 19, Berlin W. 57, Germany.

Belgium: Reseau Belege, 11 Rue du Congres, Brussels.

Bermuda and Bahama Islands: Ian C. Morgan, "Southlands," Warwick East, Bermuda Islands, B. W. I.

Brazil: Vasco Abreu, 89 Rue Riachuelo c/IV, Rio de Janeiro.

Chile: Luis M. Desmaris, Casilla 50D, Santiago de Chile, S. A.

China: (Under cover.) Send Chinese cards to A.R.R.L.

Cuba: (Under cover.) Send Cuban cards to A.R.R.L.

Czechoslovakia: Send cards either to S.K.E.C., Smichov "Sumava," 1429, Prague; or to, K.V.A.C., Hlavni Posta, Box 531, Prague.

Denmark: Experimenting Danish Radioamateurs, 5 Holmens Kanal, Copenhagen K.


India: R. N. Fox, 6 Pachpedi, Jubbulpore.

Iran: C. W. Liversedge, Wireless Station, Royal Air Force, Sulaimania.

AN INVISIBLE HAND STRETCHED OVER TEN THOUSAND MILES OF LAND and sea to take this photograph, marking the opening of the Seventh Annual Convention of the Wireless Institute of Australia. In the December issue of QST was shown one end of the circuit with President Maxim keying the signal which controlled the taking, at the other end in Melbourne, of the picture above.

Ireland: W.S.I., 12 Trinity St., Dublin. (Cards for Northern Ireland go to R.S.G.B., England.)

Italy: A.R.I.; Viale Bianca Maria 24, Milan.

Japan: (Under cover.) K. Kasahara, 11 Kitana-tugi, Nisinomiya.


Kenya Colony: Times of East Africa, Box No. 194, Nairobi.

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Malay States and Asia generally: J. P. C. Bell, F. M. S. Railways, Kuala Lumpur, Xelamgor, Federated Malay States.

Netherlands: N.V.I.R., Post Box 400, Rotterdam.

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South Africa: S.A.R.R.L., P.O. Box 7028, Johannesburg.

Spain: Asociacion EAR, Mejia Lequerica 4, Madrid.


Uruguay: Resident, Casilla de Correo 37, Montevideo.


(Continued on page 84)
Another Contest?

Goldfield, Iowa

Editor, QST:

Why all the adverse criticism about long CQ's? This is a free country, is it not? Those boys have licenses to transmit, don't they? And with the exception of a few things mentioned in the Radio Act, there are no restrictions on what a fellow shall transmit!

Really there is something heroic, when one thinks of it, about the way one of these men will stride up to his table, clap on the calls with a determined expression, grasp the key, shut his eyes, concentrate his mind on the one tremendous thought, and send it crashing out over the ether to the limits of space. There is magic in those wonderful letters, CQ! Expressed in dots and dashes, there is a swing and rhythm to them which fascinates, hypnotizes their devotees, causing them to go to limits of endurance unheard of in other lines of endeavor.

Now watch him. Having made a record that he thinks will stand, he finally stops, relaxes a few seconds, lights a fag to quiet his nerves from the exertion, and then begins searching the dial to see if any others of his kind are doing better than he did. If he finds such a one, does he quit? Not so! He merely tapes up his aching wrist, settles himself firmly and starts again with renewed vigor.

Show him a little friendly consideration, fellows. Remember his interests in radio are not the same as yours. If you call him, he may stop and work you out of gentlemanly consideration for your hobby, however inferior to his own he may consider it. But he loses valuable time thereby. Remember, he doesn't want to work you. If he did, he would have stopped and listened for you a long time ago. So if you cannot join in friendly contest with him, don't interfere with his pastime; let him alone!

The A.R.R.L. is supposed to represent and encourage all amateur radio interests. We have had contests, with prizes, for traffic handling, for foreign contacts, for miles-per-watt, etc. Why not a contest and prize for marathon CQing? As an appropriate trophy I would suggest a 204-A tube, latest model, with two-piece filament, mounted on a gilded concrete base, and hand-decorated with the letters CQ near the top, then a picture of a hound pup with mouth open and nose pointing to the moon, and around the base an inscription.

What shall we say in the inscription? "Champion Nuisance of the Universe?" No; that title belongs exclusively to off-band 'phones! But surely someone can offer an appropriate suggestion.

— R. P. Griffith, W9EJQ

A Possible Explanation

203 Aldeah Ave., Columbia, Mo.

Editor, QST:

It has been demonstrated and conclusively proved that there is a gravitational effect exercised by mass upon the directional distribution of light. The effect is proportional to the mass of the body and to the distance of the source of light from that body.

In other words, when light passes close to the sun, for example, its path will be deflected by the gravitational effect of the sun upon that light. Einstein proved it when a total solar eclipse occurred, and gave us the Special Theory of Relativity. We cannot observe this effect upon the earth, due to such a relatively low amount of deflection, but with the sun it was easily observed and measured. Thus, the phenomenon which involves gravitation and inertia is relative to that which involves electricity and magnetism, for light, according to Maxwell, is due to a changing magnetic field.

Let us now take a disturbance caused by a strong radio transmitter. The signal travels with the same speed as light, i.e., about 186,000 miles a second. The wave of this signal is like that of a ray of light, save that it is of lower frequency. By analogy, as in the case of light, the signal will not travel in a straight path, but will be deflected due to the gravitational influence of the earth. The deflection should be about the same as for light.

The thing, you might say, sounds very nice on paper. The proof of the matter is different. I don't attempt to prove it. Leave that for mathematicians and scientists. But it occurs to me that if radio waves were not deflected by some force, they would leave the earth at a point tangent to its surface and to the source of emission, and then become lost in space. Of course, the signal must be strong enough to pass the point of tangency.

Considering skip effect next, we assume that it is due to the presence of a so-called Heaviside Layer that reflects the sky wave back to the earth. It is the same process of reasoning that the ancient Greek philosophers used when they attempted to explain the Universe. "A system of
SPRAGUE ELECTROLYTIC CONDENSERS were the dominant choice of radio engineers in 1930. They were specified for more radio sets, used by most manufacturers. The great improvement represented by the new Sprague Inverted Type Electrolysics is sure to be reflected in an increasing use in 1931.

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they will cost.

The ‘Phone Problem

632 W. 20th Ave., Spokane, Wash.

Editor, QST:

I certainly agree with the views of Mr. C. S.
Hoffman, Jr., WSHD., as published in the August,
1930, issue.

My idea of the disposal of the poor ‘phones is
this — place all ‘phone men on the 1750-kc.
band only; this will eliminate those utilizing
inadequate and obsolete equipment because of
serious interference with B. C. service and con­
sequent suspension of that station’s ‘phone privi­
lege. Those left at the end of six months of work
on 1750 kc. could submit a diagram of the exist­ing
station with the request that they be permitted
the use of the higher-frequency ‘phone bands;
the diagram, of course, would be accompanied by
an affidavit as to its correctness.

This system would certainly satisfy c.w. men
by the lessening of off-frequency ‘phone in the
code section of the band. It would also reduce
QRM and allow the good ‘phone stations a chance
to work. Goodness knows it is bad enough to be
put into a 50-kc. band and then have several
dozen loop-modulated “peanut” stations on top
of the station you are receiving. Loop modulation
is OK but for one thing — usually no one knows
what’s being said except the ham at the mike.

My experience to date is three years as a ham
— the last year and a half being m.o.p.a. ‘phone
work — several months as a broadcast op, and a
little theatre sound work. I will be glad to receive
letters pro and con on the subject from hams or
fight it out on the air in the rotten ‘phones will
shut down for a few minutes.

— R. B. Sutton, W7QTV-W7GZ-W7HF

How About It?

Box 264, Rushville, Ind.

Editor, QST:

In all the years I have been reading QST this
is the first time I have sent in a suggestion. Since
this is my first request, see what you can do.
You Don't Work the Stations
You Can't Hear

HEAR 'EM ON THIS
SENSATIONAL RECEIVER

The most practical Amateur band Receiver yet developed — designed for Amateur work by the oldest reliable manufacturer of Short wave equipment. Just see these outstanding features:

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6. Readily calibrated for each band.
7. Easily assembled and wired.

A complete kit comprising all necessary parts to build this record breaking Receiver — includes drilled and engraved panel, metal cabinet and three special Amateur band plug-in coils allowing each band to be spread over the entire tuning dial. Price $30.00

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Why not give us technical information? We can all figure out how long a Zepp should be or how many turns to put on those inductances. Any of us that have pounded a key get tired of simple explanations. We want to know how things happen.

For instance, get some engineer to tell us how vacuum tubes are figured out. We all know that if we load them up enough they will oscillate—but what are they made of? How do they know how far apart to put the grid, filament, and plate? Just think of the good space that is taken up with letters of pain regarding CQ’s and QSL cards that could be used giving us fellows the dope we want.

There are a million things that fellows build up and make work. Anyone can build them, but how many hams can tell how they perk?

Let’s see how the gang feels. Give us a trial and see if you don’t get thanks from a majority of the old-timers.

— M. A. Russell, W9EEY

I.A.R.U. News
(Continued from page 64)

Send cards for countries not listed in the foregoing to the A.R.R.L., West Hartford, Connecticut, U.S.A. Every effort will be made to forward them properly. Corrections to this list, and additional names, will be welcomed.

H. B. Cowan, W3CBT, reports that YU1LM comes through between 6:00 and 7:30 p.m. E.S.T. (1123-1200 G.C.T.) This is on 7 mc. Stations from this section are heard on 14 mc. from 4:30 p.m. to 6:00 p.m. Here’s a chance for that Asian contact to complete your WAC, eastern W’s!

Personal nomination for world’s most optimistic amateur: One who appeals to his State Department claiming that the A. T. & T. transatlantic telephone interferes with his transmissions.

AUSTRALIAN REPORT

By W. G. Sones, Fed. Publicity Director, W.I.A.

The seventh Annual Convention of the W.I.A. mentioned in last month’s report proved to be the most successful yet held. Delegates who were present, some of whom will be familiar to overseas amateurs, were H. K. Love, VK3BM, Federal President; S. W. Gadsden, VK3SW, Fed. Vice-President; Bruce Hardie, VK3XY, our extremely popular Federal Secretary, and voting delegate for Victoria; R. Chiltern, VK2RC, delegate for New South Wales; L. J. Feenaughty, VK4LJ, for Queensland; I. Thomas, VK5IT, for South Australia; Maxwell Howden, VK3BQ, proxy for West Australia; and J. Heine, VK7JR, for Tasmania.

Convention opened on the 20th October, and by working 12 hours at a stretch, business was concluded by the 24th. Social activities were sandwiched in between sessions, and it is reported

(Continued on page 80)
Here’s the Oscillator You Have Been Waiting For!

The JEWELL Portable Test Oscillator

A necessary instrument for testing radio receivers

Radio frequency circuits, whether in a tuned radio frequency or super-heterodyne receiver, must be accurately adjusted to obtain the greatest sensitivity and selectivity. To make these adjustments accurately and quickly, a test oscillator of special design is required. No makeshift, cheaply built oscillator can be used for checking modern high gain receivers.

The Jewell Pattern 560 Portable Test Oscillator is designed and built to meet the needs of radio servicemen. Simplicity of operation, hair-line accuracy, and assured reliability are the cardinal features of this portable test oscillator. Each feature has been achieved by incorporating constructional details which actual service tests have proved absolutely necessary.

Some Important Features of the Jewell Test Oscillator

SELF-CONTAINED BATTERIES
The Jewell Test Oscillator is convenient to use because it operates from self-contained batteries. Services both A.C. and D.C. sets. Accurate adjustments cannot be made with A.C. operated oscillators that feed energy back to the receiver through light lines.

LEAK-PROOF INTERLOCK SHIELDING
Every part of the Jewell Test Oscillator is enclosed by a combination aluminum and copper interlocking shield. An oscillator with less shielding is worthless.

BROADCAST AND INTERMEDIATE BANDS
The Jewell Pattern 560 Portable Test Oscillator covers the broadcast band from 550 to 1500 K.C. and the intermediate frequency band from 125 to 185 K.C. Jewell Test Oscillator is adequate for testing every super-heterodyne receiver built today, and provides for future design in that it covers the entire band from 125 to 185 K.C.

NEW ‘30 TYPE TUBES
Two tubes are used; one a radio frequency oscillator and a second to generate audio frequency notes. Shielded tube compartments are of ample size for the ’30 type tubes with present small glass envelope or with the new larger standard size envelope.

OUTPUT METER
The Jewell Test Oscillator may be had with or without Jewell Pattern 559 Portable Output Meter. The meter is carried in a pocket provided in the oscillator case. In use, it is placed near the output circuit of the receiver eliminating long leads and preventing any possible coupling to the oscillator.

EASY TO OPERATE
You do not have to study the instruction book to use the Jewell Test Oscillator. A wiring diagram and set of calibration charts are carried in the oscillator cover where they can never be mislaid.

Built to the same high standards as the Jewell Tube Checkers and Jewell Set Analyzers

JEWELL

Send for descriptive bulletin

Jewell Electrical Instrument Co.,
1642-C Walnut Street, Chicago, Ill.

Please send bulletin completely describing the Jewell Pattern 560 Test Oscillator.

Name.......................................................

Address.......................................................

Say You Saw It in QST — It Identifies You and Helps QST 65
ARE YOU BINDER-CONSCIOUS?

Thousands of League Members Are

because they know the value of keeping their past issues of QST where they can get at them with the least amount of effort.

Handy — and handsome.

Keep them as a unit in a

QST Binder

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

$1.50 each postpaid

QST

West Hartford Connecticut

that most of the delegates obtained very little sleep during the week they were in Melbourne. The Convention was formally closed with a complimentary dinner (a true “Ham-fest” as our American friends would have it) tendered by the quest division, Victoria, as an opportunity for meeting a number of the Victorian members and representative radio leaders including the Radio Inspectors, Navy, Army, Air Force, Broadcast services, and Commercial organizations.

The items included on the agenda paper were outlined with explanatory notes in last month’s report and the main resolutions, which are likely to be of interest to foreign amateurs, are as follows:

TECHNICAL DEVELOPMENT. — A Federal Technical Development Section (Experimental Section) was created with its Headquarters in South Australia. Each Division has been instructed to form a Divisional Technical Development Section to work under the direction of the Federal Section Headquarters.

STANDARD FREQUENCIES. — This was the subject of a number of related resolutions, the substance of which was that the substandard held by the Victorian Division calibrated from a Multi-Vibrator now in the possession of the P.M.G.’s Department, Research Laboratory at Melbourne, should be the standard for calibration by all Australian amateurs. The Federal T.D.S. has been instructed to prepare specifications for Divisional Standards to consist of a balanced oscillator with crystal resonators. Sufficient of these will be constructed by each Division to mark the important frequencies in each band, and will then be calibrated and checked at necessary intervals by the T.D.S. from the Federal Sub-Standard.

Marker stations are appointed particularly for 3.5 mc. and 4 mc.; 7 mc. and 7.3 mc.; 14 mc. and 14.4 mc. All other crystal-controlled stations are to be notified of their true frequencies, and requested to sign off with it at all times.

VIGILANCE COMMITTEES. — It was recommended that Divisions appoint Vigilance Committees to report direct to offending stations causing unnecessary QRM, off-wave working, etc., and to suggest possible causes of the trouble and methods of eliminating it.

EX-TERRITORIAL MEMBERSHIP. — Provision has been made for admitting to membership, persons resident outside of Australia. Such members will be accepted by Federal Headquarters on the recommendation of individual Divisions.

FEDERAL HEADQUARTERS LOCATION is again in Victoria for the 3rd year in succession, and we feel that extraordinary confidence has been reést in this Division in so honoring us again.

COMMERCIAL OPERATION IN AMATEUR BANDS. — It was resolved to communicate with the I.A.R.U. periodically in connection with this subject and to cooperate in its elimination as much as possible.

TRAFFIC MANAGERS. — R. Cunningham, VK-3ML, was appointed to Federal Headquarters as Federal Traffic Manager with instructions to
Every Transmitting Amateur Uses These Forms

Everything that you've wanted in a log is in the Official A. R. R. L. Log Book

New page design to take care of every operating need and fulfill the requirements of the new regulations!

New book form! No more fussing with binders, or trying to weight down loose sheets when the breezes blow!

New handy operating hints and log-keeping suggestions, put where they are always convenient!

Everything that you've wanted in a log is in the Official A. R. R. L. Log Book

New page design to take care of every operating need and fulfill the requirements of the new regulations!

New book form! No more fussing with binders, or trying to weight down loose sheets when the breezes blow!

New handy operating hints and log-keeping suggestions, put where they are always convenient!

Here are 39 pages like the one above, 8¼" x 10¾", carefully designed to incorporate space for all the essential information you want and need to record about your station's operation. Thirty-nine blank pages (backs of the log pages) to be used for notes, experiments, changes of equipment, etc. Durable covers of heavy stock with space for your station call and dates over which the log entries extend. On the inside covers and first two pages are complete instructions on maintaining your log, convenient tabulations of the most-used Q signals, miscellaneous abbreviations, operating hints, amateur prefixes and signal-strength scales. The information you want, always at your finger-tips.

The new regulations require a log; a well-kept one identifies your station; a uniform series constitutes a progressive and permanent record.

We honestly believe the new Official A.R.R.L. Log Book is the best you've ever seen!

40 cents each
Three for $1.00
Postpaid anywhere
RCA INSTITUTES trains men in RADIO

MEN who need radio training... who wish to know all about radio servicing, radio telephony and telegraphy and broadcasting, can quickly obtain this valuable knowledge through RCA Institutes and its famous Home Laboratory Training Course.

Radio Instruction by America's Oldest and Foremost Radio Training School

You can study at home in your spare time or at any of the RCA Institutes resident schools throughout the country. Thorough and reliable training given you. As a student you also receive the complete RCA Institutes Laboratory Equipment... enabling you to easily solve radio problems at home in your spare time. This is the recognized way to speedily acquire the commercial knowledge and ability demanded in Radio today.

Free Book for Ambitious Men

Send for this free book... many pages of pictures and text giving full details about the Home Laboratory Training Course... the RCA Institutes Laboratory Equipment... RCA Institutes and the noted staff of instructors... that have helped thousands of men to make good in Radio.

RCA INSTITUTES, Inc.

RCA INSTITUTES, Inc.,
Dept. T.S.-2
76 Varick St., New York, N.Y.

Gentlemen: Please send me your big FREE book which tells about the many opportunities in Radio and about your famous laboratory method of radio instruction at home.

Name _____________________________________________ 
Address _______________________________________________ 
Occupation _____________________________________________ 

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

organize a Federal Traffic channel in conjunction with Divisional Traffic Managers. Radiograms to VK, intended for Federal Headquarters, should now be relayed to VK3ML. Complete details of the traffic, schedules, etc., will be reported as soon as they are available. The Federal Traffic Manager will also have charge of, and arrange for, International Traffic Handling tests so that information of this nature from foreign sections will be greatly facilitated if addressed direct to him. The address, incidentally, of the Federal Headquarters of the W.I.A. is Kelvin Hall, 55 Collins Place, Melbourne C.1., Victoria, Australia.

TELEPHONY ON 7 MC. — It was decided to investigate the possibility of restricting the use of telephony on this band except through M.O.-P.A. and C.C. transmitters. Australian amateurs enjoy a number of privileges in connection with telephone transmission and the object of this resolution is, of course, to restrict the use of the band as an amateur broadcasting band because of its value for DX work. It is not intended to restrict speech telephony other than by means of self-excited and other types of interference causing transmitters.

AIR FORCE RESERVE. — This will be completely reorganized to provide for its control by the Institute and received rather a lengthy discussion in conference with a representative of the Air Force Authorities. Details of the new scheme will be referred to later.

The Convention waited upon the Chief Inspector of Radio regarding several matters, with very gratifying results. The Chief is to recommend to the P.M.G. that the Federal Executive of the Wireless Institute be officially recognized as the controlling authority for amateur radio throughout Australia.

It is also reported that so far as could be seen at present, the 3.5-mc. band is available to us indefinitely.

BRITISH NOTES

By J. Clarricoats, Hon. Sec'y R.S.G.B.

On behalf of all members of the R.S.G.B. and the B.E.R.U. I send best wishes for the New Year.

Preparations have now been made for Empire Radio Week, which is to be held during the inclusive period February 22nd to 28th, 1931. During this week all British Empire stations will concentrate on working stations in other B. E. zones. To the station recording the most points a special award known as the "B.E.R.U. Challenge Trophy" will be presented. This will be competed for annually, and will be donated by the Home members of the R.S.G.B.

The Annual General Meeting of the R.S.G.B. and the B.E.R.U. was held on December 19th, when Mr. H. Bevan Swift, G2TI, succeeded Mr. Gerald Marcuse, G2NM, as President, and Mr. Arthur Watts, the well known Publicity Manager of the B.E.R.U. was elected Acting Vice-President. Mr. E. Dawson Ostermeyer and Mr. John Clar-
TECHNICALLY SPEAKING

"THESE FEATURES MAKE THE RECORDOVOX SUPERIOR!"

ELECTRICALLY and mechanically, the PACENT RECORDOVOX is as fine an instrument as you could find even in the professional recording laboratories.

Every possible angle has been taken into consideration in the design of the RECORDOVOX. Supplied with 3 adjustable weights, it can be used with motors that lack sufficient torque to operate the turntable when the head is fully weighted. Like the well-known PHONOVOX, the RECORDOVOX, as the result of careful design, possesses excellent frequency characteristics.

Designed for pre-grooved type of records only.
List Price $25.00. Microphone $10.00 list extra.

Write for information on special types and models to meet your specifications

Manufacturers

PACENT ELECTRIC CO., INC., 91 SEVENTH AVENUE, NEW YORK
Pioneers in Radio and Electric Reproduction for Over 20 Years
Licensee for Canada: White Radio, Ltd., Hamilton, Ontario
POPULARITY won on performance!

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TRIAD

T-210 TUBE

CONSTANT IMPROVEMENTS
IN TRIAD T-210 have resulted in a tube as nearly perfect as science can make it. No wonder it has become tremendously popular! Functions equally as well as a power amplifier or oscillator. Special construction eliminates grid and plate emission which is the chief cause of noisy tubes.

Yet this is but one instance of the new and sensational improvements carried out through the entire Triad line. It will repay you to insist upon Triads — the tubes of guaranteed service!

Send now for Triad bulletin T-210 and for information regarding the remarkable improvements that have been carried out throughout the entire Triad line. A special price is extended to Licensed Amateurs and Members of A.R.R.L.

TRIAD Tubes are fully licensed under all R.C.A. General Electric and Westinghouse Electric Mfg. Co. Patents

Triad Manufacturing Co.
Pawtucket, Rhode Island

 Nicolas continued in office as Honorary Treasurer and Honorary Secretary respectively.

During November certain British stations were given special permission to operate during the evening hours on the 3.5-mc. band, and as a result much interesting work was carried out. It is hoped that a portion of this band will soon be opened permanently to G stations.

Considerable enthusiasm is being shown for the 28-mc. tests which commenced on January 4th. All reports of signals heard should be sent to G5VI, H. J. Powditch, Porth House, Porth, St. Colomb Minor, Cornwall, our Contact Bureau Manager.

Other tests for amateurs who are interested in 56-mc. and 1.75-mc. work are being arranged by Contact Bureau, full details of which will be found in the "T & R Bulletin" which is issued free to all R.S.G.B. and B.E.R.U. members.

Membership of the Society is open to all amateurs in every country — the Headquarters are at 53 Victoria Street, London, S.W.1.

NORWEGIAN NOTES

By G. H. Petersen, Pres. N.R.R.L.

Our 3750-kc. test during the first days of November proved a complete success, signals being received all over southern Norway at all times of day and night. As a consequence, we have applied for the unrestricted use of part of the 3.5-mc. band from our Government. As will be remembered, we got only a temporary permit, lasting till the end of November.

Many of our stations also report European contacts on this band, and we certainly look forward to less congestion on 7 mc. if this band is opened for general amateur work.

The winners of the 80-meter tests were LAI W, as best transmitter, and LAI J, as best receiver.

We are also active in increasing our membership, and might point out in this connection that we gladly receive a representative from each foreign Society as a corresponding member, without any fee, in order that we may improve upon the exchange of regular notes and cooperation between societies in general.

SWEDISH NOTES

By Goran Kruse, Vice-Pres. S.S.A.

Since our last report we have had the pleasure of becoming a member of the I.A.R.U. and have received congratulations from several societies upon the occasion. We are grateful for these kindnesses, and hope to establish a still better cooperation with all in the future.

The Fifth General Convention of the S.S.A. was held on September 27th, and was a great success. The following officers were elected:

President: Dr. Bruno Rolf
Vice-President: Goran Kruse, SM5TN
Secretary: Osborn Duner, SM5ST
Tech. Sec'y: Mats Holmgren, SM7TO
Treasurer: H. Hanell, SM5XH

The QRA remains as before, S.S.A., Stockholm 8 for correspondence, and Dr. Bruno Rolf, Alsten, Stockholm, for QSL cards.
BARGAINS

Aviation Helmets, Western Electric, adopted for phones. Genuine leather. List $44.00. Our price...

Microphone Cable, 3 wire shielded, Western Electric heavy duty. Per foot....12c

Propeller, wood, 15" long, 5" wide, 2" pitch. 1/16" bore. $1.00

Condenser, Dubilier, mica, 1 volt. Small, very sensitive. List $2.00. Our size:

Condenser, Dubilier, mica, volts 37.5, pitch 8/32", wide 1/2", bore 3/32".

Telephone, desk style, type Bell, complete with ringer box (A.C. Ringer)...

Headphones, West Elect., No. 1944 same as C.W. 834, 2000 ohms, D.C. slightly used. $5.00

Condenser, Dubilier, mica, volts 40,000 to 50,000, .001-.0008 or .0005...$25.00

Switchboard, 8 line portable Western Electric, magnetic ringing, dry cell calling circuits, 8 drops, anti-capacity 12 to 16 terminal key switches, regular price $75.00, special $30.00

Western Electric Dynamo- motor System No. C.W. 927. C.W. 927...375 volt dynamotor in shock proof housing. May be used in parallel to give 100 volts at 350 volts, or in series, giving 90 volts at 700 volts. Can be used to operate transmitters up to 50 watts from mains. Ideal for Delco systems. Two dynamotors in hanger $15.00

Single dynamotor without hanger (illustrated)....30.00

Western Electric Dynamo- motor System C.W. 928. Control board for Dynamo-motor System C.W. 927. C.W. 927. Consists of starting switches, variable from 0-50-500 volt voltmeter with switches for testing main lines and output. Also contains complete filler system. Very special...

Here's a real buy! U.S. Army Signal Corps, 44 solid coin silver contacts, flameproof...

Federal Carb., "Mike" Utah type, carbon granular resistor. Special...

Western Electric Radiophone Transmitter unit, 380, Special...

Dynamo- motor GE Army Navy Type...1150 volt dynamotor with aluminum frame, unusually good for airplane work, especially used by General Motors. $27.50

Ferris Armature...

Dynamo- motor, 32-22 volt, 10 amp. 4000 cycles, will deliver 600 volts...

U.S. Navy head phones, excellent forgratis. Switch, moderate...$15.00

Navy Armature...

Coil, repetition, West Elec., No. 57C, 33 ohm, with...$12.50

Relay, coil, West Elec., No. 63 A, 1000 ohm 12 amp. 4000 cycles...

Relay, coil, West Elec., No. 74 A, 1200 ohm 12 amp. 4000 cycles...

Telephone and buzzer portable sets, mahogany case, 2 tone 4 contact platinum contact high frequency buzzer, 4 telephone toggle switches, potentiometer, sending key, 3 ind. contacts, transformer, and 3 choke coils, receiver, $30 for...

Generator, D.C., 12 volt, 33 amp., 5000 R.P.M., with d.c. regulator...

Sounder, Signal Corps, 120 ohm, adjustable...

Spark transmitter, complete, entire type, rot. type, rot. transmitter, mica condenser, 300 volt 6000 cycles, will excite a 36 volt generator...

Generators, Westinghouse 110 volt, A.C. 900 cycles, 200 volt, will excite a...

Generator 1/4 kw. 300 cycle, 300 volt, self-excited, can be hand driven...

Voltmeter, 6000 scale, new Western model 45, 3 scale 0-15-150 guaranteed 3/4 of 1% accurate...

Amplifier, 20,000 watt, new Western model 45, 3 scale 0-15-150 with 3 scale external shunt and loads of 1% accurate...

Headphone, Radio School, headband, 75 ohm...

Keys, transmitting, Navy, back connected on telephone line...

Charging panel, Navy type, 3'X 8', 90 cells, Ward Leonard bar and arm set, Westinghouse voltmeter and ammeter, Sanguino ammeter hour meter, $30.00...

Receivers, Navy C.N., 200-1000-10,000 meters...

Receivers, Navy C.N., 100-1000-10,000 meters...

Relay West Elec., low voltage, 2 upper and 3 lower contacts, every switch...

Extra platinum contact screw or arms...

SELECTION (Call Box)

Postal Telegraph type has variety of uses...

Ampere hour meter, Sanguino, same charging and discharging, 1 incandescent light, 0-5000 scale, capacity 15 amp. $10.00

Skinny, Edison Storage Battery Cells...

Type A-4, 1.2 volt, Type M-8, 1.2 volt, Type M-6, 1.2 volt, 275 amp., nickel...$4.00

Type A-6, 1.2 volt, 1100 amp., nickel...$4.00

Largest Radio and Electric Supply House in U.S. specializing on Army and Navy Surplus. Write us your particular requirements. Sufficient quantities in deposit of 25% required on G.O.D. orders. NO G.O.D. ON CANADIAN ORDERS. DUE TO LIMITED GOVERNMENT SURPLUS WE DO NOT ISSUE CATALOGS.

EDISON Universal motor 1/36 h.p. with governor and regulator, has one thousand uses. 110 V. Price, each...

Condenser, West Elec., 1 mf. 1600 volt A.C. test...

Motors back geared 110 A.C. variable speed, suitable for (Society oil burner type) has one thousand uses, a very good buy...

Motor generator, R & M, 110 D.C. 3/4 h.p., 2 kw. 20 volt D.C., 50 cycle. Cores for large catalog supply...

Motor Cryostat, Holzer-Cabot, 1/4 kw., 250 volt D.C., 5000 cycles...

Also complete line up to 5 K.W. in stock.

SPECIAL—U.S. Army instruction book on telephony or telegraphy. Hundreds of pictures and diagrams...

Radio Frequency "Driver," 6000 to 10,000 meters Navy Type SF103A, highly sensitive. Cost $40.00. Our price...

Ammeter, R.P., 0-10 amp. zero adjust, 4 in. diameter. A real buy at...

Magneto auto-anti microphonie, good for home recording...

Hour Circuits, Century H. P. Buzzer...

ARMY AND NAVY RADIO SURPLUS

MANHATTAN ELECTRIC BARGAIN HOUSE, Dept. Q, 105-7 Fulton St., New York City

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

71
WESTON model 563 checks resistances and continuity of circuits

TRANSMITTING amateurs, set builders, service men and radio engineers will find this new Weston double range Ohmmeter, Model 563, a handy, compact, practical instrument for experimental and repair work. It is well designed, sturdy, thoroughly dependable, yet attractively priced.

Model 563 is most useful in checking resistances, choke coils, secondaries of power transformers and continuity of circuits. The two ranges of the instrument, 0-50,000 and 0-5,000 ohms permit an unusually wide scope of measurement; thus, this one instrument serves for practically all resistance testing.

Because Model 563 is a high sensitivity instrument, the drain on the self-contained 1.5 volt dry cell is very slight—only 1 milliampere on the high range and 10 milliampere on the low range. Therefore, on the high range, the life of the cell is practically its "shelf" life, assuring long service before replacement. Any changes in its potential may be compensated for by the voltage adjuster on the top of the instrument.

Model 563 is supplied with 30 inch test cables.

For details, write for Circular LL

WESTON model 563 checks resistances and continuity of circuits

Probably on account of the variable conditions existing, activity among Swedish amateurs has been at a low ebb during the period since our last report, but seems to be increasing now with the coming of autumn weather and less "QRL," etc. HI. SM7TO has been keeping a fine sled with ON4RO from a temporary station at the Technical University (SM5UX) at Stockholm. A visiting Belgian scientist, formerly amateur B9, was kept in daily contact with the University of Brussels whereby lots of important and money-saving traffic was exchanged, a traffic which could not possibly have been arranged over ordinary telegraph lines.

Tests with short wave gear on aeroplanes have been carried out by SM5SV with fairly good results. They will be continued.

Many SM's are regularly taking part in the wave propagation investigations being undertaken by the French Meteorological Institution (ONM) in cooperation with the U.R.S.I. This work was still further stimulated by the conference of the U.S.R.I. at Stockholm this summer, when several of our hams had an opportunity to attend the meetings of the conference, and also to personally meet the president, Professor Kennelly, who proved to be a real friend of the amateurs. It is our opinion that amateurs have much to gain through close cooperation with the U.R.S.I. in their various tests, especially in Europe where the amateur has not so many occasions to prove his usefulness as in America. Then certainly the representatives of the U.R.S.I. at the Madrid conference will assist us amateurs in our struggle to retain privileges to which we are rightfully entitled, against the encroachment of commercial interests.

GERMAN NOTES

By Dr. Curt Lamm,
Foreign Office,
D.A.S.D.

During the period covered by this report some investigations were made by the District Manager of the Berlin area concerning the relative audibilities of four different stations on 7 mc. as far as the propagation of the surface wave goes all over the Berlin area. Detailed results will be dealt with at a later date. The following stations took part in the tests: DAADC, DAADF, QAEEZ, and DAAPA. Reports were received from well over fifty receiving stations.

Conditions on 14 mc. were very bad indeed, only South African stations being heard. At the beginning of November, W's were heard very well, but lately we experienced a bad spell of "mudness" on that band. On 7 mc. VK and ZL stations are to be heard during the early mornings, but no Americans seem to be received. On 3.5 mc. an increasing activity is to be reported, somewhat like in the good old days. D4UBA has made some very interesting investigations on that waveband. The summary was published in last month's "CQ."

Our foremost DX station at present is D4WAO without any doubt, who is making many contacts with all parts of the world.

On January 1, 1931, the new inter-European
BIG FEBRUARY SAVINGS

Acme 500-watt transformer, 1500-2000 volts each side of centre $21.00
Acme transformer to change 220 A.C. to 110 A.C. — 250 watt $10.00
Acme transformer to change 220 A.C. to 110 A.C. — 500 watt $15.00
Acme variable ratio audio transformer ................................ $1.65
Acme 30 K.C. transformer, makes a good mike transformer. $6.9
General Radio audio transformer, 3 to 1 — 6 to 1. $1.85
General Radio transformer, 600-0-600 volts; 2-7½-volt filament $3.50
Thoradson "B" Eliminator transformer, 285-0-285 .................. $1.65
Thoradson 100-watt power transformer, 400 volts each side of centre, 5 volts filament $3.50
Radio Foundation, 234-volt, 10-amp. transformer for 866 tubes $2.45
Sangamo A.X. audio transformer; list $6.00. Our price ........ $2.45
Sangamo Push-Pull transformer for dynamic speaker; list $13.00. Pair. $4.45
Emcotran Push-Pull transformer; list $10.00. Extra special pair $2.95
Special 560 filament transformer, 2½-volts, 10 amps, 10,000-volt insulation $5.45
Cardwell .0005 variable condenser ................................. $3.00
Cardwell No. 201E condenser; adjustable slot for short wave $2.40
Cardwell .00045 transmitting condenser; list $10.00. Special $7.00
National new type short-wave tuning condenser; 500 mfd. $2.25
National new type short-wave tuning condenser, 100 mfd. $2.25
National new type short-wave tuning condenser, 500 mfd. $3.50
National 001 variable condenser ......................... $3.95
Aerovox 8 mfd. dry electrolytic condenser self healing 400-volt, D.C. $1.45
Aerovox 5000-volt test, .002 condenser .................. $1.45

Write for our circulars on our products. Quotations on special transmitters, etc., supplied upon application

LEEDS Short Wave Receiver

The successful operation of any Short Wave Receiver depends almost entirely upon its handling (smooth regeneration control, etc.). The LEEDS Short Wave Receiver has flawless regeneration control from 20 to 80 meters with only 22½ volts on the detector tube.

No finer tube is present, and absolutely no hand clamping is found to disturb tuning.

Many of these receivers have been sold to people who have tried more elaborate sets, only to discover that a simpler well balanced receiver would be more efficient and satisfactory for their work.

Three 301-A tubes are used, one as the detector, and two audio stages.

The Universal type has a continuous rating from 15 to 100 meters, using three plug-in coils.

The Amateur type incorporates a Cardwell 201-B adjustable type condenser for tuning which can be adjusted to give any spread of the bands desired. The set is supplied with 20, 40 and 80 meter coils to cover the Amateur Bands.

Universal or Amateur type Receiver completely constructed and tested, price $37.50

New Cardwell transmitting and receiving condensers. ½ the size, ½ the weight. Rounded edges on the stator and rotor plates. A real job to use where limited space makes a more compact receiver essential. Write for full particulars and price.

Say You Saw It in QST — It Identifies You and Helps QST
**SIEMENS & HALSKE**
High Voltage Condensers

Exceptionally well built — Compact
Very Conservatively Rated
Safe to Use
(Standard with Telefunken)

<table>
<thead>
<tr>
<th>DC Working Voltage</th>
<th>Mfd</th>
<th>Size</th>
<th>List Price</th>
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<tbody>
<tr>
<td>1000</td>
<td>1</td>
<td>5.4-2.5</td>
<td>$2.75</td>
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<tr>
<td>1500</td>
<td>1</td>
<td>6-1.5</td>
<td>$3.00</td>
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<tr>
<td>2000</td>
<td>1</td>
<td>6-2.5</td>
<td>$3.50</td>
</tr>
<tr>
<td>3000</td>
<td>1</td>
<td>6-4.5</td>
<td>$4.00</td>
</tr>
</tbody>
</table>

The BIGGEST VALUE for Your Money

MORRILL & MORGILL
30 Church St., N. Y. City
Sale U. S. A. Distributors
If you cannot get SIEMENS & HALSKE condensers from your dealer, write us sending your dealer's name and address.

Sold by
J. H. BUNNELL & CO.
115 Fulton St., N. Y. City
LEEDS RADIO CO.
45 Vesey St., N. Y. City
WIRELESS EGERT
179 Greenwich St., N. Y. C.
and other reliable dealers throughout the country

It’s EASY to Get a New HANDBOOK
(Seventh Edition)

DIRECTIONS:
Realizing that Handbook must be had, proceed as follows:
(1) Fill out below, tear off.
(2) Reach in pocket, produce U. S. A. $1 bill, old or new size (we don’t care).
(3) Clip together, mail us.

Handbook Factory,
West Hartford, Conn.
SEND IT AT ONCE.

(The Name)

(Street or P. O. Box)

(City and State)

scheme of standard frequency transmissions will be started, and we all hope it will turn out to be a success, and besides foster the cordial relations between the various sections taking part in it. A detailed schedule will be published in next month's report.

**Standard Frequency News and Schedules**
(Continued from page 48)

are made by laboratories equipped with accurate frequency standards and the transmissions are also checked by the U. S. Department of Commerce monitoring stations.

**TRANSMITTING PROCEDURE**

The time allotted to each transmission is 8 minutes, divided as follows:

2 minutes — QST QST QST de (station call letters).
3 minutes — Characteristic letter of station interrupted by call letters and statement of frequency. Characteristic letter of W1XP is “G,” of W9XAN is “D,” and of W6XK is “F.”
1 minute — Statement of frequency in kilocycles and announcement of next frequency.
2 minutes — Time allowed to change to next frequency.

**THE TRANSMITTING STATIONS**

W1XP: Massachusetts Institute of Technology, Round Hill Research, South Dartmouth, Mass., Howard A. Chinn in charge.


W6XK: Don Lee Broadcasting System, Los Angeles, Calif., Harold Peery in charge.

Do not forget to QSL the transmissions. All reports should be sent to the A.R.R.L. Standard Frequency System, Hartford, Conn. A record will be made at Headquarters and the report will be then forwarded to the proper station. S. F. report blanks can be obtained from Headquarters, free and postpaid, upon request.

Don’t guess. Use these transmissions and be sure.

— J. J. L.

W9DXP, Chicago, Ill.
(Continued from page 51)

and back to the receiver when receiving. In this way it is easy to check up on the note, frequency drift, quality of keying and quality of the “fist.”

A log is kept of the activities of the station, which embrace traffic handling, rag-chewing and some DX.

At the time of this writing the station has just been moved to Chicago from its old location in Des Moines so there has been no opportunity to see what it will do in the way of DX in the new location. In Des Moines all continents except Asia were worked, despite the fact that local hams insist that Des Moines is a dead spot.
Slightly used R.C.A. U.V. 851 1000 watters, guar... $175.00
R.C.A. U.V. 240 H.M.T. tubes... 1.00
New All-Hens 5000 watters... 1.00
New Coe 250 - 7 volt (199 type) non microphonic... 1.25
New Coe 232 - 7 volt screen grid D.A... 1.90
Used U.X. 685 tubes, guaranteed... 20.00
Sagansco 009925 0095, 204 a, 35 volt condensers... 1.15
R.F. choke for receiver and transmitter... 5.00
New National A.C. 3 Short-wave Radio ... at $97.50...
New, Dual Screen grid... 4.95
National power for same list at $34.50... 6.00
Factory wiring net $7.50 extra.

Above set when ordered complete with power pack and wiring, special...

Microphone stand special, adjustable floor stand, parts, adjustable to 78 inches, statuary bronze finish...

New jewell-0 filamentmeters. Beautiful Type Bakelite case...

Aluminium can assembled 9" x 9" x 3". flats $5.25...

Aero listening monitor... 10.85
Plechheim 1 mid 2000 volt trans. condenser... 8.00
Plechheim 4 mid 200 volt trans. condenser... 14.75
90 volt sockets for 203A or U.V. 250 watt socket... 9.50
250 watt sockets 230A to 300A... net... 10.00
904A - 300A sockets, set... 5.00
L.N. 281 tested and functioning... 1.85
Latest amateur call book... 5.00
Western Electric 203A tubes... 3.50

Noldor fully mtd, pent, trans, real job. 1-2-3-5 volt... 7.00
amps, 2-1/4 v. 3amps, one 5 volt 3amp. All C.T. with extra C.T. all resistances, special... 3.25
Noldor fully mtd power and fl. trans, 2-1/4-2-3 volt C.T. 4 amp, 1-2-3-5 volt 2 amp and high volt... 14.25
age. All center tapped and with extra C.T. resistances... 4.75

Thoradon 40 henry 250 mill filter choke 104 ohms re...

Arlington 1141, 14 volt 14 gauge... 1.50
Plechheim 1 mid 1000 volt inv. condenser... 1.00
Pyrex 12" large metal insulated... 1.85
Plechheim 4 mid 200 volt... 7.50
National NR-865 screen grid new... 12.25
Pyrex 7" large metal insulated... 1.05
New Green Seal S.A. - 1000... 2.00
Manhattan phones single with head band cord... 7.50
Western Electric 204A, 2304A, condenser Cardwel... .0044 three thousand volt trans. condenser...

10.00
1.00
1.00
1.00
1.00
1.00
1.50
1.50
1.50
2.50
2.50
3.00
8.50
4.75

Northern R.F. 1000-ohm 25 watt trans. leaks... 0.90
Microphone cases, special... 0.90
New Sprague 8 mid 430 volt electrolytic condenser... 0.90
New Marshol 15 mid 430 volt electrolytic condenser... 1.00
Plechheim 4 mid 1500 volt 25 v. in condenser... 7.50
Plechheim 4 mid 1000 volt 25 v. in condenser... 7.50
Repl. D.C. voltage rectifier... 1.25, list, out now, list... 1.75
L.N. 352 sockets... 1.15
G. E. 3 mid 2000 volt oil-immersed condensers... used... 20.00
G. E. 10 mid 2500 volt oil-immersed condensers... " " 30.00
Several small motor generator sets at real bargains...
Ampl. slightly used 8 tubes but guaranteed... 3.50
Stand-off insulators. Each 5, 10, dozen... 1.00
Enamelled no. 12 wire, 100 feet... 1.00
Two hundred feet coils... 1.50

We carry about the most complete line of transmitting equipment as well as receiving apparatus. We are short wave specialists. Broadcast transmitting stations built to specifications.

WANTED — USED TELEPLEXES, OMNIGRAPHS AND LARGE TRANSMITTING TUBES

Include postage with all orders and 20% deposit against C.O.D. shipments. View our radio shack while in this city — good time assured — what have you for sale or trade?

WE CARRY EVERYTHING FOR THE HAM

MORE FOREIGN TRADE SOLICITED

Write for free Ham Sheet

115 North Pearl Street, Albany, New York

Uncle Dave's Radio Shack

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

Uncle Dave's Radio Shack
They Come to JOHNSON
For Condensers Like This

Type G-196. 500 mmf., 30,000 volts. Pyrex insulated. Plates .25" thick, highly polished and edges rounded. Ball bearing counterbalanced rotor. The price is surprisingly low.

Our new catalog will be sent for 10c, describing the full line of fixed and variable condensers, inductances, carbon and condenser microphones, insulators, and many other items. Contain the pick of other makes of radio, laboratory, and sound equipment.

E. F. JOHNSON CO.  WASECA, MINNESOTA

GUARANTEED NEW RADIO BARGAINS

International Microphone—Two button for public address systems and transmitters. Speech or music .......................................... $7.75

Complete Phone and CW Transmitter 15 to 30 Watts, $39.50 including tuned plate, tuned grid oscillator with provisions for crystal control. Wired for one or two UX 210 tubes. One or two UX 200's as modulators, two stages of speech amplification. May be used with any type of two-tone Walnut cabinet. Has simple setup for AC Power supply. Price includes one Stromberg-Carlson microphone.


World Wide 2 Tube Short Wave Receiver, $11.75. A two-tube receiver in a beautiful shielded metal cabinet. An ideal all around set which will give loud speaker reception on many stations. Very flexible in tuning. Complete with a set of 6 diode coils. Covers 14 to 550 meters. Can be used with any standard base tubes.

Tubes UX Type, 30 day replacement guarantee. No. 210, $2.25; No. 200, $3.50 No. 281, $1.85; No. 240, 95c No. 245, $1.25; No. 224, $1.25; No. 227, 75c; No. 226, 65c No. 171, 75c.

Low Power Transmitter, adaptable for phone or code, with plug-in coils ......................................................... $14.75

Short Wave Sets, one tube complete with 5 coils, 14 to 550 meters. .......................................................... $6.45

Auto Radio — Uses 3-224, 2-227 tubes and 1-245 Power tube, single dial, tremendous volume. Complete. Fits any car. We guarantee this set to perform better than sets selling up to $150, 30 henry each, 160 mils., 1500 volt test, shielded.

Short Wave Sets, one tube complete with 5 coils, 14 to 550 meters. .......................................................... $14.75

Stromberg-Carlson telephone transmitter on desk stand, $2.75

Triple Chokes, 30 henry each, 160 mils., 1500 volt test, shielded. .......................................................... $3.75

AC-A. B. C. Power Packs, completely assembled .......................................................... $8.75

250 or 245 Power Condenser Blocks, 13 Mfd., 1000 volt A. C. test, tapped 2.5, 4.0, 6.0, and 1 Mfd., 1 each. .......................................................... $7.90

2 Mfd. Condenser Packs, 2000 volt A. C. test .......................................................... $5.80

 ORDERS SHIPPED PROMPTLY

CHAS. HOODWIN CO.

Guaranteed New Radio Bargains

International Microphone—Two button for public address systems and transmitters. Speech or music .......................................... $7.75

Complete Phone and CW Transmitter 15 to 30 Watts, $39.50 including tuned plate, tuned grid oscillator with provisions for crystal control. Wired for one or two UX 210 tubes. One or two UX 200's as modulators, two stages of speech amplification. May be used with any type of two-tone Walnut cabinet. Has simple setup for AC Power supply. Price includes one Stromberg-Carlson microphone.


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 ORDERS SHIPPED PROMPTLY

CHAS. HOODWIN CO.

They Come to JOHNSON
For Condensers Like This

Type G-196. 500 mmf., 30,000 volts. Pyrex insulated. Plates .25" thick, highly polished and edges rounded. Ball bearing counterbalanced rotor. The price is surprisingly low.

Our new catalog will be sent for 10c, describing the full line of fixed and variable condensers, inductances, carbon and condenser microphones, insulators, and many other items. Contain the pick of other makes of radio, laboratory, and sound equipment.

E. F. JOHNSON CO.  WASECA, MINNESOTA

Good Practice
(Continued from page 58)

cated and technical study but there are some basic rules regarding the grounding of shields.

(a) Though very generally done by commercial people and by amateurs as well, it is very bad practice to ground onto the shielding of a set. Get that! There should be one central "ground bus" to which all the returns to ground should be made. All apparatus should be insulated from the shielding, the only contact being at the one point where the ground bus is connected to the shielding. This means that variable condensers should not be fastened electrically to the shield but a lead should be taken from the moving plates to the ground bus. Above all, filament returns should never be made through the shielding. This article is meant to be brief, so if you want the whys and wherefores of the above statement — look up "Eddy-CURRENT Losses" in any good text.

Grounds mean stability and stability means consistent operating, continual readability and low background noises.

Calls Heard
(Continued from page 68)

guido ha visto benefit of some older days. For instance, there is a need for a "radio manager" on the car.
Our New Improved

DOUBLE BUTTON

Microphone

STAR
MODEL C

Regular List Price
$35.00

Special Price
$19.50

TO AMATEURS

Listen for the STAR microphone on the air. CHECK the QUALITY and remember to DOUBLE-CHECK the following features with the man who owns one:—

Non-metallic diaphragm — output level 10 to 20 D.B.s higher than average microphone — flat output curve within voice frequencies — eliminates one stage resistance or impedance coupled speech amplification — minimum carbon hiss — only 10 mills per button — 200 ohms impedance — solid brass construction — chromium-plated.

Packed in modernistic plush-lined pocket carrying-case and sold with a MONEY BACK GUARANTEE

SEND REMITTANCE WITH ORDER AND GIVE CALL LETTERS

See January QST for list of accessories

GAVITT MANUFACTURING CO., INC.
Brookfield, Massachusetts

announced in January issue of QST has already been acclaimed the STAR “mike” on the air, and has won the whole-hearted approval of the leading phone men. We have accordingly given this instrument the trade name STAR (model C).
any of the items offered here or in our catalog with the assurance:

CHOOSE FROM THE FOLLOWING FILTERS:

- RCA 1 mfd, 800 volt metal-cased - $0.60
- CARDWELL: 1 mfd, 650 volt metal-cased
- SANGAMO 5000 volt test condenser
- FFARION 3000 Volt rating
- DUBILIER 0.002 mfd, SLF lo-loss variable condensers
- MICA MOLD 0.001 mfd, or POLY 0.00025 mfd

TERMS:

- 30 days trial period
- 14 days to return
- If returned within five days and have your money returned. Can

- ELECTRONIC COMPONENTS:

- Faraday & Jaffe: 400 mfd, 600 volt working
- Thermo-couple Radiation Meters
- UX-245 TUBES
- ALUMINUM BOX SHIELDS
- STROMBERG-CARLSON: 1 mfd, 650 volt DC working
- DUBILIER or Grad 2 mfd, 500 volt metal-cased filter condensers
- MISCELLANEOUS:

- 1½ Henry, 150 Milliampere. Very neat case
- 20 H, 250 MA - $3.75
- Double 18 H, 250 MA - $6.25
- 14-Hour Service
- Save on QSL postage. Send for details.

G7XY, L. M. Allman, Lucerne, Ind.

7000- and 14,000-kc. bands

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

ALUMINUM BOX SHIELDS

Beautiful Silver Dip Finish

Any Size to Order

Monitor Size 10" x 6" x 7" high

-25% Discount on Special Orders

Stop by our Showroom, 288 East Main Street, New York City

HARRISON RADIO CO.

189 Franklin Street

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

ALUMINUM BOX SHIELDS

Beautiful Silver Dip Finish

Any Size to Order

Monitor Size 10" x 6" x 7" high

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Any Size to Order

Monitor Size 10" x 6" x 7" high

-25% Discount on Special Orders

Stop by our Showroom, 288 East Main Street, New York City

HARRISON RADIO CO.

189 Franklin Street
Anticipating the need of a condenser smaller and lighter than the usual types at present used for transmitters and receivers and for neutralizing purposes, and at the same time having features that would eliminate the drawbacks found in the smaller or so-called "Midget" type condensers, CARDWELL for some time had been developing and testing a model which could for every practical purpose be substituted for larger and bulkier types. The largest Radio Engineering and Manufacturing Organizations in the world have confirmed our judgment—read and see how it was received by engineers whose judgment is beyond question.

**THE INQUIRIES**

"We are needing very badly a variable condenser of the following general specifications . . . ."

"We of the . . . Company have depended on the Cardwell Mfg. Corp, many times in furnishing desirable apparatus with the rapid advance of the radio arts, and we feel that you will not fail us at this needy time."

"In some of our transmitter work, we have a need for a small capacitor of the air dielectric, variable type, to meet the following specifications:

Maximum capacity 35 mmfd.
Minimum capacity approx. 5 mmfd.
Operating voltage 3300 peak radio frequency.

"Inasmuch as these capacitors are to be employed in aircraft equipment, it is absolutely necessary that their weight be reduced to a very low minimum. It is also desired that the space occupied by a capacitor of this type shall be very small, and the design be such that extreme rigidity be obtained."

**THE O.K.'S**

"We received your sample light weight condenser, 83 mmfd .... and are pleased with it very much . . . ."

"We have ordered today some of these condensers for use in sample sets we are building . . . We are deeply obliged for your efforts in this new development work."

"The sample condenser which you sent us July 3rd has been received and tested."

"We find that its mechanical construction is very good, and its voltage breakdown at 6000 KC is within the limit necessary for our purpose, this being approximately 5,200 volts R. M. S."

**NOW YOU CAN BUY IT**

**"STANDARD" SIZE**

**CARDWELL TRANSMITTING CONDENSER**

A compact, featherweight variable condenser for purposes where reduction of bulk and light weight are desirable in transmitters, receivers and oscillator-amplifier outfits.

A smaller CARDWELL, (not a "midget") but having the same solid, strong construction for which the larger CARDWELL has so long been famous.

Aluminum is used throughout with a few minor exceptions. As a result the largest sizes (.000150 mfd. for transmitting and .000365 mfd. for receiving) weigh only 7 ounces, the smallest only 4 ounces, and a panel space of only $2\frac{1}{16} \times 2\frac{1}{16}$ is required!

**MIDWAY CONDENSERS—SIZES AND PRICES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Plates</th>
<th>Cap.</th>
<th>Panel Cap.</th>
<th>Panel Weight</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>401-B</td>
<td>3</td>
<td>2-9/16&quot;</td>
<td>50</td>
<td>8</td>
<td>3 oz.</td>
</tr>
<tr>
<td>402-B</td>
<td>5</td>
<td>2-9/16&quot;</td>
<td>70</td>
<td>9</td>
<td>4 oz.</td>
</tr>
<tr>
<td>403-B</td>
<td>7</td>
<td>2-9/16&quot;</td>
<td>105</td>
<td>10 2 oz.</td>
<td>2.80</td>
</tr>
<tr>
<td>404-B</td>
<td>11</td>
<td>2-9/16&quot;</td>
<td>150</td>
<td>11 1 1/2 oz.</td>
<td>3.20</td>
</tr>
<tr>
<td>405-B</td>
<td>15</td>
<td>2-9/16&quot;</td>
<td>200</td>
<td>13 2 1/2 oz.</td>
<td>3.60</td>
</tr>
<tr>
<td>406-B</td>
<td>25</td>
<td>2-9/16&quot;</td>
<td>300</td>
<td>13 6 oz.</td>
<td>4.20</td>
</tr>
<tr>
<td>407-B</td>
<td>35</td>
<td>2-9/16&quot;</td>
<td>405</td>
<td>14 7 oz.</td>
<td>5.00</td>
</tr>
</tbody>
</table>

*Rotor and Stator plates of Transmitting Condensers have edges well-rounded and are highly polished over all.

If Your Dealer Will Not Supply, Order Direct

**THE ALLEN D. CARDWELL MFG. CORP.**

83 Prospect Street, Brooklyn, N. Y.

**"THE STANDARD OF COMPARISON"**

Say You Saw It in QST — It Identifies You and Helps QST 79
POWERTYPE CRYSTALS
For Amateurs, Commercial Stations and Dealers

THE STANDARD OF COMPARISON
POWERTYPE crystals are recognized as the best.
No off frequency operation with
POWERTYPE CRYSTALS
FULLY GUARANTEED BY A RELIABLE COMPANY

Ground by experts and calibrated from precision standards.
Crystals for amateurs ground to approximate frequency and calibrated to better than 1/10 of 1%.

1715-2000 kilocycle band .................. $10.00
3500-4000 kilocycle band ............... 15.00
7000-7300 kilocycle band .......... 26.00
One inch oscillating blanks .......... 4.00
Plug-in dust proof mounting as illustrated above .......... 6.00
Twelve inch minus 10 plus 110 degrees Centigrade
thermometers ...................... 5.00

Grinding instructions furnished with crystal blanks.

550-1500 kilocycle band — calibrated at any temperature plus or minus 200 cycles desired frequency, complete with plug-in dust proof mounting — $4.00. Constant temperature of these crystals $1000. We do any kind of special crystal grinding for any frequency.

We build dynasty oscillators and monitors.
Just the thing for frequency Precision in monitoring that set/stator condenser guarantees maintenance of calibration and plus or minus 500 cycles desired frequency complete with

FREE

7000-7300 kilocycle band .. , ....., , , ..••••••

introducing a new line of FREQUENCY METERS.

AMERICAN PIEZO SUPPLY COMPANY
1101 Huron Building
Kanszsa City, Kansas

14,000-ko. band

14,000-ko. band

FREE

Send name, no obligation, for full information on crystals, holders, blanks, heater oven, etc.

"CLEAR AS A CRYSTAL"

AMERICAN PIEZO SUPPLY COMPANY
1101 Huron Building
Kansas City, Kansas

Specialists in frequency precision

Our Engineering Dept. is at your disposal.

TRANSMISSION CONDENSERS
Send for interesting data and price sheet on Transmission Condensers with working voltages up to 3000 D.C. for use with the following tubes: 203A, 204A, 210, 6SOW, 851, 852, 860, 865.

CORNELL ELECTRIC MFG. CO.
Long Island City

New York

Ellis Model 40 S
Ellis Model 40 S
Ellis Electrical Laboratory
337 West Madison St.
Chicago, Illinois

Say You Saw It in QST — It Identifies You and Helps QST
FOR THAT DYNATRON FREQUENCY METER

we recommend the General Radio amateur-band condenser. The large value of zero capacitance (43 µµf) is obtained by the use of two rotor plates which are complete circles. The frequency ratio is just right for spanning the 3500-ke. (80-meter) band with one inductor when allowance is made for the dynatron oscillator.

ORDER FROM THIS AD ADDRESS DEPARTMENT Q-1

GENERAL RADIO COMPANY
CAMBRIDGE A, MASSACHUSETTS
PACIFIC COAST WAREHOUSE: 274 BRANNAN STREET, SAN FRANCISCO


Here’s the Story behind These Headlines

The Yancey plane (ESCO equipped) in its non-stop flight to Bermuda maintained direct two way communication with New York. Darkness forced the plane down a little short of its goal. The plane floating on the sea remained in communication with New York.

Later, on its “Good Will” flight to South America the Yancey plane, on the ground at the Canal Zone, maintained two way communication with New York. Zeh Bouck, Radio Operator, said—“I believe this is without doubt a record for Airplane transmission, and it shows very clearly what we could have done had we been forced down in some of the jungle over which we have flown during the last few weeks.”

And on July 1, this last record was broken — the Yancey plane, on the ground at Buenos Aires, communicated uninterruptedly for more than an hour with the New York Times Station, 5838 miles away.

The Yancey plane was equipped with an "ESCO" wind driven generator to supply radio power while flying, and a battery operated "ESCO" dynamotor for ground work.

"ESCO" has a very complete line of wind driven generators, and dynamotors for airplane service. Let "ESCO" Engineers help you with your power supply for communications.

ELECTRIC SPECIALTY COMPANY

225 SOUTH ST. STAMFORD, CONN.
Manufacturers of motors, generators, dynamotors and rotary converters

Say You Saw It in QST — It Identifies You and Helps QST
Kellogg hand microphones are exceptionally sensitive throughout all tone values. This new instrument was originally designed for amateur broadcasting. It is today used as the standard microphone on home-recording sets of five leading radio manufacturers.

Oaty $650 Complete with Sloot cord

This package is attractively finished, compact, sturdily constructed and registers perfect response curves in tests. Sent prepaid with money order; or C.O.D., plus postage. Order today!

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NEW A. C. KEYING RELAY

1. A two pole relay one pole for PLATE CIRCUIT one for the GRID CIRCUIT.

2. Keys directly from 110 volt A.C. lines.

3. It follows a key up to 40 WORDS A MINUTE.

4. TOTALLY SHIELDED by Aluminum Case.

WARD LEONARD ELECTRIC CO.
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Coils — Magnet Wire Wound
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Say You Saw It in QST — It Identifies You and Helps QST
TRANSMITTING TUBES

We take this opportunity to announce the organization of transmitting tubes, of the medium and high-power varieties, for amateur or commercial applications.

• We have manufactured a laboratory devoted exclusively to the manufacture of transmitting tubes, of the medium and high-power varieties, for amateur or commercial applications.
• We unqualifiedly guarantee this tube to be superior, electrically and mechanically, to any tube of equal rating.

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All tubes unconditionally guaranteed against all defects, with order. Stock available for immediate shipment.

Minimum order $5.00

Dealers Discounts

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YOUNGSTOWN, OHIO

MICROPHONE LABORATORY
PACIFIC ENGINEERING LABORATORY CO.
515 South Gramercy Place, Los Angeles, Calif.

J. A. Stevens, 75 Willow St., Hauppauge, New York

3500-kc. band

$2.00 each

$25.00 prepaid

Stock available for immediate shipment.

Our personnel is composed entirely of men having long association with the amateur field and in addition possesses many years experience in the commercial manufacture of transmitting tubes. These qualifications enable us to offer the amateur, tubes of exceptional quality at reasonable prices.

We are also in a position to manufacture tubes of all types in ratings up to 20 K.W. Information upon request.

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Amateurs!!

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The safe resistor for power packs. Adjustable sliding clip enables quick adjustment to exact resistance value desired. Saves time and money for experimenters.

Rectifier Engineering Service, 4837 Rockwood Rd., Cleveland, Ohio

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18 Boylston Street, Boston
Send for Catalogue
Tel. Hancock 8184 Established 1905

5s 6s 7s and 9s!

Why send all the way east for your kits and parts? We have the most complete stock west of Chicago right here for you on the coast. Parts by the hundreds at real prices for the licensed ham. Get our catalog.

Everything for the amateur

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THE ONLY LOW LOSS COIL FORMS
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condensers were made on special order for use
systems. In metal ca.es; a real 41ood job. WORKING VOLTAGE (NOT test voltage) 1250 D.C.
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1500 $3.90 $8.95 $11.50 $2.40 $4.60 $6.95

1000

mfd

$2.65.

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$2.05;

$2.05;

$1.95;

$1.95;

$1.95;

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Terms:

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A.C.—SW'S. THRILL-BOX
NATIONAL CO., INC., 61 Sherman St., Malden, Mass.

REMARKABLE BUYS
EVERYTHING GUARANTEED
SPECIAL: Filter condensers at less than MANUFAC-
TURES'S COST. Made to sell at well within the prices. These
condensers were made on special order for use in public address
systems. In metal cases, a real good job. WORKING VOLTAGE
(Not test voltage) 1250 D.C. 2 mfd — Only $1.95; 3 mfd —
Order $2.65.
LAST CALL: Dongan 250-watt transformers with line
ballast resistors. Insures stable output at any voltage regulation.
Completely mounted and shielded. Terminal lugs on top.
Transformers furnished free. Secondary high voltage output is 1500
volts, centre-tapped at 1250 volts. Maximum load is 1250 volt.
7 1/2, 7 1/4, 8 1/2, and 9 1/2 volts for the
filaments. Shipped in a metal case. Special. $2.75
RC-ACTOR power transformers, 150 watts. Just the
thing for the 245 transformer (Nov., QST). Supplies 600 volts
centre-tapped, and 2 1/2, 2 1/4, 1 1/2, and 1 1/2 volts for the
filaments. Shipped in a metal case. Special. $2.75
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COLUMBUS 25 henry, 300-milliamp. choke. The real rugged choke.
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GRID-LEADS Wire wound and enameled coated. For all tubes
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TUBES of high quality. Made to stand the gaff, FREE 30-
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V224. $1.20; X171A, $.70; X280, $.90; X245, $.120.
COLUMBUS TRANSMITTING FILTER CONDENSERS,
Newer and better. Extra heavy duty and with a REAL replace-
ment guarantee. FREE Get our inside list for more bargains. It's FREE!
IMMEDIATE SERVICE Terms: Cash or C.O.D.
COLUMBUS SPECIALTY CO.,
1932-1038 Longwood Ave. New York City

(Continued on page 50)
AMATEUR BANDS:

Winter is here, and no doubt you are going over your transmitter removing those weak links so as to get the most possible efficiency from your set.

One item of great importance is the frequency stability of your set. Does it stay on one frequency? If not, our power crystals will solve that problem. SCIENTIFIC RADIO SERVICE crystals are known to be the best obtainable, having ONE single frequency and highest output. With each crystal is furnished an accurate calibration guaranteed to better than a tenth of 1%. New prices for grinding power crystals in the amateur bands are as follows:

- 1715 to 2000 Kc band . . . . . . . $15.00 (unmounted)
- 3500 to 4000 Kc band . . . . . . . $20.00 (unmounted)
- 7000 to 7300 Kc band . . . . . . . $40.00 (unmounted)

BROADCAST BAND:

Power crystals ground in the 550-1500 Kc band accurate to plus or minus 300 cycles of your specified frequency fully mounted for $55.00. In ordering please specify type tube, plate voltage and operating temperature. All crystals absolutely guaranteed regards to output and frequency and delivery can be made within two days after receipt of your order.

CONSTANT TEMPERATURE HEATER UNITS:

We can supply heater units guaranteed to keep the temperature of the crystals constant to better than a tenth of 1 degree centigrade for $300.00. Two matched crystals, ground to your assigned frequency in the 550-1500 Kc band with the heater unit complete $410.00. More detailed description of this unit sent upon request.

ATTENTION AIRCRAFT AND COMMERCIAL RADIO CORPORATIONS:

We invite your inquiries regards your crystal needs for Radio use. We will be glad to quote special prices for POWER crystals in quantity lots. We have been grinding power crystals for over seven years, being pioneers in this specialized field, we feel we can be of real service to you. We can grind power crystals to your specified frequency accurate to plus or minus .03%. All crystals guaranteed and prompt deliveries can be made. A trial will convince you.

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"THE CRYSTAL SPECIALISTS"

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Mount Rainier, Maryland

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Measure Easily
Resistance-Voltage-Current

Super Akra-Ohm wire-wound Resistors and Shunts afford an inexpensive means to build test equipment for the measurement of resistance, voltage, and current with accuracy. A combination for the measurement of voltages and resistances is shown in the above diagram.

Super Akra-Ohm wire-wound Resistors are manufactured in any value from 100 ohms to 10 megohms. They are carefully designed to insure an accuracy of one per cent and a constant permanency of calibration. Their use is highly recommended for Laboratory Standards, High Voltage Equipment, etc.

Prices range from $1.25 for 100 ohms to $4.00 for 500,000 ohms

Send us your dealer's or jobber's name and we will send you a copy of Bulletin 73-C

We manufacture special multiplying resistors for A.C. voltmeters. Full information will be sent on request.
HERE at Volume Control Headquarters we maintain a complete department devoted to engineering research.

This department is organized to serve you in solving any problems that may come up in connection with the fixed and variable resistors necessary to exactly meet your requirements.

We invite you to get in touch with us concerning the application of FROST-RADIO Volume Controls to your product, or the application of other controls involving precise regulation by means of fixed or variable resistors of the several types manufactured by Herbert H. Frost, Inc.

Why not use this service, just as a considerable number of others are doing? You will find the resources of our Engineers of great value in working out your problems. You will discover, as many others have done, that this department fully understands the requirements of present-day radio manufacturing. And you will like the speed, service and cooperation that is directed toward the solution of your problems.

An inquiry on your letterhead will bring full particulars of this unique service to the radio industry.

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Senders Is EASY
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Black or Colored, $17. Nickel-Plated, $19

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Special Martin Radio Bug — Extra large, specially constructed contact points for direct use without relay, Black or Colored.

Old Vibroplex accepted as part payment

Send Money Order or Registered Mail
THE VIBRROKEFLX COMPANY, Inc.
825 Broadway, New York City
Cable Address: "VIBROKEFLX" New York

How Is Your Tone Color?

(Continued from page 10)

and you expand it into the finished product. You may feel flattered, sir, that I credit you with the ability to discharge so important a task."

"Well, if it's so blamed important why don't you do it yourself?"

"Time, my dear man, time. I have just explained that I am already over-burdened — "

"Oh, all right," I cut in. "What's the lowdown?"

"I presume that you are asking for the details of the article?"

"I am," I replied. Poor Asparagus. He wasn't like that before he went to college.

"Very well. When you hear a pure d.c. crystal-controlled signal, what color is called to your mind?"

"Pure white," I answered.

"Correct. And when you hear a plain d.c. signal?"

"Just plain white."

"Right again. That is the substance of the article. Instead of trying to describe the note in the ordinary cumbersome way, merely state the color that is suggested to your mind. It is a fact that a certain note will suggest the same color to nearly everyone. For instance, a raw a.c. signal suggests black, near d.c. suggests gray, r.a.c. brown, 1000-cycle light yellow, et cetera. Thus a crystal-controlled near d.c. signal might be accurately described as a light gray (d.c.) signal against a pure white background. Doesn't that give you a vivid picture of the signal?"

"Boy," I said, "I've got to hand it to you. You really have a wow of an idea."

"Will you write that QST article for me then?"

"Will I?" I cried enthusiastically. "Well, you just bet!"

Now, Mr. Editor, I am so busy at present that I won't be able to write that article. I haven't been able to QSO Asparagus to tell him, so I am writing you. It eases my conscience somewhat, for when I make a promise, I always keep it. If you see Asparagus please tell him for me.

Station Licenses

HERE it is middle December and December QST is floating around the country bearing our statement that the new licensing arrangement "at this writing is proceeding smoothly and promptly at Washington," while dozens of chaps have written in to us to say that they made application for renewal six weeks ago and still no license and that the Super has shut them down because the old license expired.

Both statements are true. The new system started off fine and then broke down when a thousand applications for renewal, which had to be sent back along the system for certain missing information, came in in a heap — in what is technically known as "one fell swoop." At one time there were approximately 1500 amateur applications pending before the Commission. A week of strenuous work followed, with extra people on the
The New Leach...

Ultra Sensitive Relay

For light sensitive cell work, recording radio signals, burglar alarms, fire alarms, etc.

Will operate in excess of 100 words per minute on an input of ONE MILLIAMPERE. Will also operate on as low as 200 MICRO-AMPERES.

Will stand a floating current of three or four milliamperes on the winding, and operate on a variation of this current.

Easily adjusted and all adjustment screws are provided with knurled set screws.

Not affected by ordinary vibration and will operate in any position.

Leach Relay Co.
860 So. Los Angeles Street
Los Angeles, California

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For Your Friend

Who Wants to Be an Amateur

"How to Become a Radio Amateur," a helpful booklet for beginners, describing simple apparatus and telling the whole story. Ten cents postpaid, $1 per dozen copies.

American Radio Relay League
West Hartford, Conn.

Become a Radio Operator

See the World, Earn a Good Income, Duties Light and Fascinating

Learn in the Second Port U.S.A.

Radio Inspector located here. New Orleans supplies operators for the various Gulf ports. Most logical location in the U. S. A. to come to for training.

Our students qualify for the various branches of radio. Runs to all parts of the world. Positions Afloat and Ashore.

Special courses. Day and Night classes, Enrollee time. Oldest and Largest Radio School South.

Literature on request.

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179 Greenwich St., New York City

Remember—Reliability and lowest prices—a combination that’s hard to beat.

Write us your requirements.

Specials for This Month.

All prices listed are net.

New! New! Wireless Egert Engineering Keying Relay. A complier—satisfaction guaranteed...

Kolster Transformer

Windings 1200 V. 1-2-3 V.

1-2-1 V.

2-1-1 V.

2-1 V.

Concourse 8 mfd. 500 V. peak...

10 mfd. 2-8 mfd. sec. 500 V. peak...

Baldwin Genuine Type "C" Phones...

50 Short Wave Collar forced 4 prong (colors)...

National S-101 Couplers...

Peanut "N" Tub Sockets...

Thordarson 30 Henry 150 MA. Coil...

Universal Microphone Transformer...

Double Button...

Single Button...

Wireless Egert Filament Transformers, 8000 Volt Insulation...

2.5 V. — 8 Amps. for 210-260-261...

2.5 V. — 5 Amps. for 216-260-261...

10 V. — 7-13 V. Amps. for 203A-212D...

12 V. — 10 Amps. for 203A-212D...

Wireless Egert 50 Watt Socket...

Ward Leonard Gold Knobs with brackets...

5000 ohms 50 watt...

5000 ohms 200 watt...

10000 ohms 50 watt...

10000 ohms 200 watt...

15000 ohms 200 watt...

20000 ohms 200 watt...

20000 ohms 200 watt...

50000 ohms 200 watt...


Write for our net prices. Mail orders filled same day. Must be accompanied with 10% cash of order plus postage charges.

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Give You Speed

Increase your speed and step up to a better position. CANDLER SYSTEM will help you. Scientific methods. Result of 19 years research and experience by world's most successful developer of Morse and radio operators. Eliminates all "hit-or-miss" in telegraphing.

ADVANCED COURSE for Operators. Trains brain, muscles, nerves to coordinate in doing fast, accurate work. Corrects "Glass Arm" and faulty word ing. Develops concentration, confidence. Shows how to service all old and new sets with CENTRALAB units.

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Send 25 cents at once for your new VOLUME CONTROL GUIDE.

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CENTRAL RADIO LABORATORIES
Dept. 329F, Keefe Ave, and Humboldt Milwaukee, Wis.

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W9ABB, Paul Hinkle, 411,9 Madison Ave., East Chicago, Ind.

Say You Saw It in QST — It Identifies You and Helps QST
SPECIAL AUDIO and OUTPUT TRANSFORMERS
Now made in U. S. A. on 48 hours’ notice

For the exacting requirements of broadcast stations, public address systems, recording devices, laboratories, speech transmission and other uses where a flat curve over a wide frequency band is necessary. They can be supplied for the following requirements, as well as many others not mentioned:

- Microphone step up
- Microphone mixing
- Microphone to line
- Tube to line
- Tube to speaker
- Line to speaker
- Line to line
- Line to line

When transformer stages are cascaded the errors resulting from poor curves are multiplied. If transformers are down 3 db. at 35 cycles a three-stage amplifier using three audio and one output stage would be down at least 12 db. With three stages of coupling with our standard AF 5 audio transformers and the new precision output transformer the error or loss at 35 cycles is only about 2.5 db. if a good circuit free from regeneration and feed back is used. Further, the deviation of the curve from a straight line, between 35 and 8000 cycles, is less than 1.5 db. Circuit recommendations will be given on request.

FERRANTI, INC., 130 West 42nd Street, NEW YORK, N. Y.
HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their field of interest.

(2) No display of any character will be accepted, nor can any event be run as all or part capital letters be used which would tend to make one advertisement stand out from the others.

(3) The Ham-Ad rate is 15c per word, except as noted in column of rate on this page.

(4) Remittance in full must accompany copy. No cash or check or discount or agency commission will be allowed.

(5) Closing date for Ham-Ad is 25th of the second month preceding publication date.

If any word will apply to advertising which, in our judgment, is obviously non-commercial in nature and which is not related to the interests of the American Radio Relay League, such advertising of bona fide surplus equipment, surplus parts, or apparatus sold by an individual or association offered for exchange or advertising in- cluding for sale, equipment of the new 872 rectifier, complete plate power units, Rectifier Engineering Service, 4857 Rockwell Road, Cleveland, Ohio. THE finest in radio for amateur, broadcast and marine. The most modern short-wave receivers. Four to ten tube designs. Radiophone CW transmitters of any power or type. We make a complete line of apparatus, including speech amplifiers, filter coils, inductances, power units, etc. Any special apparatus, de- signed to order, using your parts if desired. Prices on request. New bulletin lists complete line of apparatus. Write for copy. Ensell Radio Laboratory, 1527 Grandview St., S. E., Washington, D.C.

WHOLESALE discounts. Approved parts. $50,000 stock. On delivery charges on orders over $25.00. Catalogs, 25c, prepaid. We band-spread them. Write for price. E. Donovan, 48 Inman Place, North Arlington, N. J.

SILVER-Marshall Round-the-World Four with coils and tubes. $20. Box 91, Hemipala Station, Fort Worth, Texas.

SOLD or trade 600 volt dynamotor WSBHY.

VWAG for sale cheap. Complete Xil Radiophonc and Superhet receiver. See page 2, Jan. 1930 QST for description. Write Frank Smolek, 4842 S. Troy St., Chicago, Ill.


COMPLETE transmitting receiving station, 50 volts, thirty meters, all accessories, ready to run, guaranteed, $75. Hardy, 24 H. St., Chicago, Ill. Included is the 305-ohm, 125,000-volt transformer for motor generator. $25.00. WJK, San Anselmo, Calif.


WANTED — HY-7 superhet. Clean West, 815 Dodge, LaFay­ ette, Ind.

TRADE Telescope for receiver or meters. W2CRF, Wm. Mcll­ eghan, Jr., 625 Chancellor Ave., Irvington, N. J.

NATIONAL A. C. SW54, $31.80 complete — tubes, set, power pack, tested. Write for prices. Sell-6/400V dynamotor, 10W c/w and fone mixer, never used. Excellent condition, $35. W5HH.

SELL — 390-volt 300-mill Holzer-Cabot m.g., $25. Delivers 500 volts or trade for 250-mill filter choke and 852. W8BMC, Madisonville, Texas.

FILTER condensers, 1.8 mid. working voltage, alternating 2900 direct current 4000, thirteenth by thirteen inches. Westinghouse 27.5/505, $7.50, 28.50, 852, $25.00, 125 volts or trade for good 250-mill filter choke and 852. W5WJ, East Bay Radio Corp., Detroit, Mich.

TUBES wanted for exchange for a Conn clarinet and case, in good condition. Can pay cash, one 212D or two 203A, one 860. Advertising or bona fide personal. Sold to get parts for ham equipment. Write for prices. Hatry & Young, Hartford, Conn.

NATIONAL A. C. SW54, $31.80 complete — tubes, set, power pack, tested. Write for prices. Sell-6/400V dynamotor, 10W c/w and fone mixer, never used. Excellent condition, $35. W5HH.

SELL — HY-7 dynamotor, 10W c/w and fone mixer, never used. Excellent condition, $35. W5HH.

_FILTER condensers, 1.8 mid. working voltage, alternating 2900 direct current 4000, thirteenth by thirteen inches. Westinghouse 27.5/505, $7.50, 28.50, 852, $25.00, 125 volts or trade for good 250-mill filter choke and 852. W5WJ, East Bay Radio Corp., Detroit, Mich.

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Selling four UX856a, 10c each, $75 takes 'em all. W9BUB, Anderson, Ind.

BEST Silicon transformer steel. 20c per pound cut. W9EBL, Elm St., Batavia, Ill.

SELL Aoversoex four a.s. receiver. Also see my adv this issue about Greene and back issues QST. W. L. Hollis, 614 Forest Glen Ave., Chicago.

HAMS: Get our samples and prices on printed call cards made to order as you want them. WJAY, Hinds, 19 S. Wells St., Chicago, Ill.


SUPERHETRODINE, built according to March 1929 QST, capacity 15 kits, one nice copy. Selling for parts because fre­ quent travelling prevents radio activity. Set, on experimental panel, has not been completely tested. Price, $40 cash, lease exchange for power supply. T. L. Bowes, 6037 N. Neva Ave., Chicago, III.


SUPERHET profoundly electric air - 2451 volt dynamotor, 350-watt ball-bearing, $37.50; 24/750-volt 150-watt, $27.50. On 12 volts delivers 375: 18 volts 860; shafts for external motor drive $3.00, $5.00, $7.50, 12 volts. Alden 800-watt magnet, 852s, $15; 24/750-volt 150-watt, $25.00, 6-volt 500-cycle Special, $7.50. Western Electric Helme­ ter, 500, 1000 volts, $15. fuse 1500 volts, 300 mma., 50c dozen. Henry Kienale, 501 East 84th St., New York, N. Y.

TRADE your receiver on HY-7, write for offer. Get our catalog for 25c — includes dope on HY-7. Large stock of parts. Hart­ ley & Young, Hartford, Conn.


CONFIDENCE-See April QST, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.

QST, April, p. 54. QST, May, p. 34.
QST

60 c. straight with copy in following address form only:

W1HB — R. S. Jackson, 83 Center St., West Haven, Conn.
W1MG — St. George’s School Radio Club, Thomas W. Brown, 4th opr., Newport, R. I.
W5BTA — J. N. Reuben, Box 332, University Mls.
W6CHI-W6EXG — Eugene B. Kille, 742 Burchett St., Glencliff, Calif.

W1MK, A.R.R.L. Headquarters

R. B. Parmenter, Chief Op. "rp"

The following calls and personal signs belong to members of the A.R.R.L. Headquarters gang:

W1AKW—W1KPK Clyde J. Houdson "eh."
W1BAY R. B. Berlein
W1BDI J. E. Handy "fh.
W1CBD Clinton H. Desoto "do."
W1AL J. J. Lamb "Jim."
W1DE Geo. Gray "hg."
W1EH K. B. Warner "ah."
W1EB3 A. A. Hoberg "ah."
W1FL-W2JR G. Donald Merze "dm."
W1EZ-W1BIZ G. C. Rodimon "red."
W1UE E. L. Battey "ev."

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1 KVA 3 phase 1500-2000 v. each side .................................. $40.00
700 volt 1000-1200 each side ........................................ 14.50
250 volt 500—750—1000 each side .................................... 8.50
unmounted $10.00 mounted $11.50

Auto-Transformers, Chokes, Polyphase and 25-cycle Transformers, Add 25% to List.

W9CWS FRANK GREBEN
1927 So. Pooir St., Plisena Sta. Chicago, III.

Complete stock of replacement parts — all models

Brunswick-Radiola receivers

RPA-1 RPA-3 RPA-4 RPA-5 RPA-7
$7.50 $7.50 $7.50 $7.75 $7.75

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We guarantee these condensers for 100 per cent. free replacement. Replenish men should carry a few dozens in stock.

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One-half Mfd. 300 $25c

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W2SAE Price List

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

93
To Our Readers who are not A.R.R.L. members

WOULDNT you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only amateur association that does things. From your reading of QST you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on the page opposite the editorial page of this issue. We should like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio. You will have the membership edition of QST delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

A bona fide interest in amateur radio is the only essential qualification for membership

AMERICAN RADIO RELAY LEAGUE
West Hartford, Conn., U. S. A.

I hereby apply for membership in the American Radio Relay League, and enclose $2.50 ($3 in foreign countries) in payment of one year's dues, $1.25 of which is for a subscription to QST for the same period. Please begin my subscription with the . . . . . . issue. Mail my Certificate of Membership and send QST to the following name and address.

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

Thanks
Console Quality
in a Midget Broadcast Receiver
You Can Place Anywhere

PILOT MIDGET
This attractive two-tone walnut miniature
A.C. receiver has proved the equal of high
priced consoles in many locations
throughout the country. Because— it em-
bodyes console features: 2-224 Screen
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designed electro dynamic speaker. A super
powered 280 voltage supply gives trouble-
free operation from any 110-20 volt house
current line.

Pilotron tubes are standard equipment
because Pilot retailers know none are
more reliable.

PRICE
Complete in
Modernistic
Cabinet

$59.50

For World-Wide
Radio Reception
Short and Long Waves, 14 to 500 Meters

PILOT Super-Wasp
Rev. J. W. Niterio, Bulongo, Congo-Belge Africa
says: "Here in the heart of Africa I have received
9LO, JR, 20L, SSW, AFK, PCJ, WGY (W2XAF),
WRNY (W2XAL) and more stations on loud speaker
with my Pilot Super-Wasp."

David W. Jones, Brisbane, Australia says: "I
have received on my Super-Wasp all the test trans-
missons between W2XAF (Schenectady, U. S. A.)
and W2XME (Sydney NSW) and PCJ Holland,
G8SW England and Sydney—London phone
service."

Austin R. Baldwin, St. Raphael (Var.) France,
says: "I heard from KDKA 25.4 meters, "We will
now rebroadcast a concert from London," Shortly
after the music from London came in clearly,
"having twice crossed the Atlantic."

Pilot Super-Wasp Comes in KIT FORM
which can be assembled in a few hours

BATTERY SET KIT

$29.50

A.C. SET KIT

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Kit K-110: The bat-
ttery-operated Super-
Wasp. Batteries and
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Wasp. Use your own A.C.
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Temperature-controlled plug-in oscillator; 100% modulation panel, and other new apparatus, completely described, with instructions for operation.

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Latest types of commercial and amateur short-wave apparatus; directions for securing operator's and station license.

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Radio beacons; arc radio transmitter for ships; Reed course indicator; latest developments in high frequency transmitters.

New RADIO LAWS and REGULATIONS

The Latest Data!
Complete and up-to-date information covering the entire field of Radio—all arranged for ready reference in this one big guide book

The RADIO MANUAL
A Handbook for Students, Amateurs, Operators and Inspectors
Here's the answer to every question about the principles, operation and maintenance of apparatus for radio transmitting and receiving. No detail has been omitted, from elementary electricity and magnetism for the beginner to television and radio movies. Important new chapters have been added to bring it right up-to-the-minute, and an immense volume of facts never before available is now presented in the book. Included are detailed descriptions of standard equipment, fully illustrated with photographs and diagrams. It is now more than ever the one complete handbook covering the entire radio field.

Prepared by Official Examining Officer
The author, G. E. Sterling, is Radio Inspector and Examining Officer, Radio Division, U. S. Dept. of Commerce. The book has been edited in detail by Robert S. Kruce, for five years Technical Editor of QST, the Magazine of the American Radio Relay League, now Radio Consultant. Many other experts assisted them.

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Send me the Revised edition of THE RADIO MANUAL for examination. Within ten days after receipt I will either return the volume or send you $6.00, the price in full. (QST 2-41)

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96
New page design to take care of every operating need and fulfill the requirements of the new regulations!

New book form! No more fussing with binders, or trying to weight down loose sheets when the breezes blow!

New handy operating hints and log-keeping suggestions, put where they are always convenient!

We honestly believe the new Official A.R.R.L. Log Book is the best you've ever seen!
To the amateur and to every other user of dry cell batteries. Outstanding because of unequalled performance under most severe as well as all ordinary circumstances.

Ask any Radio Engineer

BURGESS BATTERY COMPANY
MADISON, WISCONSIN
Those Station Logs

By R. D. Magill*

OW that the Federal Radio Commission has ruled that all United States amateurs must keep logs "in which shall be recorded the time of each transmission, the station called, the input to the last stage of the transmitter and the frequency band used," many amateurs have doubtless been wondering how to get out of it as painlessly as possible, and still comply with the regulations.

A log may be kept in a stenographer's notebook, which may be procured from any book and stationery store for about fifteen cents. It is preferable, but not essential, to get one with half-inch spaces between the lines, instead of the customary 4-inch rulings. These books are about 3 by 9 inches in size, and have each page divided by a vertical line down the center. Lines are ruled parallel to this one in such a way as to divide the portion to the left of this line into three equal columns, and the portion to the right of it into two unequal ones, as shown in the figure. By ruling a few pages in advance during spare moments, the time required to prepare our log for use will never be missed.

In keeping this log, we glance at the clock when we start each call, and make an entry to the nearest minute. In the left-hand column we note the date, then we drop down to the next line, and place the time in the same column. In the second column we place the call of the station we tried to raise, or CQ as the case may be. If we raised the station, we enter his call again in the third column. The fourth column we devote to the power and the frequency band in one column to save space for the last or "Remarks" column. Of course, if desired, two narrow columns may be provided. Signal reports, tone, traffic handled—anything that may help us to fill out a QSL card a month hence should go in this column. If we failed to raise the station called, we either leave this space blank or record a laconic ND. Any important change in the station equipment should also be recorded by notations written across the page.

The simple log described takes little time required to prepare our log for use will never be missed.

In keeping this log, we glance at the clock when we start each call, and make an entry to the nearest minute. In the left-hand column we note the date, then we drop down to the next line, and place the time in the same column. In the second column we place the call of the station we tried to raise, or CQ as the case may be. If we raised the station, we enter his call again in the third column. The fourth column we devote to the power and the frequency band in one column to save space for the last or "Remarks" column. Of course, if desired, two narrow columns may be provided. Signal reports, tone, traffic handled—anything that may help us to fill out a QSL card a month hence should go in this column. If we failed to raise the station called, we either leave this space blank or record a laconic ND. Any important change in the station equipment should also be recorded by notations written across the page.

The simple log described takes little room on the operating table. After all the pages have been filled on one side, the book may be turned over, and the back sides filled. It is extremely inexpensive, since with normal operation a fifteen-cent notebook will last a year or more. When completed, it should be filled away as a permanent history of the station's activities. It makes extremely enjoyable reading after it has had a year or two to cool off.

Most of our memories are extremely unreliable and we never know when the time may come when we would give a whole lot to know whether we worked Africa before or after we made that change in our antennas. If the log has been properly kept, the information we want is right there, in black and white. It is also interesting to check up on the percentage of our calls which are answered, and to compare the results obtained using different equipment and at different times of day, etc. A log offers endless possibilities to the ham and he should regard the Commission's rulings, not as a burden, but as a means of improving the effectiveness of his station and of increasing the pleasure he will get from operating.

B. E. R. W.

THE R.S.G.B. announces British Empire Radio Week as February 22nd, 0000 GMT, to February 28th, 2400 GMT, 1931. All A.R.R.L. members in the twelve competing Empire Groups, (1) British Isles, (2) Canada, including Newfoundland and Nova Scotia, (3) West Indies, including Bahamas, Bermuda and British Guiana, (4) South Africa, including N. and S. Rhodesia, (5) Kenya, Uganda and Tanganyika, (6) Egypt and Sudan, (7) Iraq, (8) India, Burma and Ceylon, (9) Malay, (10) Hong Kong, (11) New Zealand, (12) Australia, are urged to get on the air and take part in this most interesting competition. A maximum of 20 contacts on each frequency band with stations in any one Group may be counted, as long as the stations worked are in a different Group than the one in which the competing station is located. Count one point for each station worked and as soon as the contest is over send your entry to Hon. Sec'y, R.S.G.B., 83 Victoria Street, London, S. W. 1, giving date, time and frequency band for each point claimed.

Second All-Section Sweepstakes Contest

SEE page 39 of this issue for complete rules and information on the Second All-Section Sweepstakes Contest to be held February 14th to 28th. Remember the dates! Get on the air and plan to participate as fully as possible. Make a record for your station. And whether your score is large or small, be sure to report it so that you will receive full credit in QST.

Fourth International Relay Competition

THE Fourth International Relay Competition is scheduled for the two weeks March 8th to 21st. Mark your calendar now! Read the preliminary announcement elsewhere in this issue and prepare to take part. This contest has a number of important objectives. It promotes international fellowship and good will in addition to making possible some rare sport and a pile of new records for every station that takes part. This is one of the biggest events of the year. Don't miss it. Send your entry QSL-card right now.

IPH

SECTION Manager B. E. Sandham of W6VO will leave Los Angeles January 10th for a three-months' exploration trip with the Second International Pacific Highway Expedition. Automobile trucks will be driven from Mexico City to Balboa, Canal Zone, starting about January 20th. Sandham will use call signal IPH and 500-cycle note 100 watts on

* W8DQD-WBCLJ, 1040 11th St., Boulder, Colo.

QST FOR FEBRUARY, 1931
frequency of 7330 kc. After morning and evening schedules with X6A or Los Angeles stations IPH will contact as many amateurs everywhere as time permits. Look for IPH during next three months and help all you can.

The Chair Warmers’ Club

By Charley R. Estes

SEVERAL times, in the Communications Department of QST, mention has been made of the Chair Warmers’ Club, that happy band of brass pounders who, because of physical disability are called, or miscalled, “shut-ins.” The club was organized in April, 1929, by Walt J. Colpus, W8BRH, Pontiac, Mich., and in its 18 months of existence has grown from a small group of some half dozen members to an international organization of nearly one hundred members in this country, Canada and England.

The club is unique in more than one respect. It publishes a neatly mimeographed official organ, made up like a regular magazine with cartoons drawn especially for it by a good friend of the society, Otto Eppers, W8EE. Outside of the illustrations all work of issuing the bulletin is done by the members. James Kak, W8EQ, Lima, Ohio, is the art editor. W8DIK, an assistant editor, prepares the stencils and mails them to Rudy Drews, a junior member in Lansing, Mich., who runs off the sheets, makes up the magazine and mails it to the members. A technical editor in the person of F. R. Gibb, W8BAU, writes an article each month on transmitting equipment and answers the questions of the members.

A system somewhat similar to that of the A.R.R.L. field organization is employed to gather the club news each month. A reporter has been appointed for each radio district. The members send all news and traffic reports to their district reporter to be relayed to the editor for publication.

Shortly after its organization the C.W.C., affiliated with the American Radio Relay League and virtually all members who hold operating licenses are League members. The purpose of the club is to band together all licensed shut-in amateurs and any other “shut-ins” who wish to take up amateur Radio. The members are divided in two classes: junior and senior. The seniors being those who already have stations and are helping the juniors to obtain licenses.

The club has made only one departure from its original rules. In forming the women’s auxiliary it was decided that no physical infirmity need be required to make an applicant eligible. It is headed by three “yl” operators, well known amateur members not previously mentioned in QST, which includes among its members, some of the best operators in the country. The club is headed by the three “yl” operators, well known amateur members not previously mentioned in QST.
The Frankford Radio Club (Penna.) cooperated at the American Legion Air Races held at the Philadelphia Airport on September 6 and 7, 1930. A "phone transmitter using one 100 500 volt "B" batteries was set up at Pylon No. 1. Stations were also installed at the other two Pylons, the three stations being tuned to different points in the 3500 kc. "phone band, and being received simultaneously on three receivers in the control room under the grandstand.

The stations reported on the progress of the various planes around the course. The reports were put through amplifiers and rebroadcast at the grandstand. The operators were W3LC, W3AQJ, W3AHZ, W3AKB and W3AVI.

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The Miami Amateur Radio Club is holding meetings each Thursday at 8:00 p.m. in its new club room on the 16th floor of the Congress Building, Miami. A general invitation is extended to all amateurs and commercial operators, who may be in Miami, to visit the club. W4LA is the call of the club's station, which is on the air Tuesday, Thursday and Friday nights. A table is rigged up in the club room so that code practice may be given to as many ten beginners as at once.

The Miami Amateur Radio Club publishes a winter months. Members of the club intend to change the motto of the city of Schenectady from "Schenectady Lights and Hauls the World" to "Schenectady Lights, Hauls and Tells the World." Meetings are held the first Monday of each month at the Y.M.C.A.

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The Cleveland Amateur Radio Association publishes a very fine bulletin called "Crystal Notes." This club boasts a licensed YL on the list of members, W8CKH. W8AKA, the club station, has a 250 watter with type 806 rectifiers. The club has three rooms, two of which house the operating room and the Chief Op's work shop. Meetings are held every Friday night.

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The Amateur Radio Transmitting Society of Louisville, Ky., installed an amateur station at the 1930 Louisville Radio Show. The transmitter was a 50-watt T.P.T.G. Other transmitters and receivers were on display. A corps of operators were on duty constantly and the transmitter was kept working throughout the hours of the show.

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The Chapman Amateur Radio Association held its annual banquet at Schenectady on the evening of October 8, 1930. After the "eats" a program similar to a regular convention schedule was carried out. Among the speakers were J. C. Warner, E.E., Frank J. Motel, G.E., W2QU, SCM, E. N. Y., W2RGO, SCM, N. Y., C. L. L. and W2OP, President of the Club. The film "Cleveland Air Races" was shown during the meeting. A liar's contest was won by W8OS. The S.A.R.A. is planning a heavy program for the winter months. Members of the club intend to change the motto of the city of Schenectady from "Schenectady Lights and Hauls the World" to "Schenectady Lights, Hauls and Tells the World." Meetings are held the first Monday of each month at the Y.M.C.A.

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The Chapman Amateur Radio Association conducted a joint meeting of the local Cleveland radio clubs at the Hotel Winton. Division Director Angus was present and addressed the group. SCM Tummonds spoke a few words relative to O.R.S. appointments and traffic handling. Lt. (g) Scott spoke on the U.S.N.R. and approximately fourteen recruits were obtained. A committee was picked whose duty it will be to keep the Director informed of the wishes of the amateurs in the vicinity of Cleveland. This committee is composed of the officers of the various clubs.

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All these stations appearing in the BRASS POUNDERS' League are noted for their consistent schedule-following and dependable message-handling work in amateur radio. Special credit should be given to the following stations in the order listed responsible for over one hundred deliveries in at least one month. W6HM, W4LCX, K4RR, W6TM, W3IE, W6CA, W3TGO, W3OMT, W3MN, W3DO, W3KJ, W3ALX.

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Approximately 600 messages were filed, many being moved directly from the show, and the balance being distributed among other Louisville stations. The club's booth drew larger crowds than any other exhibit at the show. FB, OMs.

The University Amateur Radio Club at the State University of Iowa held meetings every Friday evening. Research and experimental work is carried out by all members interested. They have use of apparatus in the Electrical Engineering and Radio Engineering Laboratories. The club has a building thirty feet square located beneath two ninety-foot foot towers. Two transmitters are to be built, one for C.W., on 14.7 and 3.5 mc., the other a 'phone transmitter.

Sand Glasses

The University Amateur Radio Club at the State University of Iowa holds meetings every Friday evening. Research and experimental work is carried out by all members interested. They have use of apparatus in the Electrical Engineering and Radio Engineering Laboratories. The club has a building thirty feet square located beneath two ninety-foot towers. Two transmitters are to be built, one for C.W., on 14.7 and 3.5 mc., the other a 'phone transmitter.

The following are active 'phones in the Midwest: W9DB, W9ESL, W9AAP, W9DRS, W9DIJ, W9EXL and W9IEJ. The Army-Amateur Radiophone Net in the Seventh Corps Area is progressing rapidly. Any radiophone operator in the Seventh Corps Area interested in taking part in Army-Amateur activities is invited to write to H. W. Kerr, W9DZW-GP, Radio Aide, 7th C. A., Little Sioux, Iowa.

Traffic Briefs

Most unfortunately W8VD was omitted from the Navy Day Honor Roll appearing in January QST. He had excellent copies of the messages from NAA and WIKR and should have been listed as fourth high man in the Fourth Naval District. We regret this omission and want at this time to announce W8VD's rightful place on the Roll.

The long winters up in the Hudson Bay and Arctic country are no longer dreaded by the operators at the Canadian Government Radio Stations there. Amateur equipment is being installed at many of the stations, and the operators are able to while away many lonely hours chewing the rag with brother hams. VE6AJ is the call at Cape Harrington where VE6EG is a teleprinter operator at Port Churchill, Manitoba, says that he believes that in proportion to the population, the Northwestern Territories have a bigger percentage of hams than any other part of the world.

C. A. Briggs, W9CAB, well-known Washington amateur, was recently appointed to the rank of Lieutenant in the United States Naval Communication Reserve.

Hart Conn at Bunker Hill, Indiana, doesn't like the terms "OW" and "XYL" — he doesn't consider either particularly complimentary. He says, "Since a wife is a wife, why just call her a 'YF'?"

After publishing in January QST the account of emergency work carried out by Nebraska amateurs during the elect storm which hit that section of the country in November, we receive information regarding the part that W9DHO and W9EYE took in this emergency. The storm raised havoc with the telegraph service in the vicinity of Chadron, Long Pine and Gordon, Nebraska. W9DHO at Wisner made contact with W9EYE, the dispatcher of the Northern Missouri Railroad at Chadron, and arranged a important traffic between the railroad stations at Wisner and at Chadron throughout the worst part of the storm until wireless communication was reopened. Nice work, OMs.

W5AMC offers the latest possible solution to the problem of eliminating "CQ hounds." He suggests that all stations use sand glasses to time their CQs and calls. He has a five-minute glass mounted directly in front of him at the operating table. A twist of the wrist is all that is necessary to start the sand sliding. This presents a very convenient time indicator for calling. Of course it is not necessary to make the calls of five-minute duration. W5AMC has found by experience that a CQ of a little over one minute and a call of one minute duration brings good results. This does not mean one-minute calls without proper "CQing" of the stations.

Send for the Sixteenth (January, 1931) Edition of the Rules and Regulations of the Communications Department, on the cover of which is a photo of W1MK. If you have been wanting a picture of the Headquarters station, here is your chance to get one. And — you need the R. & R. R. It contains the full text of the amateur regulations, lists of Q code, international prefixes, information on the qualifications and duties of different officials in the A.R.R.L. field organization, how elections are held, etc. A postal will bring you the latest up-to-date edition of this information for your operating table free of charge. Mail it today.

W5WF says, "Noah was supposed to have had every kind of animal on the Ark. Wonder who the ham radio operator was!"

QST FOR FEBRUARY, 1931
### High Signal Reports

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>QST for February, 1931</th>
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<tbody>
<tr>
<td>WA1QX</td>
<td>Quinney, Mass.</td>
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<tr>
<td>W1AQX</td>
<td>So. Manchester, Conn.</td>
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<tr>
<td>W3CQD</td>
<td>Ho-Ho-Kus, N. J.</td>
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<tr>
<td>WA4M</td>
<td>Bexar Center, Texas</td>
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<tr>
<td>W6BUZ</td>
<td>Reedy, Col.</td>
</tr>
<tr>
<td>W7ACD</td>
<td>Shelley, Idaho</td>
</tr>
<tr>
<td>W7QV</td>
<td>Spokane, Wash.</td>
</tr>
<tr>
<td>W8AQF</td>
<td>Martinezburg, Ky.</td>
</tr>
<tr>
<td>W8BYD</td>
<td>Jamestown, N. Y.</td>
</tr>
<tr>
<td>W8DNT</td>
<td>Rochester, Mich.</td>
</tr>
<tr>
<td>W8LC</td>
<td>Youngtown, Ohio</td>
</tr>
<tr>
<td>W9ANL</td>
<td>Mapleton, Ill.</td>
</tr>
<tr>
<td>W9APF</td>
<td>Tabor, So. Dak.</td>
</tr>
<tr>
<td>W9BPK</td>
<td>Minneapolis, Minn.</td>
</tr>
<tr>
<td>W9BSF</td>
<td>Olathe, Kansas</td>
</tr>
<tr>
<td>W9DDY</td>
<td>Chester, Ill.</td>
</tr>
<tr>
<td>W9EBD</td>
<td>Menasha, Wis.</td>
</tr>
<tr>
<td>W9EFP</td>
<td>Geneseo, Ill.</td>
</tr>
<tr>
<td>W9GCC</td>
<td>Kansas City, Mo.</td>
</tr>
</tbody>
</table>

### Reports of Self-Ish-Cited Signals

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>QST for February, 1931</th>
</tr>
</thead>
<tbody>
<tr>
<td>WA1UW</td>
<td>Quincy, Mass.</td>
</tr>
<tr>
<td>WA9GW</td>
<td>Allentown, Pa.</td>
</tr>
<tr>
<td>W9CDQ</td>
<td>Ho-Ho-Kus, N. J.</td>
</tr>
<tr>
<td>W5QL</td>
<td>Allentown, N. J.</td>
</tr>
<tr>
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</tr>
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</tr>
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</tr>
<tr>
<td>W9GCC</td>
<td>Kansas City, Mo.</td>
</tr>
</tbody>
</table>

### Well-Operated Stations

- WA1QX
- WA9GW
- W9CDQ
- W5QL
- W6BUZ
- W7QV
- W8AQF
- W8BYD
- W9DDY
- W9EBD
- W9EFP
- W9GCC

### Code Practice Stations

<table>
<thead>
<tr>
<th>Station</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>WA1OQ</td>
<td>Pawtucket, R. I.</td>
</tr>
<tr>
<td>W1AQQ</td>
<td>Quiney, Mass.</td>
</tr>
<tr>
<td>W3CQD</td>
<td>Ho-Ho-Kus, N. J.</td>
</tr>
<tr>
<td>W6BUZ</td>
<td>Reedy, Col.</td>
</tr>
<tr>
<td>W7ACD</td>
<td>Shelley, Idaho</td>
</tr>
<tr>
<td>W7QV</td>
<td>Spokane, Wash.</td>
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<tr>
<td>W8AQF</td>
<td>Martinezburg, Ky.</td>
</tr>
<tr>
<td>W8BYD</td>
<td>Jamestown, N. Y.</td>
</tr>
<tr>
<td>WA1QX</td>
<td>Quinney, Mass.</td>
</tr>
<tr>
<td>WA9GW</td>
<td>Allentown, Pa.</td>
</tr>
<tr>
<td>W9CDQ</td>
<td>Ho-Ho-Kus, N. J.</td>
</tr>
<tr>
<td>W5QL</td>
<td>Allentown, N. J.</td>
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<td>W7QV</td>
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<tr>
<td>W9GCC</td>
<td>Kansas City, Mo.</td>
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</table>

### High Quality Signals

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>QST for February, 1931</th>
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</thead>
<tbody>
<tr>
<td>WA1QX</td>
<td>Quinney, Mass.</td>
</tr>
<tr>
<td>W1AQX</td>
<td>So. Manchester, Conn.</td>
</tr>
<tr>
<td>W3CQD</td>
<td>Ho-Ho-Kus, N. J.</td>
</tr>
<tr>
<td>WA4M</td>
<td>Bexar Center, Texas</td>
</tr>
<tr>
<td>W6BUZ</td>
<td>Reedy, Col.</td>
</tr>
<tr>
<td>W7ACD</td>
<td>Shelley, Idaho</td>
</tr>
<tr>
<td>W7QV</td>
<td>Spokane, Wash.</td>
</tr>
<tr>
<td>W8AQF</td>
<td>Martinezburg, Ky.</td>
</tr>
<tr>
<td>W8BYD</td>
<td>Jamestown, N. Y.</td>
</tr>
<tr>
<td>WA1QX</td>
<td>Quinney, Mass.</td>
</tr>
<tr>
<td>WA9GW</td>
<td>Allentown, Pa.</td>
</tr>
<tr>
<td>W9CDQ</td>
<td>Ho-Ho-Kus, N. J.</td>
</tr>
<tr>
<td>W5QL</td>
<td>Allentown, N. J.</td>
</tr>
<tr>
<td>W6BUZ</td>
<td>Ho-Ho-Kus, N. J.</td>
</tr>
<tr>
<td>W7QV</td>
<td>Spokane, Wash.</td>
</tr>
<tr>
<td>W8AQF</td>
<td>Martinezburg, Ky.</td>
</tr>
<tr>
<td>W8BYD</td>
<td>Jamestown, N. Y.</td>
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<td>W9DDY</td>
<td>Chester, Ill.</td>
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<td>W9EBD</td>
<td>Menasha, Wis.</td>
</tr>
<tr>
<td>W9EFP</td>
<td>Geneseo, Ill.</td>
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<tr>
<td>W9GCC</td>
<td>Kansas City, Mo.</td>
</tr>
</tbody>
</table>

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- WA9GW
- W9CDQ
- W5QL
- W6BUZ
- W7QV
- W8AQF
- W8BYD
- W9DDY
- W9EBD
- W9EFP
- W9GCC

### Code Practice Stations

- WA1OQ
- W1AQQ
- W3CQD
- W3CL
- W6BUZ
- W7ACD
- W7QV
- W8AQF
- W8BYD
- W9DDY
- W9EBD
- W9EFP
- W9GCC
A Well-Arranged Log Sheet

The sample log sheet shown below is an exceptionally fine example of an up-to-date log. Under the new regulations the Federal Radio Commission obliges every amateur station to maintain an accurate log of the time of each transmission, the station called, the input power to the last stage of the transmitter, and the frequency band used. This log sheet provides for all those

<table>
<thead>
<tr>
<th>DATE</th>
<th>FREQUENCY</th>
<th>POWER</th>
<th>CALLED</th>
<th>CALLED BY</th>
<th>STATION HEARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/29/28</td>
<td>7.52</td>
<td>5575</td>
<td>W2CDK</td>
<td>W6AKU</td>
<td>W6AKX</td>
</tr>
<tr>
<td>7/29/28</td>
<td>8.00</td>
<td>3575</td>
<td>W1DXD</td>
<td>W6WMK</td>
<td>W6AKX</td>
</tr>
<tr>
<td>7/29/28</td>
<td>8.40</td>
<td>740</td>
<td>W9FR</td>
<td>W6AHL</td>
<td>W6AKX</td>
</tr>
<tr>
<td>7/29/28</td>
<td>5.50</td>
<td>34</td>
<td>W3AVI</td>
<td>W6AKU</td>
<td>W6AKX</td>
</tr>
<tr>
<td>7/29/28</td>
<td>7.18</td>
<td>509</td>
<td>NS90</td>
<td>hook</td>
<td>VYaMu</td>
</tr>
</tbody>
</table>

Every amateur should keep a log not only because it is a ruling of the F.R.C. The well-kept log is invaluable in checking up reports of any nature concerning amateur station operation. It contains positive evidence of every transmission, it is a permanent record of the achievements of the station. Full records of reception, experimentation and adjustments are interesting and profitable as well. Carefully kept logs tell a complete story of communication achievement which becomes increasingly valuable historically and likewise more valued for the cherished memories of worthwhile amateur operation that it will recall to you as the years go by. Unless you already have a well-arranged, complete log of some kind, you should plan to start one at once.

Traffic Briefs

The following excerpt from a letter received at HQs from W. L. May, W3ASJ, Washington, D.C., dated September 16th, contains some interesting facts regarding 14 mc. cond-

Every summer a number of amateurs are found among the fellows assembled at the Citizens Military Training Camp, Fort Monmouth, N. J. During the assembly this year the amateurs conceived the idea of forming a club to band themselves together and to further the interests of amateur radio at the camp. On July 7th thirteen amateurs got together at the camp to organize such a club. The name chosen was "The Brass Pounders Club of the Citizens Military Training Camp at Fort Monmouth." The following amateurs were present at this "first meeting": W1BRG, W1AHK, W2AIL, W2OHF, W2CDK, W3ABG, W3CZ, W3Y A, W8BFW, W8DXK, W8TZ, W8CMH and Ogden Bowman. W1BRG was chosen President, W1AHK, Vice-President, W8BFW, Secretary-Treasurer, and W8TZ and W3AVA, Communications Managers. The club may be continued from year to year for the benefit of other amateurs attending the camp.

W9EBO is making use of amateur radio as a means of increasing his postage stamp collection. During QSOs with foreign stations he asks that the operators send him stamps of their respective countries. He has already received quite a bunch of stamps in reply to his requests. Some of the amateurs who have helped him are K4KD, CM2WA, Z8IM, PY2BA, V51RG and W1CBWD-W9KL. W9EBO would be glad to hear from any amateurs who are interested in collecting stamps.

Amateurs passing through the town of Harrison, N. Y., should make it a point to stop in and look over the new club house of the Pioneer Radio Club. This is one of the best amateur meeting places in the country, and houses the Pioneer Radio Club's station, W2ANS. When passing through Harrison on the road to White Plains watch for a one-story building with a hip roof, near the top of which is fastened a sign reading "W2ANS—Pioneer Radio Club—W2ANS."
Traffic Briefs

When telephone and telegraph communication between Beddes Island and New York City was accidentally severed on December 1, 1930, W3SC at the Island contacted W3BD at East Orange, N. J., who telephoned the traffic received direct to the Signal Officer, U. S. Army on Governors Island, N. Y. W3BD and W3SC handled official government traffic for four hours, and continued communication until the cables had been repaired. This is another example of the good work being done by amateurs, FRI. OMs.

Traffic Summaries

<table>
<thead>
<tr>
<th>Region</th>
<th>Stations Originated</th>
<th>Stations Delivered</th>
<th>Stations Relayed</th>
<th>Total QSOs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic</td>
<td>869</td>
<td>9,179</td>
<td>9,507</td>
<td>1,51,271</td>
</tr>
<tr>
<td>Prairie</td>
<td>62</td>
<td></td>
<td></td>
<td>75,682</td>
</tr>
<tr>
<td>Quebec</td>
<td></td>
<td></td>
<td></td>
<td>1,11,797</td>
</tr>
<tr>
<td>Rock Mount</td>
<td></td>
<td></td>
<td></td>
<td>2,904</td>
</tr>
<tr>
<td>Porto Rico-Virgin Islands</td>
<td></td>
<td></td>
<td></td>
<td>1,147</td>
</tr>
<tr>
<td>Southern Nevada</td>
<td></td>
<td></td>
<td></td>
<td>959</td>
</tr>
<tr>
<td>New England</td>
<td></td>
<td></td>
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<td>41,110</td>
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<tr>
<td>Northern New Jersey</td>
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<td></td>
<td>46,46</td>
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<tr>
<td>Central</td>
<td></td>
<td></td>
<td></td>
<td>2092</td>
</tr>
<tr>
<td>Northwestern</td>
<td></td>
<td></td>
<td></td>
<td>1621</td>
</tr>
<tr>
<td>Rocky Mountain</td>
<td></td>
<td></td>
<td></td>
<td>40,966</td>
</tr>
<tr>
<td>Southern</td>
<td></td>
<td></td>
<td></td>
<td>54,019</td>
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<tr>
<td>Western</td>
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<td></td>
<td></td>
<td>86,949</td>
</tr>
<tr>
<td>Rocky Mountain</td>
<td></td>
<td></td>
<td></td>
<td>51,271</td>
</tr>
<tr>
<td>Total</td>
<td>215,471</td>
<td>4,391,585</td>
<td>4,319,714</td>
<td>88,493</td>
</tr>
</tbody>
</table>

Those who remember "Chain Lightning Hill," 4GL, and the old team, 4GL-3ZY, should listen to operator Kimmel, "GL," at W3CXT-WLM, if they want to bring back thoughts of the "old days." W3SZ says he has sent traffic to this operator "GL" for a half hour at a stretch with the bug wide open, and all that he says at the end is, "faster, please." Think you could put him under the table?

W8AXY reports working WBFT, the bank City of New York, on approximately 7200 kc. at 7:50 p.m. E.S.T., December 22, 1930. The boat is now making an exhibition voyage to various Atlantic ports. WBFT uses a frequency of 8000 kc. and W8AXY advises that he CQs for ham contacts quite often.

DIVERSIONAL REPORTS

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Don Lusk, W3ZF— W3EU is looking for schedules, KMs, note. W3EY says traffic is picking up, W3MC installed a new power supply, W3AAB is busy with the Frankford Radio Club. W3AKLE is a frequent visitor at W3UX. W8AFO's report for last month was received too late for inclusion. W3QF reports he will be on regularly now. W8BD is handling considerable amateur traffic. W3CWO hasn't much time for radio. W3AVI has a nice lot of schedules. W3QMC started and W3CVD, W3DZZ, Dec. 15th. W3AWB is now using a 211 tube, W3OF seeks an ORS, W3GS worked an Englishman on the 3.5-mc. band. Paul Levin, a new man, reported a nice total, but forgot to mention his call letters. W3CFT is turning in some nice reports, W3ZJF and W3CS have a nice local 20th-century route feeding the main line, Stations having traffic west should give it to them.

W3PR says "No ambush," W3NF is pounding away for the 1st time.


SOUTHERN NEW ENGLAND — SCM. Bayard Allen, W3ATJ — W3SM makes the BPL. W3BEX becomes an ORS this month. W3NAP is President of the Morris Radio Club. W3AWT is busy with Dental Lab. work. H. T. Conklin, Secretary of the Morris Club, built a push-pull TPTG job for the club. W3ABG worked Nebraska. W3JL is a commercial photographer, W3ASG is still working the VK's. W3ACX sympathizes with the SCM in a forlorn attempt to work Asia. W3ZX had a QSA 5 100% QSO with Porto Rico on 14-mc. phone. W3BEI is trying to locate a steadier job. W3HAN is on sick list, W3OH is on re-

QST FOR FEBRUARY, 1931
casionally, W3AWL has disappeared. W3AWL’s sister’s cat knocked his monitor over and left it in 98 pieces. W5QW has applied for his license. W3BMS does the same. W3ATJ has 9 QRM from the law office. W5QW reports.


WESTERN PENNSYLVANIA — SCM, R. M. Lloyd, W3CGR — W3CGU leads again; he keeps 17 schedules a week. W3DGL has a nice array of schedules and traffic. W3BAG is active in the U.S.N.R. W3AVY has an AC receiver working. W3CNP reports conditions had at State College. W3CEO is working with the Army-Amateur net. W3DUT is planning to set down to some good traffic work. W3AGO is on every week-end. W3BK is having receiving troubles. W3CWT is sending with a crystal transmitter. W3CAV is working on 720 K. W3AEIE is sending to W3 of some beginners got started. W3YA is still without a license. W3KZ and W3APQ make the BPL for the first time. W3BNV was elected President of the Erie Amateur Radio Club, and W3DKL was made Secretary. W3SH is on 7 Mc with a type ’10. W3GU and W3CRR are on occasionally. W3DYL has a new receiver; he is active in the Navy Net. W3CRA sticks to 14 mc and DX traffic. W3DOW is cramped by business. W3LAQ is building a new transmitter. W3DRA and W3BRC are on for the first time. W3BK is working all frequencies. W3AYII is on 3.5-3.6 mc. W3BXG is still trying to solve his crystal transmitter troubles. W3BAG has a new antenna system. The Amateur Transmitters Association has gone to work on ‘phone interference. Both the off-frequency and BCL varieties are being tackled. W3CFR worked his old friend FY1AW. W3BOS has blown his transmitter down.


MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Forrest Calhoun, W3BBW — Maryland: W3LA says watch his smoke. W3AFF has some QRM he can’t find. W3AIL is ready to go. W3WFH has a 50-watt phone rig. W3GIC is trying to build his new QRP transmitter. W3BRR was reported being heard in Poland by SP3GR. W3ED has two transmitters going. W3ZK has his crystal outfit going. Deluxe: W3AALQ is trying to get a super wap to kick like its namesake, the bug. Hz. W3JHC wants to be an ORS. District of Columbia: W3CXL leads all of us again this month. W3BST still holds his own. W3OZ wants us to get that banner, W3ASO sent in a nice total, W3CAB sent in a report on the A.R.R. Net, which was computed. W3DCC, W3CCH, W3CTG, W3GTH, W3GBY, W3CLN are QHL school work. W3WT got to Hartford and paid the Headquarters gang a visit. W3AKR built his MOPA in a beautiful cabinet, but is going back to bread boards. W3JGC is working on a new ASQ.


WESTERN NEW YORK — SCM, John R. Blum, W3CCK — The Jamestown gang have a monthly news sheet, the “Jamestown QRM.” $5 BYD is editor. W3AYII is on 7 mc. W3BMW is off the air until spring. W3CHL has his second commercial ticket, W3TUC designed the structure of condenser mikes. The Western Michigan hams are trying h&rd to get a crystal rig on the air. W3DGW is still trying to solve his crystal transmitter troubles. W3CEO is working with the Army-Amateur Net. W3AKJ was off the air for a few weeks. BPL members W3SQL, W3DMS, W3DDE, W3DQJ, W3FEX, W3FX, helping W3JX raise 50-foot stick, thought he might break into the commercial racket. W9AAG and W9BIIJ are active in the U.S.N.R. W3SAVY has an AC receiver.


CENTRAL DIVISION

MICHIGAN — Acting SCM, Ralph J. Stephenson.

W3DNIS — I want to thank the gang for the wonderful cooperation given me this month. W3ZK wants to be an ORS. W3IQ wants his call letters. W3PK wants his rig checked up. W3LQ wants to hear from old friends. W3BFX has a new receiver. W3GJX keeps daily reliable schedules. We need an R.M. up north. The Detroit QSO party in December was well attended. W3DYH tied for first place, but was awarded the prize because he QSO’d a phone, regardless of his resolutions otherwise. W8FX won second. The Detroit Amateur Radio Association is growing fast. Seventy-five members at December meeting, elected Felden, WBMV, president; LaDue, WBPQ, vice-president and Menult, W3CAB, secretary-treasurer. W8KZ is still trying to solve his crystal transmitter troubles. W3GJX is sending to W3 of some beginners got started. W3BOS has blown his transmitter down.


QST FOR FEBRUARY, 1931
ILLINOIS — SCM, F. J. Hinds, W9APY — W9FUL is dragging in the DX. W9DXZ is going strong. W9ERU is Junior High School. W9AHK is rebuilding the station. W9PK has worked Africa. W9BSR is installing a transmitter at W9FGD helps him roll up the traffic. "Once a Ham..."

W9A VL is a 7000-kc. Zeppelin of copper tubing 50 feet high. W9D.JG are on again. W9GFY is on 14,000 kc. The antenna at W9AVL is a 7000-kc. Zeppelin of copper tubing 50 feet high. W9DBB complains of broad RAC QRM. W9DZM says it is shocking. W9BAN sold his receiver to W9DPK.

The air has been dead around W9AFB. W9BRY is a first-class beer-guzzler and pretzel-bender. W9ARU reports a celebration on the 50th year for W8DIH on the air. W8DJD keeps a couple of schedules. W8AWS is busy with new "Bug" has crept into the station of W9FPN. W9CNY is on 7000 kc. with crystal-controlled signals.


KENTUCKY — SCM, J. B. Whitten, III, W9BZ — W9AIN is well out in front with a nice total. W9BZM wants a couple 204A's perking when this is read. W9XO has a new 4500 kc. transmitter. W9LUN is working overtime at W9CXZ. A new "Bug" has crept into the station of W9FPN. W9CNY is on 7000 kc. with crystal-controlled signals.


W9UFI works all directions on schedule, W9FAW wants an ORS appointment, W9EFG reported via radio. W9DIT will be glad to handle any traffic for his district. W9DIT recently received Commercial Second Class license. W9EB0 is conducting a Boy Scout Radio Club with 14 students. W9ERU is expected back in the air soon.

Northern Minnesota — SCM, Ray F. Welke, W9CTW — The reason for the good showing this month seems to be the dry camping in a splendid QSO parties. The SCM kept a week's schedule with W9AXY and took plenty of traffic. W9BHJ also has a west coast schedule. W9DQD is waiting for a new 303A. W9ARE left the Section for the W9BNP 540-kc. station. W9BHJ says, "Season's Greetings." "A new Naval Reserve 500-watt station is being erected in Duluth," says W9EHI. W9GQQ is going after traffic by running an ad in the local newspaper. W9EOZ sent in his first report. W9BBL reports a celebration on the 50th year for W8DIH on the air. W8DJD keeps a couple of schedules. W8AWS is busy with new "Bug" has crept into the station of W9FPN. W9CNY is on 7000 kc. with crystal-controlled signals.

electricity and strength are getting the best of him and his again. W9FAQ joined the A.R.H .. comes through again with a nice total. W9BCT got going renewed by some semblance of schedules. W9DGR handled emergency traffic for railroad, time right now. We have one report from a 1750-kc. man, now. W9CRL handled a little emergency traffic. The report. W9FFL sends in his report, and W9Y.K's also. The --- Our OBS is back in the ham... and has received a new certificate from me within the past two years. In the future... leads in traffic with the "Oriental" clicking as of old. W9BN was very active logging off-frequency stations. W9GHO is going again. W9BCN has four schedules a week. W9CKU will be on 7... has in touch with him immediately. W2APK has a new outfit. W2BVL, Nassau Radio... of the Specialty station in Shreveport. W5YW says... makes a clear-cut decision. W5BRH is the specialty station in Shreveport. W5YW says the former radio club, and W5WN is... QSOd by the holder of a new commercial ticket, W2LUJ. W2AVK is back on 7 me. W2LC, a new OOs, keeps three schedules a week. W2ASZ complains of refusals by others to QSP. W2BY promises a good total next month. W2BNL is still with us. W2AVK is on 7 mc. W2LW, a new OOs, keeps three schedules a week. W2AOY is asking for volunteers for the Naval Reserve Communication Outfit. W2BEV gets his traffic on schedule. W2BEG is in touch with him immediately. W2BQG can be heard on... the Signal Corps Reserve. W2BGH is on 3500 kc. W2AVK can be heard on... a new OOs. W2CBB is adding another tube. W2CBB says he is awaiting the arrival of a pair of type '81s. W5BPE is in... the holder of a new commercial ticket, W2LUJ. Hudson Division New York City and Long Island — SCM, V. T. Kenney, W2BG0 — The second meeting of the official SCM is held, and another meeting will be held at Naval Reserve Headquarters. Washington and Christopher Sts., on Feb. 16th, at 8 p.m. Manhattan: W2SC is the only station making the BPL, and leads the entire Section with a clear-cut decision... makes a clear-cut decision. W5BPE is in touch with him immediately. W2AVK is on 7 mc. W2LW, a new OOs, keeps three schedules a week. W2ASZ complains of refusals by others to QSP. W2BY promises a good total next month. W2BNL is still with us. W2AVK is on 7 mc. W2LW, a new OOs, keeps three schedules a week. W2AOY is asking for volunteers for the Naval Reserve Communication Outfit. W2BEV gets his traffic on schedule. W2BEG is in touch with him immediately. W2BQG can be heard on... a new OOs. W2CBB is adding another tube. W2CBB says he is awaiting the arrival of a pair of type '81s. W5BPE is in... the holder of a new commercial ticket, W2LUJ. W2AVK is on 7 mc. W2LW, a new OOs, keeps three schedules a week. W2ASZ complains of refusals by others to QSP. W2BY promises a good total next month. W2BNL is still with us. W2AVK is on 7 mc. W2LW, a new OOs, keeps three schedules a week. W2AOY is asking for volunteers for the Naval Reserve Communication Outfit. W2BEV gets his traffic on schedule. W2BEG is in touch with him immediately. W2BQG can be heard on... a new OOs. W2CBB is adding another tube. W2CBB says he is awaiting the arrival of a pair of type '81s. W5BPE is in... the holder of a new commercial ticket, W2LUJ.
Traffic:  

**MIDWEST DIVISION**  

**NEBRASKA** - SCM, Samuel C. Wallace, W9FAM - W9FAM piles up a total of 176. W9BOQ comes rearing in with 94. W9BHN says he gets traffic, but can't get rid of it. W9CJD says UHF RXing his receiver. W9EID reports 21 handled. W9FV reports W9JXQX between from TMC, W9FV's home. W9JH has a new TVT, he's limbering up his arm. W9FDR says he's getting his transmitter12 tuned up. W9F4D is back at KBEF. W9HQB says QRM is very busy with school. W9CDX is busy checking off-frequency stations. W9DLX has been on the air. W9EGC is interested. W9F3C is going to try CW to please the rest of the gang. W9EGC, a new station, is asking for ORS appointments. W9EID sends W9JXQX a new AC receiver. W9FDR has a new rig. W9JH is working on both 8500- and 7000-kc. bands. W9FF'D has W9BOQ on the map. You all know about the new ORS system. If you want to hold your appointment, keep sending in reports. W9FV reports general traffic, W9CDX has been doing more 3.5-mc. work. W9DHZ has a new antenna. W9FQQ has moved from Waterloo to Eagles Grove. W9FOF asks for ORS blanks, as does W9EIV. W9LTF reports a radio club at Marshalltown. W9JX has moved from W86DC. W9JXQ is building his receiver. W9KLD is home from Valparaso. W9KQF is working on a new antenna. W9QG requests renewal of ORS, formerly issued under W9FQM call. W9EGC is still in Buffalo.  

Traffic:  

**NEW ENGLAND DIVISION**  

**NEW HAMPSHIRE** - SCM, V. W. Hodge, W1A - W1JX and W1JY are reporting in for ORS. W1JX is on 3500 kc. regularly. W1EAF has his pull-pull rig going with a new antenna. W1ANS held open house for the New Hampshire Elites. W1A is on the map. You all know about the new ORS system. If you want to hold your appointment, keep sending in reports. W1EAF has his pull-pull rig going with a new antenna. W1ANS held open house for the New Hampshire Elites. W1A is on the map. You all know about the new ORS system. If you want to hold your appointment, keep sending in reports.
EASTERN MASSACHUSETTS - SCM, Miles W. Weeks, W1WY — W1WY and W1LQ make the BPL. W1ASI is keeping early morning schedules on 3500. W1LABG had some transmitter trouble. W1CCP has a schedule with NNWIC. W1ASF has been making good DX contacts on 7 and 14 me. W1AXQ has her ORS appointment. W1GMA is troubled with a bad power leak. W1ADK had difficulty finding stations to handle his traffic. W1RK has resumed his schedules with VOAIE. W1AIZE is doing some 3000-ke. phone work. W1BQG is preparing to use his 200A in an MBDC. W1ZIP has a good NBC network and continues to handle Naval Reserve traffic. W1CAW, W1AIF, W1RCH, W1ATX and W1CQN are now ORS. W1CABW took a two weeks trip to Washington, D.C., visiting the way. W1EBT reports better results after rebuiding. W1ATX is trying 14 me. W1CQG has been very QRL. W1WV worked Uruguay on 7000, South Africa, on 14 me., and the 7th and 7th Districts on 3500 kc. W1BDG handled some traffic with his new 852. W1AIZD is also using an 852. W1AQT is rebuiding. W1AN2Z is on signing W1ME.

Traffic: W1WY 310, W1LQ 257, W1BXH 184, W1ACH 126, W1LQM 119, W1AIF 98, W1AGB 62, W1BQG 61, W1AMH 58, W1AGK 55, W1CQG 30, W1UIC 29, W1CWW 22, W1CCP 15, W1KY 13, W1AICD 12, W1CQN 11, W1AZE 6, W1AIF 5, W1WV 4, W1MTE 20. W1BQG 32.

W1AIP's T ambitus — SCM, Fred A. Ellis, Jr., W1CTI — W1BNB sends in his first report. W1CJD makes the BPL and reports for W1BQG. W1AMW warns the gang to get their renewal license applications in early. W1BQG thinks 7000 kc. better than 3500 kc. for traffic. W1TD says "QRL." and reports for W1BEO. W1AMG warns the gang to get building. W1ANZ is on signing W1ME. 7th Districts on 3500 kc. W1BGW handled some traffic with W1QAM. W1BZQ is preparing to use his 203A in an effort try 14 me. W1CQN has been very QRL. W1WV worked visiting W2CAY on the way. W1AFP has HPL amplifiers. Get in touch with W1BHM, the RM. W1MK has the usual W1ME. W1BUC reports. Keep them coming, F.E.H. W1NE delivered an important message from Hankow, China. to W1BSU. W1EJP 12. W1EFQ 10. W1AMG 9. W1WJ 8. W1AMO 7. W1ATC 6. W1BIV 2, W1UIC 3, W1BSJ 2.

Traffic: W1WY 411, W1LQ 297, W1BQG 184, W1ACH 126, W1LQM 119, W1AIF 98, W1AGB 62, W1BQG 61, W1AMH 58, W1AGK 55, W1CQG 30, W1UIC 29, W1CWW 22, W1CCP 15, W1KY 13, W1AICD 12, W1CQN 11, W1AZE 6, W1AIF 5, W1WV 4, W1MTE 20. W1BQG 32.

Traffic: W1BWM, W1LQ 257, W1BQG 61, W1AMH 58, W1AGK 55, W1CQG 30, W1UIC 29, W1CWW 22, W1CCP 15, W1KY 13, W1AICD 12, W1CQN 11, W1AZE 6, W1AIF 5, W1WV 4, W1MTE 20. W1BQG 32.

Traffic: W1WY 310, W1LQ 257, W1BQG 61, W1AMH 58, W1AGK 55, W1CQG 30, W1UIC 29, W1CWW 22, W1CCP 15, W1KY 13, W1AICD 12, W1CQN 11, W1AZE 6, W1AIF 5, W1WV 4, W1MTE 20. W1BQG 32.

Traffic: W1WY 310, W1LQ 257, W1BQG 61, W1AMH 58, W1AGK 55, W1CQG 30, W1UIC 29, W1CWW 22, W1CCP 15, W1KY 13, W1AICD 12, W1CQN 11, W1AZE 6, W1AIF 5, W1WV 4, W1MTE 20. W1BQG 32.
Spokane on the air. W7KQ is now 00. W7 AAX keeps on
gratulations, Karl, old-timer.
ionized around Aberdeen, and W7 AQB helps him do it.
next term, and we will all have to stand behind him. Con-
sold his 111G to the local airport for a radio-phone station.
and W6 DJX are smoking 'em out together these days.
of old Hartley is causing lots of trouble. W6WN reports
W6DXW 4, W6 BN :1, W6AC 2, W6PW 6, W6DPF 24,
W7KT 2, W7 KO 11, W7EK 9, W7AG 8, W7EX 7, W7AE 6,
W7J 2.

PACIFIC DIVISION
SAN FRANCISCO—SCM, C. F. Bane, W6WB—
W6ERK is taking lots of P. I. traffic originating in
S. F. and points east. W6DZJ handled 92 messages in
the month. W6ERK is the radio operator that will do it.
and have huge traffic totals. W6OF is about settled at new
QTH at Riverside. W6DCP was appointed Section Chief.
W6UH says conditions still poor at Hermosa Beach and
QRL at Cal. Tech. The Section total this month was 2161.

Traffic: W6ERK 3163, on one.

Traffic: W6ERK 212, W7BB 146, W70V 92, W7 KZ 61,
W70J 59, W7 AO 55, W7TX 48, W7 AC 45, W7 RT 47,
W7 TK 45, W7 QF 20, W7 AY 26, W7 AS 22, W7 AQ 24,
W7 AP 23, W7 AT 20, W7 KQ 14, W7 AT 14, W7 AQ 12,
W7 UK 9, W7 AG 8, W7 EX 7, W7 AE 6, W7 J 2.

SAN JOAQUIN VALLEY — SCM, E. J. Beall, W6VY—
By the looks of things this month, this Section will soon
be a contender for the white flag, W6VY heads the list of
traffic handlers. W6 HAHO ran up a good total with a
well-established schedule. W6VYI was elected with Christmas
Radio sales. W6UZ sends code practice on 1715 kc. on
Tuesdays and Thursdays at 9:00 p.m. W6BNH took unto
himself a wife, so traffic will have to wait a while. Eight new
ORS were appointed this month. W6AAO is working hard
to make the Section report. W6FBF is the new R.S.T. for Lodi.
W6AEM has W6MSE’s 852 on 7 and 3.5 me. W6AME is standing
by for the R. I. to take a commercial exam. W6AV reports
for the gang at Lodi. W6EJH swears by the MOFA. W6CUDL is
getting his new transmitter in shape for transocean schedules.
W6CNM promises good report next month. W6APJ cannot
be mistaken for QRN any longer. He has a good rectifier
now. W6AV is using crystal on 830 kc. Two new stations on
are W6AEF and W6AWV and W6VLA takes traffic in the
winter time. W6VYI is trying 75 kc push-pull.
W6DCG has a 204-A, and says he will now try to get out of
the 6th district.

Traffic: W6ERK 4, W6VY 28, W6HAO 49, W6BZ 22,
W6KU 74, W6AA 12, W6 AV 20, W6BY 81.

Traffic: W6ALX 217, W6CDG 143, W6GCM 118,
W6AKB 111, W6XZ 102, W6DZ 86, W6BSY 45, W6JR
41, W6ETZ 20, W6BZU 21, W6ASH 20, W6M6 16,

SANTA CLARA VALLEY—SCM, F. J. Quenette,
W6NX—W6YO was the star traffic station with W6BZ12
and W6DSZ behind the key. W6HM handled 446 transpa-
cible messages, one morning handling 41 from AC8HM "all
the gang". W6CUDL is the Section Chief Operator.
W6AVG, Sergeant at Arms; and Board of Direc-
tors, W6CUDL, W6AVG, W6TJ, W6WB.

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W6AKB 111, W6XZ 102, W6DZ 86, W6BSY 45, W6JR
41, W6ETZ 20, W6BZU 21, W6ASH 20, W6M6 16,
game with nice initial totals. W6ASE and W6ALW are frequency visitors at San Jose. W6BAX's Dad lost his life in an accident and the entire Section's sympathy is extended to "BAX." Congratulations are in order for the fine bit of traffic handling put over during the month; 1513 messages were handled, and it seems that the pop is sure breaking out. Sixteen stations reported to make this month one of the most successful since the section was organized. Thanks, fellows—keep up the good work.

ROANOKE DIVISION

WEST VIRGINIA — SCM, D. B. Morris, W8IM
Every one seems to be in favor of a West Va. night, so ’coon, gang, let me hear from all of you real soon. W8OK is doing well, W8BTV is doing good, W8NNW will work him after he reports them off-frequency. W8HDN was honored with a visit from Mr. M. T. M. VanSall, Jr., of Paid, Amsterdam, Holland. W8BTV reports by telegraph. W8BBW is out for another "Aussie." W8BIZ finds it will be a season to remember with the following reports. W6GO is a new ham. W8BY is coming on stronger than ever. W8BMT is a new ham. W8HIZ wants all the traffic he can find. W8AY and W8IM have combined and are using call W8I at W. V. U. W8BOE got in Dutch with the R. I. because some one was using his call on 4000 kc. W8DNN plans an increase in power. W9CBV says he can't get schedules. W8JM wants your ideas on how to pull this "W. Va. Nite" off, and how you think the prizes should be awarded.


NORTH CAROLINA — SCM, H. L. Caveness, W4DW — W4AHS has arranged some schedules and is setting down to regular ham duty. W4ADW sends in his first report. W4TR has been doing some experimenting on the phone. W4KN and W4HR are new hams at Duke University. W4ABV remembered us when he landed in Baltimore, and sent us a card saying that the commercial game is a business. W4ABV is keeping his "name" straight. W4ADW has not yet learned how to make a living without working, so was off the air most of the month. W4BC has been on 14 mc. working eleven countries using a TPTG circuit with a single type "10." W8AZ is doing good work at Asheville doing? W4ZB has been working on that transmitter he has been telling us about. W4AGO wants ORS blanks. Meet W4AE, who says that he is but six months old as a ham. W4EG is using a new rig made up according to the following recipe; a type "10" crystal oscillator, "10 buffer, "10 doubler, 203A intermediate amplifier, and finally a 204A amplifier.


SAINT LOUIS — SCM, H. A. Ambler, W6EO — W6AJR has his schedule with W6BAP. ORS W8BCH is now with KTAU at Phoenix. W6AJR had the misfortune to bump into some filter condensers. W6AEP is on with 'phone. W6BCH has his schedule with W6BT. W6BAP has a new radio mast, zapped and received so far is all set. W6BFB reports trouble with skip distance. W6CNK is experimenting with television. The P. A. T. Club held their semi-annual election for Grand Chancellor, and W6QY is holding the chair. The club held an open meeting and had as guest Mr. Allen Babcock, our Division Director, who gave us a fine talk. W6EBS and W6EPE are applying for ORS tickets.


ARIZONA — SCM, H. B. Shortman, Jr., W6BWS, W6ALU places well in the RPL. W6LRF reports one schedule. W6BFF is operating 3500 kc. ’phone. W6ANO is to be transferred to Cresson, Pa., where he will operate for Transcontinental Western Air Express. W6AKL is turning in the best traffic report each month. W6CGJ is now doing most of his work on 3500 kc. W6BYB is now an OBS. W6AHQ, a newcomer from San Diego, who is operating at KTAU. W6GCO reported direct to Headquarters. W6EFO resigned at KTAU to accept a position with Southern Air Express. W6DJH is relief operator at KTAU. W6DWE is now in Dallas, Texas, with Southern Air Express.

Traffic: W6ALU 549, W6EGC 97, W6BLP 38.

SACRAMENTO VALLEY — SCM, Everett Davies, W6DON — W6TM wins the prize that your SCM is offering each month for the best traffic report. A prize of at least five dollars worth of radio parts will be given to the operator turning in the best traffic report each month. W6CJG is doing most of his work on 3000 kc. W6BYB is now an OBS. W6BIS will be ready for a lot of winter traffic soon. W6BAX is the banner station again this month. W6UO has been busy finding a 75-watter for W9AOD. W6ACJ and W6BOS have been busy building a 76-watter for W9AOD. W6AM and W9CDE are both strong for the Army-Army Net. W9AAB and W9BGQ have received their ORS certificates. W9CDE is on the air. W9AAB and W9BON have five schedules. W9JZ has not yet learned how to make a living without working, so was off the air most of the month. W9BC has been on 14 mc. working eleven countries using a TPTG circuit with a single type "10." W9AJA is doing good work here. W9AF is at Asheville doing? W9ZB has been working on that transmitter he has been telling us about. W9OGO wants ORS blanks. Meet W9AE, who says that he is but six months old as a ham. W9BZ is using a new rig made up according to the following recipe; a type "10" crystal oscillator, "10 buffer, "10 doubler, 203A intermediate amplifier, and finally a 204A amplifier.


ROCKY MOUNTAIN DIVISION

COLORADO — SCM, Edward C. Stockman, W9ESA — The Associated Radio Operators of Denver sponsored a radio dance, which turned out to be a grand success. W9PBQ is doing good work, and W9FBR has been busy building a 76-watter for W9AOD. W9AAM and W9CDE are both strong for the Army-Army Net. W9AAB and W9BGQ have received their ORS certificates. W9CDE is on the air. W9AAB and W9BON have five schedules. W9JZ has not yet learned how to make a living without working, so was off the air most of the month. W9BC has been on 14 mc. working eleven countries using a TPTG circuit with a single type "10." W9AJA is doing good work here. W9AF is at Asheville doing? W9ZB has been working on that transmitter he has been telling us about. W9OGO wants ORS blanks. Meet W9AE, who says that he is but six months old as a ham. W9BZ is using a new rig made up according to the following recipe; a type "10" crystal oscillator, "10 buffer, "10 doubler, 203A intermediate amplifier, and finally a 204A amplifier.


QST FOR FEBRUARY, 1931
SOUTHEASTERN DIVISION

Alabama — SCM, Robert Troy, Jr., W4AHP — W4AHP has handled his power plant for WB4USI. The SOM was pleased by visits from W4TI, W7HX, W4CW. O. G. B. is a newcomer, W4-AJP of Mobile.

Georgia — SCM, W4JDM — W4JDM is keeping some schedules and leads W4USI. W4JY TX is in the A.-A. Net and A.-R.L. Net for the American Legion. W6DII sends official broadcast and announcements of UARO activities. W4JDM reports for contact with Porter also. He is working a schedule with W6AQB at San Antonio every day except Sunday at 10:30 a.m. College Station: W5AQX is again heard from. Bay City: W5AHF has been heard, but has not been positively ID'd. He is working with a schedule with W5BQW, an ORS.


Traffic: W5BPQ 1, W5JEC 1, W5JY 1, W5KX 1, W5MB 1, W5PV 1, W5QXM 1, W5RE 1, W5SSD 1, W5WJ 1, W9EAM 1, W9JDA 1, W9JEC 1, W9JG 1, W9JY 1, W9KX 1, W9LY 1, W9MB 1, W9MH 1, W9MUM 1, W9NQ 1, W9RH 1, W9SSD 1, W9YU 1, W9ZG 1.

Traffic: W5BPQ 1, W5JEC 1, W5JY 1, W5KX 1, W5MB 1, W5PV 1, W5QXM 1, W5RE 1, W5SSD 1, W5WJ 1, W9EAM 1, W9JDA 1, W9JEC 1, W9JG 1, W9JY 1, W9KX 1, W9LY 1, W9MB 1, W9MH 1, W9MUM 1, W9NQ 1, W9RH 1, W9SSD 1, W9YU 1, W9ZG 1.

Traffic: W5BPQ 1, W5JEC 1, W5JY 1, W5KX 1, W5MB 1, W5PV 1, W5QXM 1, W5RE 1, W5SSD 1, W5WJ 1, W9EAM 1, W9JDA 1, W9JEC 1, W9JG 1, W9JY 1, W9KX 1, W9LY 1, W9MB 1, W9MH 1, W9MUM 1, W9NQ 1, W9RH 1, W9SSD 1, W9YU 1, W9ZG 1.

Traffic: W5BPQ 1, W5JEC 1, W5JY 1, W5KX 1, W5MB 1, W5PV 1, W5QXM 1, W5RE 1, W5SSD 1, W5WJ 1, W9EAM 1, W9JDA 1, W9JEC 1, W9JG 1, W9JY 1, W9KX 1, W9LY 1, W9MB 1, W9MH 1, W9MUM 1, W9NQ 1, W9RH 1, W9SSD 1, W9YU 1, W9ZG 1.

Traffic: W5BPQ 1, W5JEC 1, W5JY 1, W5KX 1, W5MB 1, W5PV 1, W5QXM 1, W5RE 1, W5SSD 1, W5WJ 1, W9EAM 1, W9JDA 1, W9JEC 1, W9JG 1, W9JY 1, W9KX 1, W9LY 1, W9MB 1, W9MH 1, W9MUM 1, W9NQ 1, W9RH 1, W9SSD 1, W9YU 1, W9ZG 1.

Traffic: W5BPQ 1, W5JEC 1, W5JY 1, W5KX 1, W5MB 1, W5PV 1, W5QXM 1, W5RE 1, W5SSD 1, W5WJ 1, W9EAM 1, W9JDA 1, W9JEC 1, W9JG 1, W9JY 1, W9KX 1, W9LY 1, W9MB 1, W9MH 1, W9MUM 1, W9NQ 1, W9RH 1, W9SSD 1, W9YU 1, W9ZG 1.

Traffic: W5BPQ 1, W5JEC 1, W5JY 1, W5KX 1, W5MB 1, W5PV 1, W5QXM 1, W5RE 1, W5SSD 1, W5WJ 1, W9EAM 1, W9JDA 1, W9JEC 1, W9JG 1, W9JY 1, W9KX 1, W9LY 1, W9MB 1, W9MH 1, W9MUM 1, W9NQ 1, W9RH 1, W9SSD 1, W9YU 1, W9ZG 1.

Traffic: W5BPQ 1, W5JEC 1, W5JY 1, W5KX 1, W5MB 1, W5PV 1, W5QXM 1, W5RE 1, W5SSD 1, W5WJ 1, W9EAM 1, W9JDA 1, W9JEC 1, W9JG 1, W9JY 1, W9KX 1, W9LY 1, W9MB 1, W9MH 1, W9MUM 1, W9NQ 1, W9RH 1, W9SSD 1, W9YU 1, W9ZG 1.

Traffic: W5BPQ 1, W5JEC 1, W5JY 1, W5KX 1, W5MB 1, W5PV 1, W5QXM 1, W5RE 1, W5SSD 1, W5WJ 1, W9EAM 1, W9JDA 1, W9JEC 1, W9JG 1, W9JY 1, W9KX 1, W9LY 1, W9MB 1, W9MH 1, W9MUM 1, W9NQ 1, W9RH 1, W9SSD 1, W9YU 1, W9ZG 1.
W5RAM 55, W5BAD 54, W5SW 34, W5ALA 31, W5ARV 14, W5ASP 8, W5BY 4, WSGZ 4, W5JV 3.

NEW MEXICO - SCM, Leavenworth Wheeler, Jr., W5AHI - W5TV took over the SCM's schedules for a couple of weeks. W5ALJ, W5AHR, W5AND, W5AOD, W5AIRE, W5AOE and W5BHY have all enrolled in the Navy Net. W5ASW is working through with a nice total. W5ALJ does a little better each month. W5AUW is running him a close second. Be careful W5AOD doesn't come from behind and fool you. W5AJL is still rebuilding. W5BHY rebuilt his receiver. W5CQE was QRL. W5AOD is cramping for the commercial exam. W5AII busts into the BB again.


CANADA

1931 promises to be a banner year for Amateur Radio in Canada. From coast to coast come reports of new calls being issued, and we fully expect that all previous records in the number of licenses issued will be broken this year.

Fair results are now being had from the All-Canada Route. With a few more Quebec and Maritime stations to schedule Ontario, traffic would be moving 100% via the All Red Line from Ocean to Ocean. Keep Wednesday nights for Canadians.

CANADIAN GENERAL MANAGER
Alex Reid, VE2BE

MARITIME DIVISION

NOVA SCOTIA - SCM, A. M. Crowell, VE1IQ - VE1EB recently completed a new receiver. VE1EB has again flown to 14 mc. VE1AW is going strong on 3.5 mc. 'phone. VE1AX is working the 'A' right and left with his phone. VE1BR paid a visit to the bunch at Glace Bay. VE1CE is proud possessor of foreign QSL card bearing a photo. VE1DA is at it again with new transmitter and receiver. VE1DM returned from the U. S. A. VE1DIQ is now crystal-controlled on 3542.1 kc. and 3559.8 kc.

ONTARIO DIVISION

ONTARIO - SCM, C. D. Lloyd, VE3CR - I should like to extend my sincere thanks to all those who made my election to this important position possible, and to ask for the cooperation of all stations in the Third District in sending in reports promptly and regularly. VE3GT makes the BPL two ways. VE3HI is a good runner-up. VE3FC is carrying on in his usual thorough manner. VE3DQ is an applicant for ORS. VE3DE and VE3NB have been rebuilding. VE3BW has recently come on with a 50. VE3HG is a newcomer in Toronto. VE3BC has been busy with school. VE3AL is with us with a good report. VE3IC has BCL trouble. VE3GF, VE3CP, and VE3HL are heard consistently. VE3GV is about ready to come on with a 50. VE3BH has rebuilt his receiver using 2-volt tubes. VE3BT is on the air with a new 14 mc. 'phone using crystal. VE3EC is putting in crystal control. VE3GX, VE3XY, and VE3HF are all on the job. VE3GP has a type '10 on both 'phone and c.w. VE3BW says he can work any 'phone he can hear. VE3XXA is on occasionally. VE3FX is working real DX on 14 mc. VE3IC is working on cutting with a nice signal every chance he gets. VE3DA is working mostly on 3500 kc. VE3GX reports VE3HN and VE3GB, new hams in Fort William. VE3DQ has been making improvements in his station. VE3AD reports difficulty in getting schedules. VE3DM reports weather conditions very poor for radio. VE3HD has a good total. VE3HA reports northern lights very bad. VE3FD is working 'phone on 3500 kc. and C.W. one 3559.8.

Traffic: VE3GT 321, VE3HA 104, VE3HD 43, VE3AL 29, VE3GK 17, VE3AD 10, VE3GX 9, VE3DW 8, VE3DA 7, VE3FD 3, VE3CB 2, VE3HB 3.

QUEBEC DIVISION

QUEBEC - SCM, Alphy Blais, VE2AC - VE2CA works DX on 14 mc. 'phone and C.W. on 3.5 mc. VE2AV uses crystal control at W51C. VE2AM is on 3530 kc. for 'phone. VE2CL is going fine. Report from VE2AP states VE2BO is active on 7 and 14 mc. VE2CP is handling traffic. VE2CO is on 7 mc. with low power. VE2AH, VE2CA, VE2DH, VE2EM and VE2AL are on 'phone on Sunday mornings. The ORS total is two at present: VE2BE, VE2CA. VE2AC worked five continents on 14 mc. this month. Reports were few this past month. We certainly can and must do better. Let's report to the SCM before the 15th each month. The Quebec Division must be the leader in 1931. A very successful ham-fest was held December 17th at VE2BE. Many amateurs were present, including VE4DL. Prizes donated were won by L. S. Coulton, radio inspector; a UX299 and UX222 won by VE2BY and a UX227 and UX224 drawn by VE2DN.


VANALTA DIVISION

ALBERTA - SCM, G. F. Barron, VE4EC - VE4EI crashes the BPL. VE4DT has built the November QST push-pull. A prospective ham at Limestone will soon be in the game. VE4GM reports via radio. VE4EB and VE4BJ are still quiet. VE4GT still buzzes around. VE4EA is using push-pull. VE4FY is pumping out a FB DC signal on 7000 kc. VE4CU manages to get on once in a while. VE4HM is QRL on the railroad. VE4GD reports via radio. VE4GQ is QRL. A banquet, attended by approximately thirty or forty, marked the opening, officially, of the A. R. E. A. station, which is now active at Calgary. VE4DX worked Panama, BAN. VE4JH, VE4GY, VE4CY, VE4EM, VE4CG, VE4XK, VE4KT and VE4IT are all active stations in Calgary. VE4CY has got the ease for 'phone and VE4AW is a 3500-kc. 'phone outfit. VE4EA is planning on building one.

Traffic: VE4EI 302, VE4GD 150, VE4DT 16.

BRITISH COLUMBIA - SCM, J. K. Cavaysky, VE5AL - VE5BR is on with four daily schedules. VE5AW is on 3500 kc. VE5CO is still fighting QRM. VE5BP burned up his motor generator. VE5EC has rebuilt on 14 mc. VE5CB has been on a few times. VE5DA has a pull-pull transmitter. VE5CW reports fine DX on a pair of type '10s. VE5AN lost his job. VE5FKL is talking of moving. VE5GD is hard at work on a push-pull. VE5GQ has built the November 3500-kc. transmitter. VE5BP hasn't had much time lately. VE5AJ has put out a nice signal. VE5BP hasn't had much success with his Hartley. VE5AC manages to handle the odd message. VE5AG is on again.

Traffic: VE5EC 13, VE5AC 9, VE5AM 6, VE5AN 12, VE5BP 2, VE5FD 1, VE5AL 36, VE5AG 12, VE5AJ 2.

PRAIRIE DIVISION

MANITOBA - SCM, A. V. Chase, VE4IR - VE4DK again leads the section. Three new stations made their appearance this month: VE4AG, VE4KK and VE4KA. VE4AF, VE4FN and VE4TV are giving good reports. VE4BD has reported heard in England with his 14-mc. 'phone outfit. VE4IR has been trying out 28 mc. during week-ends. VE4IS is still working DX on 14 mc. VE4BU was out of commission three weeks awaiting replacement of a defective grid leak. VE4FN is mourning his loss of the two type '10s.

Traffic: VE4DK 43, VE4BD 13, VE4BU 7, VE4IR 7, VE4IS 8, VE4FB 3, VE4FF 1.

SASKATCHEWAN - SCM, W. J. Pickering, VE4FC - VE4BB has been appointed RM. Give him your help, fellows. VE4CN is on again with a new receiver. VE4GN is a new ham at Glashlyn. VE4CV is an aspirant for an ORS. VE4QG is on Sundays. VE4BU has a fine 'phone outfit. VE4BP, VE4CT and VE4AV have all put in for their licence. VE4QG has broken into the traffic list. VE4QG has been reported heard in England with his 14-mc. 'phone outfit. VE4IR has been trying out 28 mc. during week-ends. VE4IS is still working DX on 14 mc. VE4BU was out of commission three weeks awaiting replacement of a defective grid leak. VE4FN is mourning his loss of the two type '10s.

Traffic: VE4DK 43, VE4BD 13, VE4BU 7, VE4IR 7, VE4IS 8, VE4FB 3, VE4FF 1.