QST
DEVOTED ENTIRELY TO
AMATEUR RADIO
PUBLISHED SINCE 1915 BY THE AMERICAN RADIO RELAY LEAGUE INC.

AMATEUR RADIOTELEPHONY
AT LOW COST
SEE PAGE 9

SEPTEMBER, 1929
25¢
Wouldn't You Like To
Be a Radio Amateur?
Are You Wondering
How To Go About It?

The American Radio Relay League, the national association of radio amateurs, has undertaken to make it easy for you by publishing a book designed for that very purpose. Amateurs everywhere hail it as the most valuable guide to practical amateur radio which has ever appeared.

The Radio Amateur's Handbook

(FIFTH EDITION—in its 53rd thousand)

By F. E. HANDY and ROSS A. HULL
of the A.R.R.L. Headquarters Staff

Here is information about amateur radio from men who are real radio amateurs themselves, written so you can understand it. It starts in at the very beginning of the subject and tells you just what Amateur Radio is, what it's all about, how to be a radio amateur, how to get started in this most intriguing of avocations, how to learn the code, how to get your licenses, how radio works, how to build the apparatus for a simple station, how to operate a station. It has chapter after chapter on the construction of apparatus; different kinds of receivers and senders, power supplies, frequency measurement, transmitting antennas, all written so that you will be able to build them yourself and make them work. The whole story of amateur radio is in this book — its very purpose is to tell these things to the folks who are looking for the key to this great hobby.

The Handbook is printed in QST format, to keep the price down. In usual text-book printing style it would be a book of over 500 pages and would cost around $5. The simpler style puts it in 200 pages like QST's style and makes the price a modest $1. It is the biggest dollar's worth of radio information you ever saw.

Break In—Let the Handbook Be Your Guide

Blue-and-gold paper cover  Stiff buckram cover
$1  Postpaid Anywhere  $2

American Radio Relay League, Hartford, Conn., U.S.A.
AMATEURS who operate phone transmitters of medium power will find that Radiotron UV-849 is a very effective modulator. Its characteristics have been so designed as to make it particularly suited for use with oscillators operating at plate voltages of from 2000 to 3000 volts. The high quality of phone transmission obtainable through its use will gratify the most exacting amateur.

Then too, Radiotron UV-849 will give remarkably smooth and stable performance when used either as an oscillator or as a radio frequency amplifier at frequencies below 3000 kilocycles (wave-lengths above 100 meters).

Filament Volts 11  Filament Amperes 5  Amplification Factor 19

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Write nearest RCA District Office for further information.

RADIOTRON DIVISION

RADIO-VICTOR CORPORATION OF AMERICA

New York—261 Fifth Avenue
Atlanta—101 Marietta Street  Chicago—100 West Monroe Street
Dallas—Santa Fe Building, Unit No. 1  San Francisco—235 Montgomery Street

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The Crosley Unitrad — the "big news" in Screen Grid Radio!

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Say You Saw It in QST — It Identifies You and Helps QST
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**Acting for the summer.**
FOR FIFTEEN YEARS

the General Radio Company has been manufacturing instruments for the amateur which have made a reputation for sound design, quality, and reliability. Among these are

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Quartz Plates for
    Piezo-Electric Oscillators
Audio Amplifier Transformers
Power-Supply Transformers
Variable Air Condensers (for work on short waves)

New items are under development. Send for Bulletin 931-X and ask to receive future announcements as they appear in the General Radio Experimenter.

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30 STATE STREET 274 BRANNAN STREET
CAMBRIDGE, MASSACHUSETTS SAN FRANCISCO, CALIFORNIA
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The American Radio Relay League

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

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is non-commercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the world and has a history of glorious achievement as the standard-bearer in amateur affairs.

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

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ADDRESS ALL GENERAL CORRESPONDENCE TO THE EXECUTIVE HEADQUARTERS AT HARTFORD, CONN.
ELSEWHERE in this issue appears the customary annual advertisement in solicitation of nominations for A.R.R.L. Director in certain of our divisions. It is part of the operation of A.R.R.L.'s normal machinery of government. This seems a good time to present a few thoughts about that form of government.

The American Radio Relay League is proud of its form of government. It is ideal; it has stood every test. Under our constitution the United States is divided into thirteen divisions. The membership in each of these divisions, by nominating petitions and then by balloting, chooses one of its members to be a director. Similarly the amateurs in Canada (and Newfoundland and Labrador) choose one of their members to be the director known as Canadian General Manager. Then these fourteen men elect a president and a vice-president, and the whole sixteen constitute our Board of Directors. They meet periodically to go over A.R.R.L. affairs with a fine-tooth comb. The League pays the expenses for these meetings, several thousand dollars each. The sessions generally last two days. One such meeting was held in May, as reported in a recent issue. With just one single exception on the part of one director who was ill, every director has attended every meeting since the League adopted its present constitution in 1923.

Here is the finest type of representative government. It is typical of the way things are done in a democracy. It is as sound as the government of our country, and that's pretty solid. Amateur position and prestige today are attributable to the wisdom, the foresight, the experience and the hard work of this Board. The Board is the absolute "boss" of A.R.R.L. and the League is exactly what the Board makes it.

On the other hand, the Board is exactly what the membership makes it. Each member has a vote in the choice of his director. Do we seem to hear some grumbling against the Board? We suppose it's only natural. One knows that everybody can't be suited all the time, and in the quest of the wisest decisions on difficult problems there are bound to be cases where somebody isn't satisfied. If the membership doesn't like the personnel of the Board, it is its inalienable privilege to change that personnel at election time. Elections are about to be held in half of the divisions— that is the purpose of the announcement referred to. Whenever the membership doesn't like the Board, whether that Board is good, bad or indifferent, the membership's plain duty is to elect the best possible men as directors and then give them loyal cooperation as its spokesmen, always remembering that this League is run on the old and familiar platform of the greatest good to the greatest number. Our directors are human beings and doubtless some of them possess more vision than others, but they are all amateurs, all loyal, all giving whole-heartedly of their time and energy on behalf of amateur radio. If a director isn't every thing he should be, it's nobody's fault but the membership of the division that elected him—the division membership chooses its own spokesman. It's just like Congress—the Board is under the obligation of accepting into its number whenever the membership of a division picks as its representative, and nobody else has the right to speak for that division. If the members decide they don't like their choice, they have the privilege of changing it when the next election rolls around.

Such an opportunity is now offered in half our divisions, the other half having had elections last year. Members should understand that they are earnestly invited to name, work for and vote for the man of their choice as their director, because when the vote is cast and a choice is made by the majority they are just as earnestly urged to cooperate with that director until the next election occurs. There's nothing new about that idea—it's typical of American government.

At the recent meeting of our Board it was apparent that there is strengthening sentiment around the country in favor of the abolition of A.C.C.W. and I.C.W. Unnecessary modulation causes unnecessary interference, and in cases where the transmitter itself is not nicely stable it means that "wobbling" occurs, with a broad interfering signal that has no right on the air these days. The Board is loath to seek a regulation against modulated plate supplies, however, because it feels that every amateur ought to be free to use anything that he can make perform properly and because our Technical Development Program has demonstrated that it is possible to avoid "wobbling" from modulated plate supplies.

The answer to this problem remains in the hands of the individual amateur. Alternating-current plate supply is the cheapest and simplest.
It can be made to produce a good clean hard signal if the precautions outlined in QST are observed to avoid "wobulation." The chief precautions are the use of high-C circuits and, if full-wave self-rectification is used, the employment of some method to make the two halves of the circuit work on exactly the same frequency. QST has explained this very fully. If these precautions are not taken, then A.C.C.W. remains just what it has always been in a hum transmitter—a terrible nuisance in the form of an emission which zigzags back and forth over a wide band at the modulation frequency, obliterating everything inside its limits. Obviously this can’t be permitted to go on indefinitely. Amateurs who desire to retain the benefit of the cheapness and simplicity of A.C.C.W. must consider themselves under the obligation of rebuilding their transmitters so that they put out "1929 signals," or something will have to be done about a.c. supply.

The ideal signal is pure C.W. Trick modulations are to be avoided like poison. They give "individuality" at short range, perhaps, but they make "selfish signals" that prevent somebody else from operating, and at greater ranges their efficiency is vastly reduced. So long as we use heterodyne reception (and nobody has discovered a better method) the clean and steady unmodulated C.W. signal will win every time, in range, reliability, and reception through interference and atmospheres. K. B. W.

Rocky Mountain Division Convention
Sept. 6th and 7th at Denver, Col.

The Argonaut Hotel has been chosen as the headquarters for this year’s Annual Rocky Mountain Division Convention to be held in Denver Sept. 6th and 7th under the auspices of the Associated Radio Operators Club. A fine program has been prepared; good speakers on timely subjects have been obtained, and the entertainment committee will do its best for every one. A.R.R.L. Headquarters has promised that Treasurer-Fieldman Hebert will attend. A cordial invitation is extended to all.

- Strays -

All amateurs, and the West Coast gang in particular, will be interested in the reason for the unusually long absence of VE5GO from the air. The achievements of Earle Chang, the owner and operator, in high frequency work have recently attracted the attention of the Nationalist Government of China and negotiations were opened with the result that on February 2d Earle sailed from Vancouver on the Empress of Russia to take an important post in the Radio Bureau of the Nationalist Government. With him he took a complete 1929 t.p.t.g. transmitter, an exact duplicate of the "High-power 1929 Transmitter," and also a 1929 receiver using the peaked audio system, all as described in QST. Not only has one of the best-known hams on the West Coast transplanted himself to China "complete with station," but also the A.R.R.L. will have a staunch supporter in China holding what, in all probability, will develop into a high government position in the Radio Bureau. - E. A. Westlake, S. S. Griffin.

When referring to the Handbook in letters to the Technical Information Service, please mention the edition number. There are now five editions and the same material does not always occur on corresponding pages of all editions.

The secondary of an Era 1000-cycle peaked audio transformer hunted by a 500-muf. fixed condenser is the feline’s love call as the impedance in place of the Ford coil secondary) in the plate circuit of the 222 tuned audio amplifier.

- W9EUV -

W5CNZ found that a burned-out 2 c.p. bulb could be substituted for the resistor used to drop the plate voltage for the oscillator in his oscillator-amplifier transmitter a la September, 1928, QST. The plate voltage supplied to the 852 in the amplifier is 1000, and using a 210 in the oscillator the drop through the burned-out bulb is 800 volts.

W5KX uses three mercury arcs to rectify his three-phase plate supply with a pair of 2-amphere tungar bulbs in a full wave keep-alive for all three arcs. Individual keep-alive chokes are used in the feed to each arc, but only one arc will operate unless a 1½ henry choke is connected in the positive high-voltage lead from each arc before the leads are connected together.

Victor T. Schmitt of St. Louis went on a still hunt for mercury to equip his variable with mercury contact a la R.E.L., snaffled it from the back-porch thermometer, lost track of the temperature and next morning found his Ford in the yard with a frozen and burst water-jacket. Moral: If you must gyp the thermometer, do it in the summer.

Correction on Modulometer Article
Footnote 2 at the bottom of page 14 of August, 1929, QST should be corrected to read, “The accuracy of measurement is within 5 per cent — .”
An Effective Low-Cost 'Phone and C.W. Transmitter of Modern Design

This transmitter, heralded in the August issue of QST, has more than come up to the fondest expectations not only on the score of performance but also in low cost of construction. It places the oscillator-amplifier type of transmitter in the price range of the self-excited r.f. of equivalent power output.

—EDITOR

By James J. Lamb, Technical Editor, and Beverly Dudley, Assistant Technical Editor

In order that it may be of maximum value to the greatest number, an amateur transmitter, 'phone or C.W., must be designed to give the greatest possible return in effective miles-per-watt per dollar expended. The actual attainment of this ideal combination of fore, need not so much guard against reckless abandon in designing the expensive technically idealistic sort of rig but rather must we beware of becoming niggardly in providing sufficient equipment of the right type to give us our money's worth in ultimate performance. There is many an

technical and economic balance is indeed a nice problem, for it is easy enough, on the one hand, to be carried away by technical idealism at the expense of economy in cost, and, on the other, to be stampeded by parsimony to the detriment of truly effective design.

We hams are not all located on Wall Street, nor do we have at hand the facilities and personnel of a G. E. Research Laboratory. Most of us, there-

otherwise good set in which an apparently slight change in design in the interest of false economy has resulted in a relatively enormous sacrifice of performance. It pays to be sure a penny-wise design may not pan out a pound-foolish flop. Fortunately, there is a point at which satisfactory economy in cost can be realized with no considerable sacrifice in performance, and the transmitter presented in this article may be considered

THE RADIO-FREQUENCY PORTION OF THE TRANSMITTER READY FOR 3500-KC. C.W. OPERATION

The push-pull oscillator with the resonant choke in its grid circuit is at the right. The screen-grid buffer-amplifier stage is at its left and the power amplifier follows. The split antenna inductance is mounted on the antenna tuning condenser at the extreme left. Pilot "widget" condensers, equipped with white cardboard for marking calibration, are used for tuning the oscillator and buffer-amplifier plate circuits. The neutralizing condensers are the double-spaced widgets mounted vertically to the left of the power amplifier tubes. In the foreground are the key, tuning lamp and a crystal mounting which may be plumbed in the oscillator grid circuit replacing the resonant grid inductance.
as very nearly representing the optimum in economy with thoroughly effective performance.

Features of the transmitter which may be specifically given in advance of the detailed description are:

1. Effective performance on both phone and C.W. On phone the carrier output is of the order of 7 watts which, modulated by the 100 per cent of 7 watts which, modulated by the 100 per cent scripton are:

2. Minimum cost compatible with maximum effective power output. This economy is made possible by the use of comparatively inexpensive receiving type tubes requiring low plate voltages, permitting the use of low voltage transmitter parts and plate supply. The total cost of the parts for the C.W. portion of the transmitter should not exceed $50.00, tubes included, while the speech amplifier and modulator unit components represent an outlay of about $40.00. These prices are

3. The simple design, construction and adjustment together with the wide availability of the parts specified should make it possible for the system, gives a peak output of over 25 watts. Satisfactory frequency stability, with or without crystal control, is attained on both phone and C.W.; and when used as a C.W. telegraph transmitter, proper adjustment permits a power output of 15 watts.

4. Improved efficiency. The total outlay, including plate supply, filament transformer and bias batteries, should not exceed $150.00.

CONSTRUCTION

To make the transmitter as adaptable as possible, it was built up in three units: the oscillator buffer-amplifier unit, the modulated amplifier unit, and finally the speech amplifier and modulator unit. The photographs show the general appearance of the three units as well as the bottom view of the two radio frequency units. It will be noted that the "bread-board" style of construction has been followed throughout. This type of construction permits accessibility of all units and wiring, is economical, and is easily executed. Furthermore, such construction per-
mits a considerable portion of the wiring to be done below the supporting baseboard, so the top of the unit presents a neat clean-cut appearance. The bread boards used in the radio-frequency portion of the transmitter were 12 inches by 18 inches, and were given two coats of Duco colorless finish. The 12-inch by 18-inch modulator board was finished in a similar manner. All connections on the two radio-frequency boards are made with Fahnestock clips, while 'phone jacks and plug and a battery cable are used in addition to the clips on the modulator board.

THE OSCILLATOR AND BUFFER-AMPLIFIER

While it is highly desirable that the output frequency of a high-frequency 'phone transmitter be controlled by a quartz crystal, the purchase of a crystal and holder represents a considerable investment for the average amateur. Although the technical reasons for a "self-controlled" oscillator were rather exigous, it was realized that there was an economic as well as a technical problem involved, and an oscillator was designed which could be made self- or crystal-controlled with no greater modification than the substitution of a resonant choke coil for the quartz plate in the grid circuit of the oscillator and a high-C tuning unit in its plate circuit. For those amateurs who have crystals, we heartily recommend the use of quartz plates, although any who do not possess a suitable crystal may obtain results very nearly as satisfactory in the manner to be described.

It is well known that when the grid and plate circuits of a vacuum tube contain resonant elements the circuit will oscillate at a frequency determined by the constants of these elements. Under such conditions, the tube will oscillate at radio frequencies over a considerable range with a fixed-tune grid circuit element, the frequency of oscillations in this case being determined by the inductance and capacitance in the plate circuit. If a fixed-tune choke coil is used to replace the quartz plate of a crystal-controlled oscillator, we obtain a tuned-grid tuned-plate type of oscillator with only one variable tuning adjustment — the tuning condenser in the plate circuit. The resonant choke coil permits QSY over a frequency band sufficiently wide for practical purposes when battery bias is employed, and by simply varying the plate circuit tuning, we have a very excellent means of quickly shifting the frequency. At the same time the screen-grid buffer-amplifier effectively prevents the antenna circuit and power amplifier from reacting upon the oscillator, so that the power output and frequency stability when using the high-C self-controlled oscillator compares favorably with the output and stability when using the crystal-controlled oscillator. As may be seen from the photographs, the grid circuit of the oscillator is provided with two switch jaws, into which the resonant choke coil

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1 "Self-controlled" is suggested for designating the type of oscillator circuit in which the frequency of oscillation is determined by the LC constants, as contrasted with the "crystal-controlled" type oscillator wherein the frequency of oscillation is determined by the oscillation frequency of a quartz crystal. While the term "self-excited" is often used in this sense, it is more specifically applicable to the specification of the source of excitation than of the type of frequency control. As a matter of fact, both "self-controlled" and "crystal-controlled" oscillators are self-excited.

2 When grid bias is obtained by the use of a grid leak resistor, no bias is available until grid current flows, which does not occur until the tube starts to oscillate. This is evidenced by the "lag" in going into oscillation as the circuit is tuned. With battery bias, the oscillations are more easily started and persist over a wider range of tuning adjustment.
may be inserted as shown or into which the crystal holder may be plugged.

The oscillator uses two UY-227 tubes in a push-pull arrangement. The use of the indirectly heated cathode type of tube is a considerable improvement over the use of the directly heated cathode type in the elimination of low frequency hum when alternating current is utilized to heat the filament. The operating characteristics of the UY-227 are identical with those of the UX-

boiling in paraffin wax. It is essential, in order to preserve the balance of the circuit, that both halves of the choke be identical.

When the oscillator is to be of the self-controlled type the resonant choke, $L_n$, will be required. This choke consists of 110 turns of No. 26 d.c.e. wire wound on a bakelite tube 1 inch in diameter for 3500 kc. If it is definitely decided not to use crystal control, this coil should be tapped at the center, the center tap being connected to the oscillator negative grid bias. The choke coils, RFC, as mentioned above, may then be eliminated.

The plate circuit, when a quartz crystal is used to control the frequency, contains the inductance, $L_o$, shunted by the 100-$\mu$fd. Pilot midget receiving condenser. For 3500-kc. operation $L_o$ consists of 20 turns of No. 20 d.c.e. wire, wound on a bakelite tube 2 inches in diameter and center-tapped, or else in two sections, both wound in the same direction, of 10 turns each. When the oscillator is to be self-controlled, the plate circuit should be of the high-C type so that maximum frequency stability may be realized. This is accomplished by reducing the number of turns in the plate coil and augmenting the capacity across it by means of a fixed receiving type condenser of proper capacity. For the 3500-kc. 'phone band, the coil should contain 10 turns, center-tapped, and the fixed condenser should be of 500-$\mu$fd. capacitance. Specifications of high-C plate circuit tuning units for the other amateur bands are given in Fig. 1. It may be found that a slight variation from the number of turns specified may be necessary, as the actual capacitance of commercial fixed condensers often varies considerably from that indicated on the label. The oscillator output circuit is coupled capacitively to the buffer-amplifier input circuit through two 100-$\mu$fd. Pilot fixed receiving condensers.

Radio frequency by-pass condensers, $C_i$, are used across the grid bias and plate supply leads. A word might be said at this point regarding the use of by-pass condensers in push-pull circuits. If the circuit is carefully built so that one side of the push-pull circuit is electrically identical with the other side of the circuit there should be no radio frequency currents flowing in the grid and plate return leads, the cathode circuits, or the center-tapped filament circuit, and the condensers may then be eliminated. However, the condensers are cheap insurance, easily procurable, and it is believed that their use is well warranted.

**THE BUFFER-AMPLIFIER**

Coming as it does upon the heels of the above
insistence upon economy in design of the amateur transmitter, the specification of a buffer-amplifier in such a simple transmitter as this may seem to some a reversion to extravagance. Such, however, is not at all the case. The buffer-amplifier has a dual and necessary function in an oscillator-amplifier type of transmitter, whether it be intended for use on 'phone or C.W. It serves to provide a voltage and power gain between the oscillator and power amplifier and at the same time prevents the unavoidable variations in power amplifier constants due to modulation or keying from reflecting back into the oscillator circuit and thereby causing undesirable variation in the oscillator frequency. The use of such a buffer stage is heartily recommended in any oscillator-amplifier type transmitter, crystal-controlled or otherwise. Its use in many C.W. transmitters at present afflicted with serious feed-back from the amplifier to the oscillator with the certain accompaniment of frequency flutter and creeping would be decidedly an advantageous investment. Some crystal-controlled transmitters never seem to grow up — they always creep.

The buffer-amplifier uses two UV-224 screen-grid tubes, which, like the UV-227 tubes, have indirectly heated cathodes. The grid circuit of this amplifier, like the oscillator, contains two radio-frequency chokes. The chokes are constructed exactly like those used in the grid circuit of the oscillator, which have already been described.

The plate circuit of this amplifier contains another 100-µfd, midget tuning condenser shunted across the coil, L₃, which consists of 20 turns of No. 20 d.c.c. wire on a 2½-inch bakelite tube. The inductance, L₃, is either center-tapped, or wound in two sections, the same as L₂. The output of the screen-grid amplifier is taken from the two Fahnestock clips at the extreme left of the oscillator-amplifier panel, to which are connected the two output coupling condensers of 250-µfd, capacitance each.

Care should be taken to make all of the filament supply wires heavy and of equal length. The current drawn by two -27 and two -24 tubes is 7 amperes, and the filament wires must be sufficiently heavy to carry this current. Not only must the filament wires be sufficiently heavy to carry the current, but they must be sufficiently large so that excessive I/R drop will not occur in the leads. As the filaments of the four tubes are all connected in parallel, it is essential that the length of the leads to any tube from the filament supply binding posts be identical with the length of any, or all, of the other filament leads to the supply posts. If this point is overlooked the drop in some filament lines will not be the same as that of other filament lines and the tubes will operate with different filament voltages. The bottom view of the oscillator-amplifier unit will show the care which has been exercised in this respect to keep all filament leads of equal length.

Closed circuit jacks are provided in the negative side of the plate voltage leads of both the -27 and the -24 tubes. A plate milliammeter provided with a cord and telephone plug is inserted into the proper jack for the determination of the plate current in either the oscillator or the amplifier. Thus, one 0–100 milliampere meter will measure the plate current of all of the tubes in any circuit, thereby affecting economy by not requiring a multiplicity of meters.

By-pass condensers are used across the grid, screen grid, and plate supply terminals of the buffer-amplifier. The condensers C₁ are 1000-µfd. mica insulated receiving condensers, while C₃ is a 0.5-µfd., 750-volt Tele filter condenser. For this larger condenser, C₃, a 1000-µfd. receiving condenser the same as C₁, could be substituted.

The photographs both of the top and bottom of the oscillator-amplifier unit, together with the detailed wiring diagram of Fig. 1, should permit any amateur worthy of the name to duplicate this unit. There is no neutralizing or laborious testing to be done.

The Modulated Amplifier

Like the oscillator and buffer-amplifier unit, the modulated amplifier uses receiving parts exclusively. The only indication of any transmitting equipment in the entire transmitter is the set of three coils made of 3/16-inch copper tubing. The final amplifier makes use of the UX-245 type tubes, which, because they are directly heated, require a filament center-tap resistor. Two 50-ohm Yaxley units connected in series serve the purpose, while two 1000-µfd. fixed receiving condensers serve for the radio frequency by-pass in the filament circuit. Another 1000-µfd. by-pass receiving condenser is employed as a radio frequency by-pass across the amplifier grid bias battery.

It should be noted that no by-pass condenser is employed across the plate supply terminals of the power amplifier. The reason for the omission of this by-pass condenser is that the plate voltage for this amplifier is obtained from the plate circuit of the modulator tube, and since plate voltage variations of the modulator tube (and consequently of the modulated amplifier tubes) occur at audio frequencies, the higher audio frequencies would be by-passed if this condenser were used across the plate voltage terminals. A 1000-µfd. by-pass condenser may be used in this position if the transmitter is to be used exclusively for telegraph transmission, however.

The choke coils used in this amplifier are identical with those used in the grid circuits of the oscillator and screen-grid buffer-amplifier, constructional data for which have already been given. The tank inductance of the modulated amplifier, L₁ of Fig. 2, consists of 16 turns of 3/16-inch copper tubing, center-tapped. In making the
Cardwell receiving type condenser. The maximum each coil is flattened and a hole drilled in this length of the feeders if a Zeppelin antenna is case being another 350-μfd. Cardwell receiving type condenser is employed.

The antenna coupling coils, $L_1$, are placed at both ends of $L_2$ and the coupling between the tank inductance and each of the two coils marked $L_2$ is made the same to load both sides of the circuit equally so that each of the two UX-215 tubes contributes its share of antenna power. Each coil consists of 6 turns of 3/16-inch copper tubing, 2 1/2 inches inside diameter. One end of each coil is flattened and a hole drilled in this flattened part in order to provide a pivot mounting for varying the coupling between the coils $L_2$ and $L_1$. In winding and mounting the coils $L_2$ care should be exercised to note that both of the antenna coils are wound in the same direction. If this point is not observed, the antenna current in one of the coils will neutralize that in the other coil, and little, if any, power will be radiated by the antenna system. The coils are mounted on the antenna tuning condenser as shown, the antenna condenser in this case being another 350-μfd. Cardwell receiving type condenser. The maximum capacitance of the tuning condenser required in any given installation will depend upon the natural frequency of the antenna system or the length of the feeders if a Zeppelin antenna is used, as well as on the number of turns used in $L_2$. In practice, the number of turns in actual use in each antenna coil should be the same.

Neutralization

The amplifier is neutralized by means of two Pilot 100-μfd. midget receiving condensers which have their alternate plates removed so the resulting capacitance of the double-spaced condensers is approximately 25 μfd, each. With the UX-215 tubes complete neutralization is obtained when approximately one-third of the capacitance of each neutralizing condenser is in the circuit.

A jack is wired in the filament center tap of the modulated amplifier so that, by plugging a key in this jack, the radio frequency units may be used without the modulating equipment for continuous wave telegraph transmission.

Note that small choke coils to prevent parasitic oscillations are mounted as close to the grid terminals of the sockets of the UX-215 tubes as is practical. Each choke consists of 15 turns of No. 22 d.c. wire, wound on a 1/2-inch dowel rod, the coils being afterward removed from the dowel and made reasonably strong and self-supporting by an application of Duco. The photographs and the wiring diagram of Fig. 2 show the rest of the details clearly and further explanation should be unnecessary.

THE SPEECH AMPLIFIER AND MODULATOR

The modulating unit comprises a microphone coupling transformer, speech amplifier tube, an audio coupling transformer to the UX-215 tube, the UX-250 modulator tube, a double speech choke with its modulating amplifier plate supply resistor, audio by-pass condenser, and the 0-100 milliammeter for measuring the current of the various plate circuits. This unit is the same as the one used with the 'phone transmitter described in the March, 1929, QST and changed so as to use a UX-227 rather than a UX-201-A speech amplifier tube.

A microphone or modulation transformer with a low impedance primary winding of the single button type is used to couple the microphone to the grid circuit of the speech amplifier. Across the secondary of the microphone input transformer is a 200,000-ohm potentiometer which acts as a volume level control. The output of the 227 tube is fed into the grid circuit of the UX-250 modulator tube through a high quality audio frequency amplifying transformer. With single button microphones, a single stage of speech amplification is sufficient, although two stages of transformer-coupled audio frequency amplification, or its equivalent, should be employed if the less sensitive double button microphone is used.

The plate current for the modulator is fed from a 500-volt supply to the UX-215 tube through an audio frequency choke coil. The inductance of this choke should be in the neighborhood of 20 to 30 henries to keep the d.c. plate current constant when audio frequency voltage variations are applied to the grid of the modulator tube. A double "B" eliminator choke is used for this purpose. One portion of this choke is used in the modulated amplifier plate circuit while the other half is wired into the modulator plate circuit.

The radio frequency amplifier plate current is varied at audio frequencies through the large audio by-pass condenser connecting the "high" sides of the double choke. Thus, when the voltage on the grid of the modulator tube is varied at voice frequencies and the modulator grid becomes less negative, the modulator plate current tends to increase. Due to the impedance of the two choke coils at these frequencies, the current flowing through their windings is kept constant and power is drawn by the modulator through the coupling condenser from the plates of the modulated amplifier tubes. When the grid of the

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1 For more complete data on speech amplifier design, see QST, August, 1929, page 13.
modulator tube becomes more negative than its normal bias, the converse action takes place. The power output of the modulated amplifier tubes varies directly as their plate power input. Therefore the antenna power is varied in accordance with the sound input to the microphone. A 5000-ohm resistor is placed in series with the choke coil feeding the modulated amplifier, as complete modulation is not possible unless the plate voltage of the modulator exceeds that of the modulated amplifier.\(^1\)

**OPERATION OF THE TRANSMITTER**

In operating the transmitter, the oscillator and buffer-amplifier should be made to function successfully before anything else is accomplished. The operation of this unit is simplicity itself, and should present no difficulties. With the unit correctly wired, the filaments should be lighted, and since it takes approximately half a minute for the tubes to assume their normal operating temperature, plate voltage should not be switched on for at least this length of time. Grid bias may be connected, however, and after the proper interval of time, the plate voltage should be applied to the oscillator. Since it is first necessary to get the oscillator operating properly, the grid bias, screen grid and plate voltages should not be applied to the buffer-amplifier at this time. Best operation of the oscillator is obtained with a negative grid bias of 221/4 volts and a plate voltage of 180 or 200. The heater voltage should be between 2.0 and 2.5 volts. While the exact heater voltage is not critical between these values, the value of 2.5 volts should not be exceeded.

With the crystal in the circuit and all voltages applied to the oscillator tube, the oscillator tank tuning condenser should be varied until oscillation of desirable amplitude at the proper frequency is indicated. In working with low power equipment a pick-up coil and lamp, shown between the key and the crystal holder in the photograph, made of from one to three turns of No. 18 d.c.e. wire connected to a low current flashlight lamp, will be found of inestimable value. This may be better appreciated when it is known that it is possible to tune the entire transmitter with this coil and lamp as an indicator. The pick-up coil is rather closely coupled to the tank inductance, \(L_s\), of the oscillator circuit to indicate oscillation and relative output, after which it may advantageously be coupled more loosely. Maximum output at a given frequency will be indicated by maximum brilliance of the lamp. The normal plate current of the UY-227 tubes when oscillating will be about 6 to 8 milliamperes. Some idea of the adjustments may be gained from the photograph since all tuning condensers were set as accurately as could be judged to their normal operating positions at the time the photograph was taken.

If a resonant choke coil is used in place of the crystal in the grid circuit of the -27 tubes, the operation will be slightly different. It will be found, when using a grid coil made up as specified, that the oscillator will give practically constant output over a goodly portion of the 3500-ke. amateur band. If this should not be the case, the choke should be altered either by adding more turns or removing turns until this condition does obtain. When the choke is properly constructed, oscillation can be obtained over most of the amateur band and it will be necessary to determine the exact frequency of oscillation by means of a frequency meter either of the oscillating or simple absorption type. Due to the low power of the oscillator and the close coupling which will be required when the absorption type meter is employed, the latter is not recommended when other means of frequency determination are available.

After the oscillator is operating properly, grid, screen grid, and plate voltages of the buffer-amplifier should be applied. The pick-up coil should be coupled to the tank inductance, \(L_s\), and the circuit tuned until the lamp burns brightest. No other adjustments, with the possible exception of grid bias, should be required. With the oscillator-amplifier unit operating properly, the modulated amplifier is the next point of attack.

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\(^1\) A more detailed discussion of this system of modulation is contained in QST for April, 1929, pages 9 to 11.
The filaments of the UX-245 tubes should be lighted and the filament voltage adjusted to between 2.0 and 2.5 volts. Since the 215 tubes are directly heated, they will reach their operating temperature much more quickly than the 227 or the 224 tubes, and consequently the plate voltage may be applied sooner after the filaments are lit. Before the plate voltage is applied, however, this amplifier should be neutralized in the following manner:

With the full grid bias of approximately 180 volts and with grid excitation applied but without plate voltage on the 245 tubes, the pick-up coil is coupled to \( L_e \) and the plate circuit is tuned to resonance. If the amplifier is not neutralized the bulb will light up indicating that power from the buffer-amplifier is being fed directly through the inter-electrode capacitance of the 245 tubes to the plate circuit. The two neutralizing condensers should then be adjusted simultaneously until the lamp shows no signs of incandescence as the plate circuit tuning is varied. The amplifier is now neutralized.

In connection with the neutralization of the amplifier, the modulometer described in the August, 1929, issue of QST is very effective. After the tubes are neutralized as accurately as possible by the method described above, a few turns of one antenna coupling coil are connected to the modulometer input circuit. The plate meter of the modulometer should show a very decided upward deflection if the amplifier is not completely neutralized. If incomplete neutralization is indicated, readjustment of the neutralizing condensers until the modulometer plate meter shows no deflection as the amplifier plate tuning is varied, will be necessary. The setting of the neutralizing condensers, while not extremely critical, is many times more accurate when the modulometer is used to indicate neutralization than when the lamp is employed. Neutralization may be realized with no difficulty whatsoever in push-pull amplifier circuits, and with the modulometer or any vacuum tube voltmeter as an indicator, there is no doubt as to its completeness.

When the power amplifier has been neutralized, the filament of the modulator tube should be lighted and the plate voltage applied to both the modulator and the modulated amplifier. Do not turn on the speech amplifier at this stage of the game. Satisfactory modulation cannot be expected until the modulator and modulated amplifier have been properly adjusted.

Modulated amplifiers are operated as “Class C,” the bias and excitation being such that the power output varies as the square of the plate voltage. The bias required is greater than, and usually double, that required to reduce the plate current to zero when no excitation is applied. The value of this bias for the 245 tubes when operated as Class C amplifiers with plate voltages of 250 to 300 is approximately 180 volts. When so operated, the excitation should be sufficient to cause normal plate current to flow.

If an attempt should be made to experimentally determine the proper bias required for “cut-off” with this particular transmitter arrangement, a peculiar difficulty of the vicious circle variety will be encountered. As the bias is increased, no excitation being applied, the plate current decreases but the plate voltage increases due to the fact that the \( IR \) drop in the series resistor is decreasing with the reduction of plate current through it. Experimental determination of the proper value of bias is, therefore, impossible. Fortunately, however, the proper value of cut-off bias for a given plate voltage may be determined by dividing the operating plate voltage by the amplification constant or \( \mu \) of the tube. For Class C operation this value may be doubled. Since the amplification factor of the 245 is 3.5 and the operating plate voltage is 250 to 300, the cut-off bias is approximately 90 volts and the proper bias for Class C operation is 180 volts.

With the proper value of grid bias thus determined and with grid excitation applied to the amplifier, its plate tank is coupled to the antenna — preferably of the dummy variety. The coupling between the plate and antenna inductances should be adjusted so the antenna current and amplifier plate input are maximum. The coupling between each of the antenna coils and the tank inductance should be the same. It will be found that variation in the tuning of the antenna circuit will necessitate a readjustment of the plate tank condenser. Therefore it is best to make these two adjustments simultaneously. The optimum operating condition will obtain when the plate current is of the order of 30 to 40 milliamperes. When these conditions have been satisfied the modulation may be applied.

With the speech amplifier and modulator used in this transmitter, the usual single button microphone is capable of causing maximum permissible grid swing of the modulator tube with the gain control half-way on when the microphone is spoken into at normal voice intensities.

When work on the transmitter has progressed thus far, the percentage of modulation may be measured with the modulometer, if one happens to be available. Lacking such a device, complete modulation will be indicated to an approximate degree when the antenna current, as indicated by the antenna ammeter, shows an increase of about 30 per cent when a prolonged, “ohhhhh” is sounded into the microphone. A check on the quality may also be made via a monitor — and the transmitter is ready to go on the air.

The dummy antenna should be replaced by the regular operating and radiating antenna. Necessary readjustments of the antenna and plate tank tuning condensers should be made. “CQ,” “test.”

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1 See “Vacuum Tube Amplifier Definitions,” this issue.

2 Figure 6, page 15, QST, August, 1929.
or any other of the cryptic utterances peculiar to amateur radio telephony may now be spoken into the microphone with reasonable assurance that they will be heard.

The foregoing may seem to be a rather elaborate process for the adjustment of a simple 'phone transmitter, but considerable experimental work has proved that this method is the most effective and quickest for obtaining real quality results.

So much for the adjustment as a 'phone transmitter. In addition, the set also has unusual possibilities as a C.W. transmitter and when used as such requires slightly different adjustment for best results.

In a continuous wave telegraph transmitter, a key is employed to open and close some portion of the circuit to alternately start and stop the radiation of radio frequency waves. Voice modulation is comparatively "smooth" and may vary in a particular word or syllable over a considerable range of amplitudes. With C.W. transmission, however, modulation is from zero to maximum amplitudes only with the result that these sudden and great differences in load require a buffer amplifier as good as, if not better than, that required for a 'phone transmitter. This is a point which, apparently, is not generally appreciated in practice since, even with crystal-controlled oscillator-amplifier transmitters, the frequency is often noticed to vary appreciably with keying. In this particular transmitter, even a direct short circuit of the output of the buffer-amplifier has little reaction on either the oscillator frequency or power output. It is, therefore, when properly adjusted, an excellent C.W. transmitter as well as an effective 'phone transmitter.

For C.W. transmission, the oscillator and buffer-amplifier are used in exactly the same manner as for 'phone transmission, but the power amplifier is operated as Class B rather than as Class C. When operating as a Class B amplifier, the grid bias is of such value that, without grid excitation, the plate current is near zero. This condition is obtained with a grid bias of 90 volts when the plate voltage is 250 to 300. Correspondingly higher values of grid bias would be required for higher plate voltages. The modulator should be dispensed with and the plate voltage to the UX-215 tube should be adjusted to 250 or 300.

The power output of this transmitter when adjusted for C.W. operation is approximately double the carrier output obtained when it is operated on 'phone. This means that the antenna current on C.W. is about 40 per cent greater than the carrier antenna current when voice transmission is employed. It is possible to deliver about 1 ampere to the feeders of a fundamental 3500-ke. Zeppelin antenna on C.W. as compared to 0.7 ampere for the carrier on 'phone.

The key is connected in the filament center tap of the final amplifier. This arrangement permits the oscillator and buffer-amplifier to operate con-

THE SPEECH AMPLIFIER AND MODULATOR UNIT

This unit is the same one used with the transmitter described in the April issue of QST with the exception that a 22 type a.c. tube is used in the speech amplifier. The milliammeter, equipped with a cord and telephone plug, is used for measuring currents in all plate circuits of the transmitter.
output of this transmitter is sufficient to swing
the grids of a couple of 50-watt or UX-852 tubes
arranged in push-pull as a linear amplifier. If
desired, additional Class B amplifiers may be
used to boost the output on C.W. Its ultimate
power output need necessarily be limited only by
the individual bank roll or the regulations im-
posed by the F.R.C. If one should wish to in-
corporate frequency doubling for telegraph trans-
mision (and perhaps for 14,000-kc. phone, if and
when that band should be made available) one or
two stages of additional screen-grid frequency
doubling amplifiers may be interposed between
the present buffer stage and the power amplifier.

POWER SUPPLY

No design data on power supply for the trans-
mitter will be given, since practically every ama-
teur has available suitable equipment to give the
necessary plate and filament power as well as the
required grid bias and screen-grid voltages. How-
ever, a few recommendations may be in
order.

The plate power for the modulator and power
amplifier tubes may be supplied by a 500-volt
motor-generator set or rectified a.c. unit. In either
case, a good filter should be used because smooth
d.c. plate supply is essential to good quality trans-
mision. This plate supply should be capable of
delivering at least 100 milliamperes and should
have good regulation. Plate power for the oscilla-
tor and buffer-amplifier may be derived from the
500-volt plate supply through proper resistances
to drop the voltage to 180 or 200, but this method
is generally unsatisfactory, and the use of a
separate supply is recommended. The latter may
be a 180-volt "B" battery substitute or 180 volts
of heavy duty "B" batteries. The screen-grid
voltage for the buffer-amplifier tubes can also be
taken from this supply. The small size "B"
batteries used for "C" bias on audio frequency
power amplifiers are entirely satisfactory as the
source of grid bias, a total of 180 volts being
required for phone operation or 90 volts bias for
C.W.

Two filament supplies are required, one capable
of delivering 1.25 amperes at 7.5 volts and the
other 10 amperes at 2.5 volts. If the plate trans-
former happens to be equipped with a 7.5-volt
winding, this may be used for the modulator tube
filament supply. A center tapped filament trans-
former capable of delivering 10 amperes may be
used as the filament and heater supply for the
2.5-volt tubes, one half of the secondary winding
being employed and a rheostat provided in the
primary circuit to drop the output voltage to not
more than 2.5 volts.

A New Vernier Dial

T HE increasingly exacting demand for ac-
curacy in frequency measuring equipment
is reflected in the new vernier scale 6-inch
National Precision Velvet Vernier Dial, big
brother to the 4-inch Type N version brought out
some time ago. Increased dial diameter on the
new type is accompanied by a proportionate in-
crease in scale length of both the dial and vernier
resulting in more facile readability.

In general, the 6-inch dial is similar to the
Type N 4-inch one. The dial is of solid German
silver with the divisions accurately cut on an
engine divider. The mechanism is the original
velvet vernier and the knob is of bakelite. Direct
readings to 1/10 scale division can be made. As
applied to a frequency meter having a frequency
range of 500 kc., this means that direct readings
to ¼ kc. (500 cycles) are obtainable with a dial
having 100 scale divisions for 180° of rotation.

A disc bakelite shield between the knob and
the metal dial is provided to prevent the fingers
from coming in contact with the metal.

The new dial should be particularly applicable
to frequency meters, calibrated monitors, beat
frequency oscillators and other equipment de-
manding accuracy of calibration and readability.
Notes on Ethereal Adornments

Practical Design Data for the Single-Wire-Fed Hertz Antenna

By L. G. Windom*

The use of the linear Hertz radiator fed by a single-wire line has been restricted in amateur work because of lack of data on its design and adjustment. This article explains how these systems may be completely designed on paper. The antenna may then be erected with the assurance that the voltage and current distribution on both the radiator and feeder will be correct.

S ooner or later in the course of amateur development, one must have some sort of antenna, skyhook, or as you like it. In the earlier stages it consists generally of merely "a" antenna, then later after much deep (?) thought, it is "the" antenna. These few notes concern themselves only with that much-cussed sterility, the single-wire-fed (cross-bred, voltage-current) Hertz. This type has the advantages of simplicity, ease of erection, very high efficiency and, as will appear later, can be designed on paper and erected without the usual pruning operation.

The information herein contained is due to the efforts of John Byrne of the Bell Telephone Laboratories, exSLT, WSGZ, WZQG, W8DKJ; Ed. Brooke, also of the Bell Telephone Laboratories, W2OV and ex8DEM; and Jack Ryder, W8DQZ, under the direction of Prof. W. L. Everitt of the Department of Electrical Engineering, Ohio State University. The writer acts solely as a reporter and all credit is due the above-named men.

Interest in the single-wire-fed Hertz antenna for amateur work started mainly with an article by Williams, KBXQ, in the July, 1926, QST followed by several others including the re-hash in the July, 1926, issue. It is perhaps best to disregard all this previous material in relation to the single wire feeder system and start from the beginning.

* WSGZ-WZG, 1575 Franklin Ave, Columbus, Ohio.
consisting of a transmitter shack, a very stable oscillator and necessary etheral equipment to vary the antenna in all possible ways. Measure-

ments were made by means of meters placed on trolley arrangements (Fig. 1) by which they were shunted across a portion of the antenna and readings taken at predetermined points through the aid of a transit.

A normal half-wave radiator with a single-wire feeder was erected, using a meter at the center of the radiator for tuning purposes, and with the feeder some 6 feet off the center as in Fig. 2.

Tuning for maximum current at the center of the antenna with this arrangement resulted in a greatly distorted current curve on the antenna and a bad standing wave on the feeder as indicated in Fig. 3. Note that this is the usual method of tuning employed by amateur stations.

Obviously this wasn't according to the theory, so different lengths and feeder positions were tried—with the same discouraging results. Now let's write this on our cuffs or where you will—

the method of tuning a single feeder Hertz by means of an indicator at the center of the antenna is wrong and should not be used. True, there are some means of so doing, but they are more likely to lead one astray, even when you know what you are doing. From the above it was apparent that the first requirement was to hammer the current curve on the antenna into shape. Then, as says the movie sub-title, "came the dawn." Just where the glimmer came from I never knew, but most amateurs have a few spare ideas stored away somewhere. The meter in the center of the antenna was taken off and tossed into the lake—it wasn't their meter, so they could afford the procedure. Nevertheless, that step is essential to results—discard all indicators at the center of the antenna—the neighbors will feel better and the fire department will have fewer false alarms.

Next, two equal reading ammeters were placed in the antenna at a random point—any place between center and end—and the feeder connected between them as in Fig. 4. These meters should be as close together as possible. Also, one meter could be used by changing it from one side to the other of the feeder and plotting two frequency-vs.-current curves.

When the proper position was located, there were no standing waves upon the feeder and the radiator showed excellent current distribution as indicated. These conditions are independent of the length of the feed line which when properly adjusted will not cause any damaging radiation.

FIG. 4.—AFTER THE RADIATOR DIFFICULTIES HAD BEEN CLEARED UP, THE POSITION OF THE FEEDER WAS SHIFTED AND THE CURRENT DISTRIBUTION ALONG IT MEASURED

When the proper position was located, there were no standing waves upon the feeder and the radiator showed excellent current distribution as indicated. These conditions are independent of the length of the feed line which when properly adjusted will not cause any damaging radiation.

FIG. 5.—IN THE TEST WORK, THE TWO AMMETERS AND FEEDER WERE PLACED ON THE ANTENNA AT A RANDOM POINT AND THE TRANSMITTER FREQUENCY VARIED UNTIL THE READINGS OF THE AMMETERS WERE THE SAME

It was then found that the current distribution was as indicated.

FIG. 1.—THIS SYSTEM OF DETERMINING THE FUNDAMENTAL EMPLOYS TWO AMMETERS PLACED CLOSE TO EACH OTHER WITH THE FEEDER CONNECTED AT THEIR JUNCTION

The ammeters normally located at the center of the system is dispensed with entirely.
our antenna the fundamental was approximately 2.07 times the length in meters, i.e., $\lambda = L \times 2.07$.

Next the feeder was given a massage. Starting with it at the center, current curves were plotted (curves on the feeder) as it was moved outward. Again by the grace of the Woull-Hong the standing wave on the feeder began to disappear. At a very definite point, the feeder curve became a straight line. Beyond this point standing waves again appeared. This procedure was repeated for a number of various antennas, and it was found that this magical position of the feeder from the center was a fixed ratio, and that, given any antenna length, we can compute the proper feeder point. This formula being: Distance of the feeder from the center equals the antenna length times up to 1200 feet in length (that being the longest distance available) and that the only losses were those of resistance. The 1200-foot feeder had an efficiency of over 85%. Anyway, it isn't usual practice to put your antenna in the next state. Hence, we can say that the feeder length has no effect, for all normal operation.

Constructing an antenna by these two formulas and tuning to the predetermined fundamental by a good accurate frequency meter, we secure current distribution on the feeder and antenna as in Fig. 6, which is about as perfect as can be desired. The feeder efficiency for the average runs well over 95%.

Next, antennas for the 14,000- and 3500-ke. bands were tried and the formulas given found to hold true for all waves. A single feeder Hertz will work well at its harmonics — in fact just as well as at the fundamental, for the reason that the feeder connection will continue to be approximately at the correct distance from the voltage nodes. We can, therefore, build the antenna for the lowest frequency (highest wave) to be used and then work at harmonics for the other bands, or else use separate antennas. At WSGZ a 7000-ke. antenna has been working very effectively on 28,000 ke.

To save time and computation, graphs covering the 7000-ke. and the 3500-ke. band are given in Figs. 7 and 8. By choosing the frequency you desire to operate on, the antenna length and feeder positions are at hand. For a half-wave 14,000-ke. band antenna divide the figures of the 7000-ke. graph by 2.

The feeder is tapped directly on the plate inductance of the transmitter at such a point as causes the tube to draw normal input — i.e., the feeder tap is moved from the filament toward the plate end until the tube draws normal operating current. It is not advisable to push it out to the limit, as this tap on the inductance has an
effect on the efficiency of the transmitter beyond a certain point. In addition, you can spoil a good note by such excessive coupling. The formulas are for average operation using inductances about 4 inches in diameter. For 28,000 and 14,000 kc., one turn from the filament; for 7000 kc., two or three turns; and for 3500 kc., five or six turns are ample, depending, of course, on the total number of turns used. A ground should be used on the filament circuit as a protective measure.

As a summary, the following steps should be (Continued on page 54)
“XYL”

By Eulalia M. Thomas*

It has been requested by the powers-that-be at QST factory, that the operator at WSCNO write an article under the caption of, “Impressions of ham radio by an XYL operator, especially those concerning the idiosyncrasies of the male of the species.” Here goes, then, under protest.

Ever since WSCNO has been on the air, two years in May, my original expression of classifying myself as an “XYL” has been a stumbling block to many, and I take this opportunity of explaining the same. “XYL” means just what it says, i.e., ex-YL, which means that I am no longer exactly a YL operator, nor yet can I be classed as an OW. Not wishing to sail under false colors, “XYL” was originated. Very few guesses as to its meaning are correct, which may not indicate an over-abundant amount of intelligence on the part of the male of the species! Some have even hazarded that it might mean “old maid.” Horrors! That decidedly is not the case; nor is it a nice way to get around “OW.” Others have given the “X” the algebraic meaning “unknown.” It has been amusing to note how some of them try to ignore the “XYL” part until their curiosity eventually gets the best of them! I hereby swear, under oath, that I am not a spinster, nor an old woman, and not a YL either — so there!

How did I get into the game? There are various absurd reasons, but being especially requested to do so, I will tell you the chief one. A great admiration for the achievements of Donald MacMillan and the fact that he was using the higher frequencies for communication led me first into the field of ham radio from which field I find it very difficult to stray.

In the summer of 1925 I read in a daily paper how one could build a radio set for ten dollars on which one could hear MacMillan broadcast. I didn’t even know I would have to learn the code and when that astounding fact was announced, I gave up all hope. The following summer, ex-WSDED became my neighbor. One night I was trying hard to distinguish a dot from a dash, and suddenly WSDED began to copy... “We are now off the coast of Disko — etc. — signed MacMillan.” Well, that settled it! I would follow MacMillan into the far North. I would master code! By the next summer I had my license and was operating. Just to hear WNP was not enough. I have called him often, but in vain. I have not given up hope, and some night may my dream will be fully realized in a two-way communication with the Bowldon.

Which phase of the game do I enjoy the most? Well, I’ve had my fling at all of them except experimenting, as most hams know it, and from the lot it is very hard to choose. A good rag-chew is a joy when I have time, which is not often. I have had plenty of thrills out of DX and of it

* (Mrs.) WSCNO, 71 Griswold Street, Delaware, Ohio.
Back came the question, "Did you say Delaware, OHIO? Do you know Lydia Crickard? She is a friend of mine." Know her! She lives but two blocks away, and was my teacher at one time. I think K6DGQ was as excited as I. To think of all the amateurs in this big old world. I should pick out of the air a friend of my former teacher! As he signed off giving me "73," I knew Miss Crickard and I had a mutual friend in far-off Wailuk.

To me, one of the greatest things in amateur radio is the friendships one forms. Ofttimes there is naught but the thinnest strands of communication binding them. It is as the poet Dix has said, "My world is as wide as the realm of thought."

(Continued on page 72)

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ELECTION NOTICES

To all A.R.R.L. Members residing in the ATLANTIC, DAKOTA, DELTA, MIDWEST, PACIFIC (including Territory of Hawaii and Philippine Islands), and SOUTHEASTERN (including Porto Rico, the Republic of Cuba and Isle of Pines) Divisions of A.R.R.L.:

1. You are hereby notified that an election for an A.R.R.L. Director, for the term 1930-1931, is about to be held in each of the above Divisions, in accordance with the Constitution. Your attention is invited to Sec. 1 of Article IV of the Constitution, providing for the government of A.R.R.L. affairs by a Board of Directors; Sec. 2 of Article IV, defining their eligibility; and By-Laws 9 to 18 providing for their nomination and election. Copy of the Constitution and By-Laws will be mailed any member upon request.

2. The election will take place during the month of November, 1929, on ballots which will be mailed from Headquarters in the first week of that month. The ballots for each Division will list the names of all eligible candidates nominated for the position by A.R.R.L. members residing in that Division.

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

(Place and date)

Executive Committee,
American Radio Relay League,
Hartford, Conn.

Gentlemen:

We, the undersigned members of the A.R.R.L. residing in the Division, hereby nominate ............., of ............., as a candidate for Director from this Division for the 1930-1931 term.

(Signatures and addresses)

The signers must be League members in good standing. The nominee must be a League member in good standing and must be without commercial radio connections. His complete name and address should be given. All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the first day of November, 1929. There is no limit on the number of petitions that may be filed, but no member shall append his signature to more than one such petition.

4. Present Directors from these Divisions are as follows: Atlantic, Prof. Eugene C. Woodruff, State College, Pa.; Dakota, Prof. C. M. Jansky, jr., Minneapolis; Delta, Mr. Benj. F. Painter, Chattanooga; Midwest, Mr. Porter H. Quinby, St. Louis; Pacific, Mr. Allen H. Babcock, San Francisco; Southeastern, Mr. Harry F. Dobbs, Atlanta. Members of the Southeastern Division are informed that no nominations were filed from that Division in the elections of 1927, in default of which Mr. Dobbs has remained in office.

5. These elections are the constitutional opportunity for members to put the man of their choice in office as the representative of their Division. Members are urged to take the initiative and file nominating petitions immediately.

For the Board of Directors:

K. B. Warner, Secretary.
Hartford, Conn., 1 August 1929.

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

1. You are hereby notified that an election for an A.R.R.L. Canadian General Manager, for the term 1930-1931, is about to be held, in accordance with the Constitution. Your attention is invited to By-Law 28, defining the policy of the League in Canada; Sec. 1 of Article IV of the Constitution, providing for the government of A.R.R.L. affairs by a Board of Directors, of which the Canadian General Manager is a member; Sec. 2 of Article IV, defining the eligibility of Directors; By-Laws 25 and 26, specifying the duties and authority of the Canadian General Manager; and By-Laws 22, 23 and 24, providing for his nomination and election. Copy of the Constitution and By-Laws will be mailed any member upon request.

2. The election will take place during the month of November, 1929, on ballots which will be mailed from Headquarters in the first week of that month. The ballot will list the names of all

(Continued on page 76)
Improving the All-Purpose Super-Heterodyne

By L. W. Hatry*

ANY designer or builder of a high-frequency super-heterodyne must reckon with a major fault of the breed, the interlocking of tuning controls affected by coupling between the oscillator and first detector. This manifests itself in two ways. Detector tuning is as critical as oscillator tuning, and several combinations of tuning condenser settings for the same station can be obtained. The former is annoying, since two dials must be carefully adjusted, but the latter makes for insane confusion as no calibration can be considered as such if it is always contradicted by finding the dial readings for the same station at, say, 15°–15°, 20°–10°, or 25°–0°, etc. Now interlocking, even with its effect on calibration, could be ignored if the wrong settings gave noticeably weaker signals, but it often has no effect on signal strength, with the result that the right setting is as much a stranger as a non-microphonic 201-A.

In the QST all-purpose super-heterodyne, a type of oscillator-detector coupling is used which generally proves noticeably critical in adjustment if interlocking is to be limited and sensitivity maintained. Because of the need for a less critical pick-up causing less interlocking, a number of tests were made toward that end. These tests resulted in an improved pick-up arrangement as well as two other improvements which came from two additional changes.

These three improvements call for several changes in a set made according to the article in QST for March, 1929, but these changes are minor and can be made easily so far as the circuit is concerned. The improvements cover an oscillator pick-up which even when over-abundant is quite useful; the elimination of first detector regeneration and consequently of a control; and greater overall sensitivity obtained partly from the use of a 240-type high-nu tube as first detector, partly from the use of abundant pick-up which is not damaging under the new conditions and partly from properly biasing the first detector.

In addition to the circuit changes required to accomplish these things one other change is recommended, a change that has been recommended previously in QST, the addition of a volume control. If the owner of the set is interested chiefly in

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*Hatry & Young, Inc., 126 Ann St., Hartford, Conn.

FIG. 1.—THE ORIGINAL AND MODIFIED VERSIONS OF THE FIRST DETECTOR CIRCUIT

The top diagram is that of the first detector circuit of the original set while the lower diagram illustrates the changes suggested in the text.

FIG. 2.—THE ORIGINAL AND MODIFIED OSCILLATOR CIRCUITS

To plate circuit of oscillator detector

To plate circuit of first detector

OLD

NEW

240

450

222
broadcasting, or sufficiently in broadcasting, his volume control must be placed where it will prevent the second detector or audio tubes from overloading. A control satisfactory for this purpose consists of a potentiometer to adjust the voltage on the screens of the r.f. tubes. The chap interested chiefly in C.W. and headset reception, however, needs his volume control after the second detector, since second detector oscillation manifests itself as a hiss and the hiss should not be reduced while the signal level is lowered. If one wants both types of reception, both controls should be provided, the one to prevent distortion and the other to prevent ear fatigue and maintain the signal-noise ratio.

THE CHANGES

In relation to the original circuit the changes required for the improvements group themselves as follows:
1. First detector circuit and coils.
2. Oscillator circuit and coils.
3. First r.f. transformer construction.
4. Screen-grid wiring or first audio wiring.

The first detector when changed has no tickler, and since the pick-up is in series with its plate circuit the detector coils will need but one winding, that for the tuned circuit. Pick-up coil and tickler are omitted. This results in leaving three of the five coil-form prongs unused and suggests an additional change and another desirable gain, or two of them. This addition is of an antenna coil or primary on each coil which would eliminate $C_1$ and the changes in calibration it can cause, since every change in $C_1$ affects the capacity setting of $C_2$ for a given frequency. As $C_2$ is decidedly too small for the broadcast and 2000-kc bands, and causes a loss in sensitivity, the addition of an antenna coupling coil is a very noticeable gain.

Fig. 1 shows the first detector changes schematiclly and also shows the original first detector circuit for comparison. Notice that the high-mu tube is impedance-coupled to the first intermediate frequency amplifier. Also notice that the grid-leak gets the grid-return through a potentiometer of 500,000 ohms (to be mounted on the baseboard and set but once as it does not need constant adjustment) which bridges the 4.5-volt “C” battery. This connection increases first detector sensitivity noticeably and, incidentally, biases the tube for plate rectification. The first detector bias could, with a saving of apparatus, be run through the indueistance of the tuned circuit, but I found the arrangement shown an easier means of changing over a ready-made set. The chap starting at scratch should omit the grid-leak and condenser, but he will probably find the potentiometer desirable for getting exactly the right bias. It should be by-passed in the filament return.

THE OSCILLATOR

The oscillator suffers circuit changes as radical as and more complete than those imposed on the first detector. These changes are most noticeable on the coils, being minor in the wiring. They are shown in Fig. 2. Whether grid or plate tuning is used is unimportant and makes practically no difference in the coils or results. Grid tuning is shown in Fig. 2 because I happen to have used it in a finished set embodying the improvements mentioned. The connections of the oscillator coil windings to the pins on the coil forms are shown in Fig. 3. Of course, these may be departed from whenever one desires. The oscillator grid leak should be 25,000 ohms, as such a low resistance makes the size of $L_3$, the plate (or if tuned-plate, the grid) coil, less critical and assures one of a full oscillator tuning range without squealing. However, with the 25,000-ohm leak one can have so much feed-back that the result is an a.f. howl or a number of beat notes independent of signals if the “B” voltage is set too high.

The first intermediate frequency transformer construction was mentioned as being changed. The change is simply in the elimination of the separate primary. Anyone wanting to use a
separate primary should wind a wad of about 300 turns for it.

The change in the wiring to the screen-grids for the insertion of a volume control is shown in the complete diagram, Fig. 4. This results in satisfactory control even on very strong local signals. And the reader will find that the complete diagram also shows, in addition, the wiring change for the proper kind of volume control for the high frequency telegrapher.

THE COILS AND THEIR WINDING

The table of coils included with this is correct for a set using double-section National "ET-27" variable condensers, one for oscillator and one for first detector; but, nevertheless, may not be exactly right for your particular set operated under those same physical conditions. The National "ET-27," incidentally, is a factory-made double-section variable with the specifications given in March QST.

The table is correct only if the coils are made as Fig. 5 indicates on Pilot coil forms. An increase of less than 50% in the spacings recommended causes small change, practically no effect upon tuning range, they can be added to the oscillator coil form without

<table>
<thead>
<tr>
<th>Wire</th>
<th>Size</th>
<th>L3</th>
<th>L4</th>
</tr>
</thead>
<tbody>
<tr>
<td>OA</td>
<td>1</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>OB</td>
<td>1</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>OC</td>
<td>2</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>OD</td>
<td>21</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>OE</td>
<td>3</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>OF</td>
<td>4</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>OG</td>
<td>4</td>
<td>30</td>
<td>14</td>
</tr>
<tr>
<td>OH</td>
<td>15</td>
<td>35</td>
<td>10</td>
</tr>
<tr>
<td>OI</td>
<td>15</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>OK</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

If one has satisfactory oscillator coils they will very likely require no change in turns, but only in terminations, and since the additional turns of the pick-up are few and have

FIG. 4.—THE COMPLETE DIAGRAM OF THE MODIFIED CIRCUIT

L1, L2—Detector coils. (DA, DB, DC, etc.)
L3, L4, L5—Oscillator coils. (OA, OB, OC, etc.)
L6—Intermediate Amplifier Inductance. See March, 1929, QST for details.
Ls—16 turns of Nos. 30 d.c. wire wound over L6 at B+ side.
RFC:—Silver-Marshall No. 277 or Kemler radio-frequency choke.
RFC2:—Silver-Marshall No. 277 or Harnmarlund 85 millihenry r.f. choke.
C1—18-plate Pilot midget condenser or duplicate of C2.
C2—ET-ET National double section variable condenser.
C3—33-plate Pilot midget or Harnmarlund 100-mfd. Equalizer.
C4—5-plate Pilot midget condenser. Omitted when L6 is used.
C5—Omitted.
C6—1-mfd. by-pass condenser.
C7—0.06-mfd. Sprague fixed condenser.

C9—250-mfd. fixed condenser.
C10—600-mfd. fixed condenser.
C11—1,000-mfd. if RFC is 85 m.h. 4,000 mfd.
C12—100-mfd. fixed condenser.
R1—3-megohm grid-leak. This value not critical.
R2—2-megohm grid-leak.
R3—3-megohm grid-leak.
R4—50,000-ohm Electrolyt variable resistor.
R5—15-ohm fixed filament resistors.
R6—2-ohm rheostat.
R7—100,000-ohm Electrolyt variable resistor.
R8—20,000-ohm grid-leak.
R9—50,000-ohm Yasky potentiometer.
R10—200,000-ohm Electrolyt variable resistor.
R11—500,000-ohm Electrolyt Potentiometer.

The designations correspond in general with those of the circuit diagram on page 13 of QST for March, 1929.
damage. If the coils are wound on S-M forms from the table accompanying this article they will differ slightly but not harmfully in frequency range, the range generally being slightly lower;

\[ R_c \text{'s knob, the previous full third will be the useful operating range. However, one can get rid of oscillator howling and half a turn of } R_c \text{ for merely controlling the strength of oscillation. The howling must be avoided because the consequence is no signal.} \]

The pick-up perhaps is best explained by contrast. The method of pick-up shown in the March QST is hard to adjust because the amount of winding in } L_5 \text{ varies with different sets and is critical unless one can put up with the horrors of interlocking tuning. For instance, I have built several sets in duplication of that described, and all have required pick-up turns on DA, DB and DC. That on DA has varied from a quarter to a full turn; a quarter of a turn making the difference between confusing interlocking and somewhat less interlocking with sufficient sensitivity. With this coil no size of pick-up can sacrifice sensitivity would eliminate an annoying amount of interlocking. The reason is plain. The oscillator and detector are only } 2\% \text{ off common resonance. Even on DD, at } 3500 \text{ kc., with the difference increased to } 4\%, L_5 \text{ when small enough to reduce interlocking decreased sensitivity too greatly, and it had to be adjusted to the quarter turn. Such adjustments are tedious and not entirely necessary, nor is a loss of sensitivity essential.} \]

The pick-up diagrammed in Figs. 1 and 2 is not so critical of adjustment or so harmful if oversized. Besides, even when so large as to cause very noticeable interlocking, the erroneous settings are apparent because of somewhat reduced volume. (Continued on page 63)
Vacuum Tube Amplifier Definitions

By H. F. Dart and C. K. Atwater*

Vacuum tube amplifiers are used in many different types of equipment and under widely varying conditions. Fundamentally, the characteristics of operation fall into general classes depending upon the main features of grid bias, excitation, distortion and other factors. The operating conditions may be divided into three general classes: namely, the usual type of audio-frequency amplifier called Class "A"; a more or less limited class of radiofrequency amplifier called Class "B"; and the usual type of oscillator or radio-frequency amplifier specified as Class "C". The definition of each class is indicated and later described in detail.

CLASS A — VOLTAGE OR POWER AMPLIFIER OR MODULATOR

"The Class A amplifier operates so that the plate output wave shapes are essentially the same as those of the exciting grid voltage. This is accomplished by operating with a negative grid bias such that some plate current flows at all times, and by applying such an alternating voltage to the grid that the dynamic operating characteristics are essentially linear. The grid must usually not go positive on excitation peaks and the plate current must not fall low enough at its minimum to cause distortion due to curvature of the characteristic.

"The amount of second harmonic present in the output wave which was not present in the input wave is generally taken as a measure of distortion, the usual limit being 5%. "The characteristics produced are low efficiency and output with a large ratio of power amplification."

The Class A amplifier is the usual type of audio-frequency amplifier and operates with very little distortion. The recommended operating conditions are such that the tube can operate with a considerable grid swing and without the introduction of an appreciable amount of distortion in the output which was not present in the input. Grid bias is secured from a separate source to keep the plate current at the desired value. The grid bias should permit the plate current to swing over the essentially straight portion of its characteristic curve when excitation is applied. The grid bias should be so selected that the grid swings in a positive direction will not cause the grid to take current while equal excitation in the opposite direction will not cause distortion due to curvature of the plate characteristic curve.

A characteristic curve is illustrated in Fig. 1 as a theoretical example. If the grid bias is extended to 45 volts negative, the plate current will be reduced to zero, while if the grid bias is reduced to zero, the plate current goes to approximately 120 milliamperes. If a signal of 16 volts is applied to the grid with the grid bias as indicated of -22 volts, it will vary the plate current between the limits of 10 and 110 milliamperes. The output wave indicated at the right of the figure represents the current in the plate circuit. As seen by inspection, the wave shape of the output is practically the same as that of the excitation or input wave. A typical circuit is indicated in Fig. 2.

This type of amplifier produces an output which follows the characteristics of the input very closely, but the efficiency is not so high as that obtainable by some other methods.

As a Heising or constant plate current modulator, the operating characteristics are practically the same as those obtainable with the usual type of audio amplifier. In fact the modulator tube
acts as an audio-frequency amplifier, except that its output is super-imposed onto a radio-frequency carrier wave, rather than fed into a loud speaker.

CLASS B — RADIO-FREQUENCY POWER AMPLIFIER; BALANCED OR PUSH-PULL MODULATOR

"The Class B amplifier operates so that the output power is proportional to the square of the excitation grid voltage.

"This is accomplished by operating with a negative grid bias such that the plate current is practically zero with no excitation and by applying excitation grid voltage such that essentially half sine-waves of plate current are produced on the least negative half cycle of the grid voltage. The grid may usually go positive on excitation peaks, the harmonics being removed from the output by suitable means.

"The characteristics produced are medium efficiency and output, with a relatively low ratio of power amplification.

This type of amplifier is used chiefly in the amplifier stages of transmitters in which modulation is effected in a low-power stage. The radio-frequency signal from this modulated stage carries the audio-frequency component and must be sent through a special amplifier, as any second harmonic or other distortion would be carried through to the receiving set and cause objectionable distortion in the signal. Therefore, the succeeding radio-frequency stages, including the output stage must amplify the signal without introducing appreciable audio-frequency changes. In other words, the characteristics of the output wave of any one stage should correspond as closely as possible with the input to that stage. The distortion may be reduced to some extent by an output tank circuit of suitable design (for instance with high capacity), or by push-pull amplifier circuit connections. The tubes in an amplifier of this type are usually operated with enough grid bias to reduce the plate current to slightly above cut-off value. The excitation is strong enough to swing the grid somewhat positive and thus produce an appreciable rectified grid current. Rather heavy loads are placed on the preceding amplifier by the large amount of grid excitation required to overcome the grid losses in the tube.

The output efficiency is very good due to the fact that the grid swings positive for part of the cycle. Also the heating of the plate is very uniform under these operating conditions. The plate dissipation ratings recommended for radio-frequency operation apply to this class of service.

As indicated in Fig. 3, the grid bias may come close to the plate current cut-off value of -45 volts. With an excitation of, say, 65 volts, the grid will swing slightly positive. The output wave shape will be practically half sine-waves of plate current which, however, are flattened to some extent at their peaks. By using two similar tubes in push-pull, a very good output wave shape can be secured, particularly when a tank circuit of suitable design is used.

Although the circuit of Fig. 2 may be used, the tuned-grid and plate circuits represented in Fig. 1 are usually more suitable. The grid bias may be secured from a "C" battery or a generator. A grid leak is not suitable as its use would tend to produce distortion.

CLASS C — RADIO-FREQUENCY POWER AMPLIFIER OR OSCILLATOR

"The Class C amplifier is one in which the output is the primary consideration. The output varies as the square of the plate voltage, within limits.

"This is accomplished by operating with a negative grid bias of more than a sufficient value to reduce the plate current to zero with no excitation. An alternating grid excitation is applied such that large amplitudes of plate current are passed during a fraction of the least negative half cycle of the grid excitation voltage. The grid voltage usually swings sufficiently positive to allow saturation plate current to flow through the tube. Thus the plate output waves are not free of harmonics, and suitable means are usually provided to remove harmonics from the output.

"The characteristics produced are high effi-
ciency and output, with a relatively low ratio of power amplification."

The Class C radio-frequency service corresponds with the usual type of oscillator and radio-frequency amplifier. The tube operates with a negative grid bias considerably more than enough to produce plate current cut-off. The excitation peak voltages must be sufficient to drive the grid considerably positive in order to secure large amplitudes of plate current. This results in very high efficiency of tube operation due to the fact that the tube's internal resistance is very low under these conditions. However, the grid excitation losses are relatively high and the preceding stage must deliver enough energy to supply these losses. In fact, the grid excitation goes so far positive that saturation may be reached for a relatively large portion of the cycle.

The tube operates so that a considerable amount of second harmonic distortion is produced with the positive grid swings. However, the plate output circuit is usually provided with a tuned tank circuit designed so the distortion is reduced by a considerable amount and practically all of the second harmonic distortion is eliminated. In most cases, the distortion is not objectionable, as the radio-frequency current acts merely as a carrier agent between the transmitter and receiver and is removed from the signal in the detector tube of the receiving set. Thus any radiofrequency distortion of this type does not impair the quality of the signal.

![Circuit Diagram](image)

The circuit of Fig. 4 also represents the connections of a typical amplifier of the Class C type. The input circuit is tuned and is connected to the grid of the tube through a suitable blocking condenser. The output circuit is tuned to the input frequency and is in turn coupled with the desired succeeding amplifier or the antenna system.

The negative grid bias may be secured from a generator or from the drop in voltage produced by the rectified grid current flowing through the grid leak, R. Also a combination may be used with the generator supplying a large proportion of the bias and a grid leak supplying the remaining amount required by the operating conditions. The value of grid bias is usually not critical.

When a grid leak is used, the grid bias depends upon the voltage drop produced by the rectified d.c. grid current flowing through the grid leak. The bias will thus depend upon the value of the grid resistance and upon the rectified grid current. In case the excitation becomes stronger, the rectified grid current becomes greater and the grid bias increases. In this manner the grid leak method of securing a grid bias is very effective over a wide range of operating conditions. In case a generator or a "C" battery is used, it is common practice to employ some grid resistance to take care of circuit and other variations.

Due to the large proportion of the time that the grid is positive, the efficiency is very high.

As indicated by Fig. 5, the grid bias may be roughly -120 volts and with a peak excitation signal of 200 volts, the grid is driven so far positive that the plate current is appreciably reduced on the excitation peaks. The increasing plate current rises rapidly to its maximum value, dips and then rises for a portion of the half cycle and later rapidly drops to zero, producing what is frequently referred to as a "square" wave shape. The tank circuit usually presents a considerable "flywheel" effect so that the signal is radiated as a wave showing only relatively unimportant amounts of distortion.

**Doings at Headquarters**

SUMMER is here which means that those of us at Headquarters who are not already vacationing are at least looking forward to our few days at the sea-shore, in the mountains or painting the house.

During July we were visited by several amateurs. Fred Elser of old-time op3AA and xop1ZA was down for a chat one afternoon. Fred is located at Cambridge at present while studying at M. I. T. Mr. and Mrs. WSKC of Cleveland dropped in on us one afternoon, as did Middleton and Lister of the same city. W3AID and W3CGS of Philadelphia drove up one day. W3MQ of Allentown, Pa., paid us a short visit. W4AZ of

*(Continued on page 70)*
W9CJC, owned and operated by E. H. Carter, 3455 Elizabeth Street, Denver, Colo, first came on the air with a tuned-grid tuned-plate transmitter using two UX-210 tubes before the days of "high C" and 1929 regulations. The transmitter was changed slightly to make it a fairly high-C oscillator circuit when it became evident that the restricted regulations would require more careful operation and better constructional practices. Modulation due to a ripple in the plate supply caused a rather broad wave to be emitted, which was quite effective in covering up any frequency drift which occurred as the oscillator tube became warm. A filter in the generator smoothed out the note, and further improvements, principally in reducing the L/C ratio so as to provide a still higher C circuit, cured creeping, and some very good results began to be obtained. However, it was believed that better results could be obtained, and a crystal controlled transmitter was decided upon. Improvements in the receiving equipment were also planned.

The present W9CJC consists of a four-tube 1929-type receiver with plug-in coils and condensers to cover the 3500-ke., the 7000-ke., and the 14,000-ke. amateur bands. A crystal control transmitter operating on the same frequency bands, a shielded monitor with plug-in coils and finally, one of the new type General Radio Company amateur frequency meters. The old equipment used in 1928 is still in use, and may be pressed into service for emergency use if necessary. The general layout of the station is shown below. In designing the crystal-controlled transmitter for 1929 operation, UX-210 tubes were chosen because of their low initial first cost, their low up-keep cost and their adaptability.

The clear bell-like note obtainable with a crystal-controlled transmitter using these low-power tubes makes a combination that is difficult to beat. The oscillator, with a 3520-ke. quartz crystal in its grid circuit uses a UX-210 tube with 350 volts applied to its plate. The next tube, also a 210, is used in a frequency multiplier circuit for operation in the 7000-ke. and the 14,000-ke. bands, while the final amplifier, a neutralized device, also uses a UX-210 tube operating on the same frequency as the intermediate amplifier.

The transmitter is a double deck affair using two 7" x 18" formica panels. The deck sub-panels are also of formica. Contrary to popular amateur belief, this sub-panel arrangement works very satisfactorily, and while this type of construction requires more time to complete than the familiar "bread-board" type of construction, a very neat job results. All experimental work is done with bread-board construction, after which the final model, using sub-panel construction, is completed. This procedure is...
followed because formica panels are too expensive to use in experimental set-ups. Benjamin sub-panel brackets are used, which aid in constructional work as practically all of the wiring, done with flexible hook-up wire, is located below the sub-panel.

The transmitter construction may be seen clearly in a photo. The wiring diagram of the transmitter at W9CJC is given in Fig. 1. All of the coils are of the plug-in variety, and are provided with General Radio Company plugs, the corresponding jacks for these being mounted on the formica sub-panels. The coils for the tank circuit of the oscillator and the first amplifier are wound with No. 12 enamelled wire on bakelite tubing which keeps the coils mechanically strong and rigid. The coil $L_1$ consists of 9 turns, while $L_2$ consists of 5 turns of wire on bakelite tubing 3" in tubing. For 7000-kc. operation, the tank inductance of the final amplifier, $L_n$, consists of 12 turns of 3/16" copper tubing wound on a 2 1/2" pipe. The antenna coupling coil $L_4$ consists of 6 turns of copper tubing similar to $L_n$. Because of the higher resistance of the antenna, smaller tubing or wire could have been used in the antenna circuit, but the 3/16" tubing provides the requisite rigidity and was available so it was employed. Fixed, though loose, coupling is employed between the antenna coupling coil and the tank coil of the final amplifier. All tuning condensers have capacitances of 500 µfd.

The radio-frequency choke coils are of various types and makes. Two General Radio Company chokes are used in the grid circuit of the oscillator and first amplifier. Two home-constructed chokes are used in the plate circuits of the series fed oscillator and first amplifier, while Aero transmitting choke coils are used in the output amplifier. The critical choke coil is that of the grid circuit of the oscillator tube. If the choke is so constructed that its natural frequency is near the operating frequency, the circuit will still oscillate at the frequency of the crystal when the crystal is used. If the crystal is removed from the circuit, oscillations will still persist at a frequency which is determined by the LC constant of the plate circuit of the oscillator, the oscillator in this case becoming a tuned-grid tuned-plate affair. Normally, the choke used at W9CJC in the grid circuit of the oscillator is so constructed that it is not resonant with the operating frequency and the circuit is then workable only when the crystal is plugged into its mounting in the grid circuit, but sometimes practical use is made of the fact that the circuit will oscillate with a resonant grid choke. A small coil shunted by a 23-plate Pilot midget condenser is used to replace the radio-frequency choke coil when the crystal fails to operate or when it is desired to change the frequency of the transformer slightly. Actually, if the choke coils were made to be resonant in the 3500-ke. band the circuit would oscillate over a considerable portion of the amateur band without any grid tuning condenser. Thus, it is possible to determine the frequency solely by

**Figure 1. Diagram of the Transmitter and Power Supply at W9CJC**

- $L_1$ — 6 turns of No. 12 enamelled wire on 9/32" bakelite tube.  
- $L_2$ — 5 turns of No. 12 enamelled wire on 9/32" bakelite tube.  
- $C_3$ — 23-plate Pilot midget condenser.  
- $C_4$ — 2,000-µfd. by-pass condenser.  
- $C_5$ — 2-µfd. filter condenser.  
- $C_6$ — Keying condenser.  
- $L_4$ — 8-henry filter choke.  
- $L_5$ — 16-henry filter choke.  
- $C_7$ — Filament by-pass condenser.  
- $R_1$ — 2,000-ohm resistor to reduce oscillator plate voltage to 560 volts.
OPERATION OF THE TRANSMITTER

When operation is intended in the 3500-kc. band the frequency doubler tube is removed from its socket, the grid excitation clip of the doubler is removed from the first amplifier, and the grid excitation clip from \( C_5 \) of the final power amplifier on the top “deck” is attached to \( L_1 \). About 10 turns are used in the amplifier tank circuit and two turns are required for the neutralizing circuit. The filament of the oscillator and amplifier are lighted and plate voltage applied to the plate of the oscillator tube, no plate voltage being as yet applied to the plate of the amplifier tube. A flash-light bulb connected to a turn or two of rather heavy wire (to give rigidity) is coupled to the circuit of the amplifier, and this tank circuit is tuned to resonance with the oscillator tank circuit. The bulb will light, indicating the circuit is not neutralized and that a portion of the power delivered to the amplifier is feeding directly to the antenna. The neutralizing condenser should then be adjusted until the light goes out, and if slight readjustment of the tank tuning condenser does not light the lamp again, the amplifier is neutralized. The plate voltage is then applied to the amplifier, and with looser coupling between the tank circuit and the pick-up coil and lamp, the tank circuit and antenna circuit are tuned to resonance with the oscillator. The tank and antenna circuits will have to be adjusted together as the coupling between the two circuits does not permit independent adjustment. The frequency doubler is not used at all in this operation. For operation in the 7000-kc. band (the band in which most communication is carried out) the frequency doubler is used, the clip from the condenser \( C_5 \) being attached to the coil \( L_1 \). It might be well to mention here that the less grid excitation on the frequency doubler (within limits) the more stable the transmitter will be. A UX-210 tube will supply the grid losses of a 50-watt tube, so that ample excitation is available for the UX-210 frequency doublers. Consequently, the grid excitation clip from the condenser \( C_5 \) may be clipped on to the coil \( L_1 \) fairly close to the filament end of the coil. In actual practice only three turns are used to supply the grid excitation to the first amplifier. When the circuit is keyed the oscillator milliammeter should not drop more than 5 milliamperes. The practice of supplying as little grid excitation as is sufficient with proper operation can make each circuit more independent of the rest. The lamp is now coupled to the oscillator tank circuit, and \( C_5 \) varied to obtain maximum brilliancy of the flash lamp. Neutralization is not required in the frequency doubler, and the next operation is to obtain maximum brilliancy in the lamp circuit when this is coupled to \( L_3 \). Neutralization is carried out in exactly the same manner as already described, except that a coil suitable for 7-mc. operation is used for \( L_3 \). Grid excitation to the final amplifier is varied by the condenser \( C_9 \) which is more convenient than shifting the clip along the inductance. In many cases, it will be possible to obtain another resonant point with the tuning condenser, \( C_9 \) adjusted to the position of nearly minimum capacitance. The tank circuit will then be found to be tuned to the 14,000-kc. band, as a test with the frequency meter will prove.

For 14,000-kc. operation, the tank circuit \( L_1-C_3 \) is tuned to this lesser peak and the antenna is tuned to give maximum current either on the fundamental or a harmonic of the antenna system. The power amplifier is now operated as a frequency doubler, and it is advisable to increase the grid bias to obtain greater power output. The grid bias is fairly critical and greatly affects the power output. Grid bias is supplied by batteries, as this has been found superior to obtaining bias through the \( IR \) drop in a resistor. If sufficiently large, the plate supply unit will be capable of supplying the grid bias voltage. A grid bias of 45 volts is used on the crystal oscillator, 135 volts is used on the first amplifier, and 90 volts on the final amplifier for 7000-kc. operation. The high bias on the frequency doubler tends to make the harmonic more pronounced than low bias.

BACK VIEW OF THE TRANSMITTER

The oscillator and first amplifier are on the lower deck. The upper deck carries the final amplifier and antenna tuning coil and condenser.
PLATE SUPPLY

Power to the plate of the tube is furnished by a 500-volt direct current Westinghouse motor-generator. This unit is mounted on a partially inflated inner tube to reduce noise and vibration. A fuse is inserted in the high voltage line to protect the tube and generator if an unusually large current is drawn from the generator. A filter consisting of a 15-henry choke coil and a 2-pfd. condenser 'fore and aft' of the choke is used. Even without any filter, "pure d.c." reports are received, due to the fact that the crystal oscillator irons out such small modulating ripples. The amplifier tube obtains its plate voltage directly from the generator; the oscillator plate supply is obtained from the generator through a 5000-ohm resistor, which reduces the oscillator plate voltage to 350.

Keying is accomplished by inserting the key directly in the high voltage side of the plate supply lead. The key opens the plate supply of the frequency doubler and power amplifier, but permits the oscillator to operate. A key thump filter is used which keeps the neighbors happy.

THE RECEIVER

The receiver used at W9CJC is a four-tube affair using a screen-grid radio frequency coupling tube, an oscillating detector circuit, a peaked audio amplifier using a screen-grid tube with a Ford secondary coil, and a second audio amplifier. Both screen-grid tubes, as well as the Ford type of audio transformer, are shielded in Carter screen-grid shields. The receiver is a copy of the four-tube receiver described in the November, 1928 issue of QST, except that a National Company type B dial is used in place of the drum type of dial to give more room in back of the panel. As is done in the transmitter, the sub-panel idea is made use of. Benjamin sub-panel sockets are used which permit direct wiring with flexible cable to be accomplished easily. Three plug-in coils, covering the three most popular amateur bands, are available. The battery cable, of the plug-in variety, is used, all battery connections are broken when the plug is removed so that the midget tuning condenser may be changed without the danger of shock from the "B" batteries. And this is a necessity.

Fig. 2 shows a schematic wiring diagram.

Further details concerning this receiver are not given, as this subject has already been thoroughly covered in the past issues of the QST.

THE ANTENNA

The antenna used is a bent Hertz and has a fundamental of 5455 kc. The antenna and counterpoise are each 38 feet long. For operation in the 3500-kc band, a loading coil is used, whereas for 7000-kc. operation, the loading coil is cut out and a series condenser cut into the antenna circuit. For 14,000-kc. operation a separate bent Hertz antenna is used. The antenna and counterpoise of the smaller antenna are each 16 feet long. This small antenna operates better than the larger antenna, although the larger antenna may be loaded to 4086 kc. and operated on the third harmonic for 14,008-kc. transmissions.

W9CJC is more or less of an experimental station. Any changes made in the station, such as the erection of a new antenna, or a new oscillator arrangement are carefully noted as to date, time, dial settings, antenna current, and circuit constants. Only one change is made at a time, and a record of all changes is kept over a considerable period of time, so that comparisons may be made with results obtained from previous operations. W9CJC believes that if you put up a new antenna and don't work everybody you call, that isn't sufficient justification for trying a new antenna system immediately. Everything is given a fair trial over a sufficient long span of

(Continued on page 82)
Utilizing the Standard Frequency Transmissions

By Killian V. R. Lansingh*

It really ought not to be necessary for an article like this to be written. Every amateur "on the air" should long hence have a well-constructed, accurately calibrated frequency meter (yes, Horace, that's high-brow for wameter). This all too prevalent practice of adjusting the transmitter frequency by seeing as nearly as possible "where the receiver picks it up," and then seeing whether or not it is "too far" from the others will surely result in further slicing of our bands if continued, for much "slipping over" into the frequencies reserved for other services is bound to result. More than one foreign government has assigned its amateur curtailed bands (such as 7650 to 7250 kc, instead of 7000 to 7300 kc) so that its amateurs will actually stay within the limits set by the 1927 conference. If the present situation, particularly at the high-frequency end of the 7000-ke. band, does not improve, our government may be forced to take the same steps.

There seems to be some amateur feeling that we received a "raw deal" at the conference, but the conference, good, bad, or indifferent, is in the past and its results are the law of the land. We should even this early be looking forward to the next one and considering what privileges we are liable to obtain there if we abuse our present privileges in such a manner that other radio services will not only be jealous of the frequencies we retain, but even of having our frequencies anywhere near theirs on account of the interference caused by us. Granted that it is only a small minority that causes interference, nevertheless we all get the resulting black eye. This off-frequency operation becomes not the private business of the offender, but the business of all of us.

The remedy is the frequency meter. To my mind the possession of a moderately good and well-calibrated meter should be made a prerequisite to the issuance of a station license and to renewals thereof. Such a meter in its simplest form consists merely of a coil, a condenser, and usually some sort of indicating device. It's probably the simplest and cheapest instrument in an amateur station, yet approximately 25 per cent of the Los Angeles stations which the writer has visited in recent months have had no frequency meter of any kind. Perhaps, though I doubt it, Los Angeles is unusually bad in this respect, but it's pretty safe to say that from 15 to 25 per cent of the amateurs of this country have no meters. It's also pretty safe to wager that if our bands are ever curtailed still further, these fellows will be the first to kick.

Why do so many lack meters? It can't be the cost. Good meters are advertised in QST and elsewhere at reasonable prices, and one can be made at home for next to nothing. It can't be the difficulty of construction, for such a meter is far simpler than the simplest "ham" receiver or transmitter ever constructed. It is not my purpose to describe such meters here; QST has described dozens in the past few years; others will be found in the Radio Amateur's Handbook by Handy and Hull. See particularly The Frequency Measurement Problem, page 9, October, 1928, QST.

There seems then, only two possible reasons why stations without meters exist: (1) General business and cussedness, and (2) difficulty of calibration. For the first, the A.R.R.L. can do nothing. For the second, the League with the cooperation of the Standard Frequency Stations has done and is doing a real service.

Various methods have been described in QST for calibrating a meter by the use of the signals of fixed-frequency stations such as WIZ, WIK, and the better broadcasting stations, using the harmonics of an auxiliary oscillator or receiver tuned to the frequency of the incoming signal. Such methods are far less complicated than they appear in print. An excellent recent article is Calibrating the Heterodyne Frequency Meter or Monitor, by George Grammer, W3AIH, which appeared in April, 1929, QST. This method can very easily be extended to calibrate an ordinary frequency meter, although I agree with Mr. Grammer that the oscillating type frequency meter is by far the more satisfactory for traffic stations and for quick frequency checks, either on your own transmitter or on a distant one.

The Standard Frequency Transmissions remove the last possible objection to constructing and calibrating a frequency meter by having you exactly the frequencies you want. Do you want to know where 7300 kc. is on your meter? All right; the Standard Frequency Station will send you a signal exactly on 7300 ke., and there is no necessity of auxiliary oscillators, checking harmonics.

or much else. All you need is the meter and a receiver to hear the signal.

These schedules cover a number of points in each of the prominent amateur bands, are made up long in advance, and published in QST. They are arranged by the Official Frequency Station Committee of the League's Experimenters' Section, and are transmitted through the courtesy and hard work of the staffs of W9XL and W1XV. W9XL is the Gold Medal Station, R. E. D. No. 3, Anoka, Minnesota and H. S. McCartney is in charge, assisted by Lyall K. Smith, Ivan H. Anderson, and George Collier. W1XV is the Communications Experiment Station of the Massachusetts Institute of Technology located at Round Hill, South Dartmouth, Mass., with H. A. Chin in charge. Both stations have efficient, steady transmitters with good notes and considerable power.

There is no reason why a standard frequency signal should not be identified if heard at all no matter how bad the interference; during the eight minutes' transmission period of each standard frequency, the station frequently signs its call letters for identification; furthermore, instead of using the letters "t-e-s-t" or the signal ... for a test signal, each station uses a special test or "characteristic letter" to assist in identification. "D" is the characteristic letter of W9XL, while W1XV uses "G." Each schedule starts at the (low-frequency high wave) end of the band being covered. Even on a brand-new receiver the approximate tuning position of this point can be determined in a few minutes by listening to the amateurs on that band, and thus the standard frequency signal should be found without undue difficulty. From there, points are given in regular order and at approximately equal intervals up (in frequency) the band and should be followed without much trouble. Evening schedules are now being sent in the 3500- and 7000-ke. bands and afternoon schedules in the 14,000- and 28,000-ke. bands.

Once the standard frequency signal is being received the sole remaining operation is to "transfer" it to the meter. If the meter is of the ordinary type, this can be done by the resonance click method which has been described so many times in these pages. Simply bring the meter near the coil of the receiver, and slowly vary the setting of the condenser until a click is heard in the phones as the resonance point is passed. This particular setting of the condenser may then be marked as

(Continued on page 76)

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### Finding the Expeditions

<table>
<thead>
<tr>
<th>Expedition</th>
<th>Frequency (kc.)</th>
<th>Call Signal</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schooner Bowdoin, MacMillan Expedition to Northern Labrador</td>
<td>12570</td>
<td>WDDE</td>
<td>Look for WDDE on 23.18 meters. Nightly operation starts at 6:30 p.m., E.S.T. The schedules and general work are indicated in our full report received via W1AFB from a position near the Labrador coast. Operator, R. E. Brooks, of W9AFA.</td>
</tr>
<tr>
<td>Base Station, All-American Yacht Malaysian Expedition, Poenauk, Tjiaboe, Barnoe</td>
<td>7330</td>
<td>PMZ</td>
<td>Several months will be spent in the jungle conducting radio and other research work. Traffic should be filed with W1ME or W9AKW to be sent to PMZ direct or via KIAF or KICY. Operator, Harry W. Wells, ex2ZD.</td>
</tr>
<tr>
<td>Yacht Kippe</td>
<td>8290</td>
<td>KFLF</td>
<td>Sailed from Baltimore for New York City about August 1. Keeps daily schedules with W9GZ who routes Los Angeles traffic via W9CI. Operator, J. R. Finan, QSL to Box 188, Bradenton, Fl.</td>
</tr>
<tr>
<td>Yacht Nomad</td>
<td>8270</td>
<td>WEDC</td>
<td>On world cruise. San Francisco QID the South Seas. Operator, Stephanie Miranda.</td>
</tr>
<tr>
<td>Yacht Tempcore</td>
<td>8360</td>
<td>WIDJ</td>
<td>On Tahiti cruise. Operator, exW9CZX.</td>
</tr>
<tr>
<td>Base, Byrd Antarctic Expedition, Lat. 73 34 S, Long. 163 30 W.</td>
<td>8810</td>
<td>WFA</td>
<td>WFA calls CQ after regular schedules, also at 0400, 0700, and 1000 GCT daily, choice of frequency depending on season and conditions. Operators, Berkner, Hanson (MP), Peterson (PETE) and Mason (MN). Worked W9/CSB with traffic using 7310 kc. from port at Dunedin, N. Z.</td>
</tr>
<tr>
<td>S.S. Eleanor Bolting of Byrd Expedition</td>
<td>8830</td>
<td>WFAT</td>
<td>Bases at rubber plantation at Santa Ream, Brazil.</td>
</tr>
<tr>
<td>S.S. Lake Orema, Ford Motor Company</td>
<td>8850</td>
<td>KVUA</td>
<td></td>
</tr>
</tbody>
</table>
The A.R.R.L. Official Frequency System

The Official Frequency Station Committee, a part of the Experimenters' Section of the A.R.R.L., has arranged the services described below for the benefit of the members of the League and others who may wish to use them.

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

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

Practical suggestions are always welcome and should be sent to the proper member of the Committee which is composed of the following: Don C. Wallace, W6AM, Chairman in charge of O.F.S., Room 410, 200 Pine Ave., Long Beach, Calif.; Prof. C. M. Jansky, Jr., head of University of Minnesota, Minneapolis, Minn.; and Killian V. R. Langkrf, W6QX, in charge of O.F.S.-S.E., Box 606, Hollywood, Calif.

STANDARD FREQUENCY SCHEDULES

<table>
<thead>
<tr>
<th>Time</th>
<th>Frequency, kc.</th>
<th>B</th>
<th>AB</th>
<th>Time</th>
<th>Frequency, kc.</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:00</td>
<td>1500</td>
<td>600</td>
<td>900</td>
<td>4:00</td>
<td>1500</td>
<td>600</td>
</tr>
<tr>
<td>4:12</td>
<td>1500</td>
<td>700</td>
<td>900</td>
<td>4:12</td>
<td>1500</td>
<td>700</td>
</tr>
<tr>
<td>4:24</td>
<td>1500</td>
<td>700</td>
<td>900</td>
<td>4:24</td>
<td>1500</td>
<td>700</td>
</tr>
<tr>
<td>4:36</td>
<td>1500</td>
<td>700</td>
<td>900</td>
<td>4:36</td>
<td>1500</td>
<td>700</td>
</tr>
<tr>
<td>4:48</td>
<td>1500</td>
<td>700</td>
<td>900</td>
<td>4:48</td>
<td>1500</td>
<td>700</td>
</tr>
<tr>
<td>5:00</td>
<td>1500</td>
<td>700</td>
<td>900</td>
<td>5:00</td>
<td>1500</td>
<td>700</td>
</tr>
<tr>
<td>5:12</td>
<td>1500</td>
<td>700</td>
<td>900</td>
<td>5:12</td>
<td>1500</td>
<td>700</td>
</tr>
<tr>
<td>5:24</td>
<td>1500</td>
<td>700</td>
<td>900</td>
<td>5:24</td>
<td>1500</td>
<td>700</td>
</tr>
</tbody>
</table>

The time is the local standard time at the transmitting station. 8:00 P.M. at W1XW-W1AXV is 0100 G.C.T. and 8:00 P.M. at W9XL-W9WI is 0200 G.C.T. Similarly, 4:00 P.M. at W1XW-W1AXV is 2100 G.C.T. and 4:00 P.M. at W9XL-W9WI is 2200 G.C.T. Due to the new regulations of the Federal Radio Commission concerning experimental licensed stations, the Standard Frequency Stations will in all probability use the amateur calls W1AXV and W9WI for these schedules.

DATS OF TRANSMISSION

<table>
<thead>
<tr>
<th>Date</th>
<th>Schedule</th>
<th>Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept. 1, Sunday</td>
<td>CD</td>
<td>W9XL-W9WI</td>
</tr>
<tr>
<td>6, Friday</td>
<td>A</td>
<td>W1XW-W1AXV</td>
</tr>
<tr>
<td>13,</td>
<td>BB</td>
<td>W1XW-W1AXV</td>
</tr>
<tr>
<td>13,</td>
<td>AB</td>
<td>W9XL-W9WI</td>
</tr>
<tr>
<td>20,</td>
<td>B</td>
<td>W1XW-W1AXV</td>
</tr>
<tr>
<td>22, Sunday</td>
<td>C</td>
<td>W1XW-W1AXV</td>
</tr>
<tr>
<td>27, Friday</td>
<td>AB</td>
<td>W9XL-W9WI</td>
</tr>
<tr>
<td>Oct. 4,</td>
<td>A</td>
<td>W1XW-W1AXV</td>
</tr>
<tr>
<td>6, Sunday</td>
<td>CD</td>
<td>W9XL-W9WI</td>
</tr>
<tr>
<td>7, Friday</td>
<td>BR</td>
<td>W1XW-W1AXV</td>
</tr>
<tr>
<td>11,</td>
<td>AB</td>
<td>W9XL-W9WI</td>
</tr>
<tr>
<td>18,</td>
<td>B</td>
<td>W1XW-W1AXV</td>
</tr>
<tr>
<td>25,</td>
<td>AB</td>
<td>W9XL-W9WI</td>
</tr>
<tr>
<td>27, Sunday</td>
<td>C</td>
<td>W1XW-W1AXV</td>
</tr>
</tbody>
</table>

Schedule "BB" sent at 2100 G.C.T. on one Friday of each month is transmitted at that hour for the particular benefit of European stations. If sufficient reports on its reception are not received, it will be discontinued. Since the 5700-ke. frequency is no longer available for use by Canadian amateurs, transmission of a standard frequency on that channel has been discontinued.

THE STATIONS

W1XW-W1AXV: Massachusetts Institute of Technology, Communications Department Experimental Station, Round Hill, Dartmouth, Mass., H. A. China in charge. Uses Eastern Standard Time and characteristic letter "G."


DIVISION OF TIME

A total of 12 minutes is allotted to each transmission divided as follows:

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

ACCURACY

The transmissions of both stations will be within 1/10 of 1% of the frequencies herein announced, which is considerably better than the accuracy to which the average good amateur frequency meter can be calibrated and maintained constant. During each transmission by W1XW-W1AXV the integral frequency nearest its exact frequency within 1/100 of 1% will be

(Continued on page 80)
Experimenters' Section

THE "DOUBLET" FOR RECEIVING

The idea of applying the "doublet" type of antenna system for reception must have occurred to many and has probably been tried before this as theory of it is so simple. Fig. 1 shows the arrangement consisting of two wires of a total length such that the natural frequency is near the middle of the band on which reception is desired. This total length may readily be determined by taking the natural wavelength and multiplying it by 1.56, the answer being in feet. For the 7000-ke. band, this length should be around 64.5 feet.

"The idea was suggested by Fred Roebeck one day when he and Ralph Heintz were at W6HM. A visit was immediately made to the village where the lamp-cord was secured and the doublet was made up. It peaks at a point slightly below the middle of the 7000-ke. band, the two sections of the antenna being each 32 feet, 8 inches long and the lamp-cord feeder 45 feet in length. For a trial, it was hooked up to a little t.g.t.p. receiver which uses a pair of Canadian peanut tubes and which had always been used capacitively coupled to a vertical wire 100 feet long. A little antenna coil was rigged up on a piece of dry shingle screwed to the window-sill just back of the receiver and the ends of the feeder were clipped to the coil. With the screw not all the way down and coupling pretty close to the grid coil, the resonant spot was just a little below the middle of the band. At this point the receiver stopped oscillating. Setting the screw down tighter raised the thin end of the shingle and loosened the coupling until the receiver started oscillating again—and there it was left. Signals come in a great deal louder than with the 'untuned' antenna and there is no increase in background noise. In fact, the detector goes into oscillation so quietly that it is difficult to determine just where it starts. The antennas work just as well on the 14,000-ke. band, and even 'way off the center of the 7000-ke. band, sigs are better than with the untuned antenna used here."

"W6AM thinks that the Zepp transmitting antenna would work just as well for reception and Fred Roebeck suggests that the feeder might be better if the wires were spaced about every three feet as the resistance and distributed capacity would be considerably reduced, 'cancelling' taking place just the same."

"W7MO was given the dope and reports that the signals are about twice as strong as with his other receiving antenna, while there is no increase in background noise level. Other experimenters may also find the system advantageous, particularly in locations where the noise level is high."

—Clair Foster, W6HM.

PUSH-PULL SELF-RECTIFIED T.G.T.P. CIRCUIT

W. H. Martin of 2270 Ocean View Blvd., San Diego, Calif., suggests the push-pull self-rectified, tuned-grid tuned-plate transmitting circuit shown in Fig. 2. While the arrangement may appear complex, it is necessary if the transmitter is to operate in true push-pull fashion at radio frequency while self-rectifying at plate supply frequency.

A study of the circuit reveals that the plates of alternate tubes are in parallel with respect to the a.c. plate supply and in push-pull with respect to oscillation frequency. Each of the pairs, 1-3 and 2-4, alternate in oscillating push-pull with alternations in the plate supply voltage.

Considerable difficulty might be experienced in getting the circuit properly balanced to realize identical frequency of oscillation from each pair of tubes on their respective alternations, but care in circuit design and the use of well matched tubes should eliminate this difficulty, particularly if each tube should be provided with individually adjustable grid leak and grid condenser. The thing looks intriguing and should provide an interesting bit of experimental work.

GRID BIAS FOR THE SCREEN-GRID TUBE

"A very good grid bias arrangement for the
screen-grid tube used in a radio frequency amplifier can be made from an ordinary 20-ohm filament rheostat as shown in Fig. 3. The link connecting the rotating arm to one end of the resistance unit is removed and a flexible lead is soldered to the rotating arm, which is then replaced. The resistance element is connected in the negative filament lead at the socket terminal. The flexible lead is connected to the grid return, the grid biss being adjusted by rotating the contact on the resistance element.

"This makes a more satisfactory and, if an old rheostat is available, a cheaper arrangement than screwing it in far enough to have it catch where the hole is reduced to the size of the original hole. This is half-way through the tool. Turn the tool over and drill into the screw shank with the drill that is the size of the contact shank. Of course, you have to judge the depth of the contact shank.

"This done, you are ready to remove the screw, insert the contact and hammer gently. You will find, if ordinary care has been used in constructing the tool, that you can drill the screw from end to end and not break out the side."

"A few of the ordinary sizes of threads and tap-drills are included in the following list;"

<table>
<thead>
<tr>
<th>Thread</th>
<th>Drill</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-32</td>
<td>36</td>
</tr>
<tr>
<td>6-40</td>
<td>38</td>
</tr>
<tr>
<td>8-32</td>
<td>20</td>
</tr>
<tr>
<td>8-40</td>
<td>28</td>
</tr>
</tbody>
</table>

-Mounting contacts on screws and rods-

"Have you ever built a relay or made anything that required a contact on the end of a screw or rod? Have you cursed and cursed because the drill followed every direction but that parallel to the axis of the screw or rod? Well, whether you have or not, just put the following down in your note-book and profit by my experience.

"The suggestion which is contained in this article has been thoroughly tested and tried out on some several hundred contacts and screws, and the results were so pleasing that it has been decided to hand it over to QST. The idea has never before been seen in any technical pages and it is believed that it may attract the attention of many experimenters because of its usefulness.

"Fig. 4 illustrates the temper-saving device. First, select a piece of iron, preferably cold-rolled, or if you want to work harder, tool steel is the thing. It should be from 1/2" to 1" thick according to the purpose for which you are going to use it: the thicker the stock, the longer the life of the tool.

"If you are mounting contacts, determine the size of the shank of the contact, or if it's a rod, determine the diameter of the rod and then secure a drill this exact diameter or .001" smaller. Drill a hole from the face of the tool, completely through it. Next, determine the thread to be used and get the corresponding tap-drill and drill half-way or less through the tool, starting on the same side as you did before and in the same hole. Your drill will act then as a reamer rather than as a drill. Now tap the hole to the size of the thread of the screw upon the contact which is to be mounted.

"Work the screw into the threaded hole, however, is for equal plate voltages on the modulator and r.f. tubes, the peak percentage of modulation being assumed as 60 (modulation factor 0.6)."

<table>
<thead>
<tr>
<th>Tube Used as Class A Modulator or Amplifier</th>
<th>Plate Input to Class C Oscillator</th>
</tr>
</thead>
<tbody>
<tr>
<td>UX-210</td>
<td>4 watts</td>
</tr>
<tr>
<td>UX-842</td>
<td>8 &quot;</td>
</tr>
<tr>
<td>UX-250</td>
<td>12 &quot;</td>
</tr>
<tr>
<td>UX-205-A</td>
<td>17.5 &quot;</td>
</tr>
<tr>
<td>UX-211</td>
<td>45 &quot;</td>
</tr>
<tr>
<td>UX-285</td>
<td>120 &quot;</td>
</tr>
</tbody>
</table>

From the above table it is clearly evident that the most effective modulator for a UX-210 used as a Class C oscillator or amplifier at normal plate voltage is the UX-250. The UX-842 is second choice while the UX-210 as a modulator is obviously quite unsuited. Similarly, for a 50-watt
Class C oscillator or r.f. amplifier, the UV-845 is the most effective with even the UV-211 a poor second choice.

Definitions of the various amplifier classifications, "A," "B" and "C," will be found in the article, "Vacuum Tube Amplifier Definitions," appearing in this issue. The system of modulation considered is, of course, the Heising.

**LOOP TRANSMISSION AND RECEPTION**

With the problem of interference between stations becoming increasingly more acute and the desirability of greater selectivity growing in proportion, it is highly probable that application of the loop antenna for both transmission and reception on amateur frequencies may prove worthwhile. In addition, directional transmission has been shown to be extremely effective on the 28,000-ke. band and may prove to be the solution for successful communication on the 56,000-ke. band. The physical size of antenna systems for these two bands is comparatively small, and loop systems suitable for both transmission and reception on these frequencies are within the space limits possible to most amateurs.

It may therefore be considered appropriate to suggest that experimental work involving the use of loop antenna systems for both transmission and reception on all our bands be given consideration by those experimenters in a position to do some good work on the problem. Something new and valuable can, without doubt, be worked out. It always is when an earnest group of amateurs tackle a thing.

A bibliography of references on loop antennas for transmission and reception follows. New applications and modifications of the material contained in these references will do the trick.

**BIBLIOGRAPHY ON LOOP TRANSMISSION AND RECEPTION**

**QST References:**

- Loop Transmission, by Bishop, pp. 7, Jan., 1923.
- Low Power Loop Transmission, by O. Wright, pp. 39, Jan., 1924.
- CW on a Loop, pp. 38, Feb., 1925.
- Top Loading Antennas and Loops, by Murphy, pp. 49, May, 1925.
- Low-Power Report (Includes Loop Transmitter), by L. W. Hatry, pp. 44, June, 1925.
- Loops and Ford, by O. Wright, pp. 33, July, 1925.
- A Neat Loop, pp. 38, July, 1925.
- Amateur Wave Changers (Contains Loop Data), by Clapp, pp. 35, April, 1926.

The Flying Loop, by Wright, pp. 53, Dec., 1926.

A Short-Wave Loop Receiver, by Preece, pp. 43, May, 1927.

**Proceedings I. R. E.:**

- Antennae, by Pickard, pp. 6, May, 1909.
- The Reduction of Atmospheric Disturbances in Radio Reception, by L. W. Austin, pp. 41, Feb., 1921.

**ADDITIONAL PORTABLE SET REFERENCE**

The bibliography on portable sets (Problem T-28) which appeared on page 46 of July QST, there should be added a very pertinent reference on the subject. This is: "Following the Sun with a Radio Flyer," by Elser, QST, Sept., 1927, page 9. This reference was inadvertently omitted from the bibliography.
The following table will show one the probable best time of times at which he can work several of the countries and continents in which there happen to be active amateurs. It should be noted that this schedule contains data on only the 14-mc. and the 7000-ke. bands. This table is something that has been needed for some time. There undoubtedly would be more foreign contacts if only more amateurs knew when to attempt contact with a given country.

We are indebted to Mr. Thomas W. Connette, W8AFM, of Lockport, N. Y., for this table, which has been compiled from observations made of the transmissions from General Electric's high frequency stations. All times specified are Eastern Standard. This table was made at 75° Lat. and 42° Long. The table follows:

<table>
<thead>
<tr>
<th>Country</th>
<th>7000-ke Band</th>
<th>14-mc Band</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>5 p.m. - 1 a.m.</td>
<td>11 a.m. - 8 p.m.</td>
<td>November to February</td>
</tr>
<tr>
<td></td>
<td>7 p.m. - 9 a.m.</td>
<td>4 p.m. - 9 p.m.</td>
<td>February to May, also August to November</td>
</tr>
<tr>
<td></td>
<td>8 p.m. - 10 p.m.</td>
<td>12 midnight - 2 a.m.</td>
<td>May to August</td>
</tr>
<tr>
<td>Argentina</td>
<td>7 p.m. - 3 a.m.</td>
<td>5 p.m. - 9 p.m.</td>
<td>November to February</td>
</tr>
<tr>
<td></td>
<td>8 p.m. - 10 p.m.</td>
<td>4 p.m. - 9 p.m.</td>
<td>February to May, also August to November</td>
</tr>
<tr>
<td></td>
<td>9 p.m. - 4 a.m.</td>
<td>3 a.m. - 9 a.m.</td>
<td>May to August</td>
</tr>
<tr>
<td>Australia</td>
<td>5 a.m. - 7 a.m.</td>
<td>11 p.m. - 4 a.m.</td>
<td>November to February</td>
</tr>
<tr>
<td></td>
<td>7 a.m. - 10 a.m.</td>
<td>2 p.m. - 6 a.m.</td>
<td>November</td>
</tr>
<tr>
<td>New Zealand</td>
<td>3 a.m. - 7 a.m.</td>
<td>12 midnight - 5 a.m.</td>
<td>February to May, also August to November</td>
</tr>
<tr>
<td></td>
<td>1 a.m. - 10 a.m.</td>
<td>8 a.m. - 10 a.m.</td>
<td>November</td>
</tr>
<tr>
<td>India</td>
<td>6:30 a.m. - 7:30 a.m.</td>
<td>11 a.m. - 3 p.m.</td>
<td>November to February</td>
</tr>
<tr>
<td></td>
<td>5 p.m. - 8 p.m.</td>
<td>11 p.m. - 3 a.m.</td>
<td>November to February</td>
</tr>
<tr>
<td>South Africa</td>
<td>5 p.m. - 9 p.m.</td>
<td>2 p.m. - 7 p.m.</td>
<td>November to February</td>
</tr>
<tr>
<td></td>
<td>7 p.m. - 11 p.m.</td>
<td>3 p.m. - 8 p.m.</td>
<td>February to May, also August to November</td>
</tr>
</tbody>
</table>

*Abstracted from a lecture given by Mr. M. L. Prescott of Genl. Elect. Co., before the Radio Assn. of Western N. Y.
Let's Improve Our Operating Practices

By Bayard Allen*

The Communications Manager invites contributions on every phase of amateur communication activity, offering prizes for the best article selected each month from those submitted. The author, whose choice of 1) a copy of the Radio Amateur's Handbook bound in Algerian, 2) six points of A.R.R.L. message blanks, or 3) 500 A.R.R.L. log sheets. If a second prize article is printed, a reward similar to one of the above will be selected by Headquarters and forwarded to the winner. The right is reserved to use other articles at any time with the usual credit to the author. A wide variety of subjects on which articles would be welcomed appeared with our original announcement (March QST, page 62) and the offer brings good for all articles received in 1929 marked for attention in connection with the contest. If you could use one of our prizes, here is a way to get it free of charge by giving all amateurs the benefit of your practical experience. So far 60% of those entering our contest have received prizes. You have better than a 25% chance of winning out and don't need to worry about competition. Why not send down and send us your ideas today?

The prize winning article by Mr. Allen calls attention to some of the faults that mar our present-day operating practice, and suggests for improvement based on standard procedures are made. The examples of proper and improper operating should be clear to all.

--- EDITOR ---

I

t is said that, "Constant dripping of water will wear away the hardest stone," but by listening to any one of the five amateur bands, it would seem that the majority of our station operators, are hard babies. They seem never to have heard or seen print the correct way to use our abbreviations and standard procedure.

At times, when the spirit moves me, I handle traffic, but due to the fact that my station is of very low power, it is necessary for me to do considerable listening in order to do effective work. By this I mean that, instead of calling "CQ West" or whatever direction I have traffic for, I listen for signals from that particular direction or state. Sometimes I can hear no CQs from a particular state and on this account, I use a plan which works splendidly with all stations that observe A.R.R.L. standards of operating.

For example: I have a mug for Pennsylvania and after listening, I can hear no CQ from that state but finally I do hear W3XXX, who by quick reference to my call book, I find is located in Eastern Pennsylvania. He is just finishing a QSO with W6XXX. I hear W6XXX give his 73 and sign SK. So, presuming that he is following A.R.R.L. practice, I call him and ask for a BK.

He comes on again but lo and behold, he is back on talking to W9BXX again. So I wait patiently and again he signs SK. I start calling him and for a second time I hear him, only to get blue in the face when I hear him going back to W6XXX. However, having a little patience left, I wait until he signs SK again.

Then I call him. Pretty soon I hear him again and, stopping my call, I hear him letting out a rapid-fire CQ. Now if I had not filled I would never wait for him to sign, but I have traffic, and so I answer him. In about 30 seconds I hear him starting to call so I stop my calling to listen, I find he is starting another five minute, or maybe longer, breath-taking CQ interposing -- -- -- -- -- -- instead of the conventional, or at least I always have thought it to be correct, -- -- -- -- -- -- is it any wonder that we have paddled cells? Now I have wasted probably 20 minutes trying to get in touch with W3XXX in order to get traffic off my hands, when I could, if he had followed the A.R.R.L. practice, had the message in his hands in five minutes.

Many fellows fail to grasp the fact that the fellow on the other end of the QSO (or prospective QSO, if you are calling him) only knows you and baa his estimation of you through listening to your list and your operating manners. A good list takes practice. Sensible operating, however, calls for only enough intelligence to read the "Rules and Regulations" and to follow them.

When you sign SK, mean it. Don't come back again for another 73 or to say you have his call, but to listen to cover the band, and to find any calls for your station. It is possible to have many a QSO by following up an SK sign — provided that the signing station actually means SK. I am thru with you and will now listen for other calls.

Some time ago, I had a message for Massachusetts, and after listening, I found I could hear no one calling CQ from that particular state, but I did hear W1— finishing a QSO. I called him when I signed "SK", and soon he "broke me" and gave me the GA signal. Now after I had raised him, instead of calling and signing about sixteen times, I called once only, asking "QSP Springfield? K." Immediately he came back with GA MK. Naturally this particular message was in his hands and acknowledged or QSLed by "W3ATJ de W1— 16 QTC7 K." I didn't have to wait while he called me for three minutes and signed a half a dozen times and then disgraced himself by "HRRRR OK OK OK all OK except address and text pse rpt. K." That sounds unreasonable but I have had it happen several times.

Would you prefer to try to give your traffic to such an operator or to enjoy a snappy transmission with an operator who uses standard practices and intelligent time-saving procedure? A five minute study of A.R.R.L. practice in the Radio Amateur's Handbook (or in the Rules and Regulations, a booklet sent free on request), will enable one to learn operating methods quickly and easily.

Then why, oh why, does nearly every QSO sound the same: "TA GE OM UB DB"? -- "QSA -- 4 HR in PUDUNK ... -- -- -- -- -- -- TS FER RPT ES 73." Sometimes it is varied with a weather report or a full QRA thrown in for good measure. It sounds like an army of mechanical robots transmitting. After such QSOs, I have received a card from the amateur station worked with the letters "RCC" on it. To such fellows, RCC must mean Radio Chat Cancelled.

Fellows, here's to better operators and more intelligent operating. Last night a friend of mine came in to tell the transmitter and said "Whom are you talking to?" I said "Just W6 in Calif." (No foolin' it was a 6.) Then he asked, "What is he saying?" and I replied, "Oh, he says my sign are QSA4 (believe it or not ..." but Joe Collitch was persistent, "Doesn't he say anything else but that?"

I groaned and said, "Yes, he says Good night & 73." And so will I. 73, SK W3ATJ.

--- TRAFFIC BRIEFS ---

The Amateur Extra First Class Operator's license continues to attract considerable attention wherever examinations are being given. At the recent Ames Convention in Iowa, W9CTW passed with flying colors. Incidentally, it is interesting to know that each individual on the staff of the Communications Department is now licensed as Radio Operator, Amateur Extra First Class.
Expeditions

WDDE

WDDE Nr. 108, July 23 (by radio via W1AFB) — Radio conditions along the Labrador coast are now very poor. The 20-meter band is the only one available since reaching Nain, July 14th. We have had wonderful help from a number of amateur stations. A total of 403 messages were sent and 29 received from June 22nd to July 23rd. Special mention must be made of the following stations handling most of our traffic: W5DD, W2AW, W9ETA, W9EF, W9ATN.

The following stations were worked during this period: W1AFB, WIBAL, W1CJE, W1CMX, W1RY, W2AEI, W2AW, W2BBI, W2BG, W2FY, W2BPA, W2CW, W9PP, W9AR, W9ADM, W9APN, W9UT, W9AGF, W9AX, W9DOM, W9DDL, W9HPP, W9CCW, W9CM, W9OUT, W9DC, W9BCN, W9CFI, W9EBB, W9EBT, W9EF, W9EO, W9ETA, K1KD and G5BY. Seventy-three times to all.

Sig. Brooks.

PMZ

Direct radio communication has been established between the United States and the main base of the All-American Lyric Malaysian Expedition, now at Petoeel-Tajoe, 250 miles up the Barito River and some forty miles south of the equator in the jungles of Dutch Borneo. The expedition has established contact with W2BB at Seattle, and with an unnamed station at Phoenix, Arizona, also with W6QDC, W6QGW and W6DQV, but most of the traffic has been through W6AKW, or through Philippine amateur stations, to this country via W6AKW at Lancaster, California. Conditions in central Borneo have been better for transmitting than for receiving, due to the electrical storms which cause almost continual QRN. Faced with the possibility of being cut off from the coast city of Banjarmasin because of the lowering of the Barito River due to drought, the expedition is preparing to depend wholly on radio amateurs as a means of contacting with civilization. The purpose of the expedition is to study tropical and equatorial radio conditions as well as to investigate the primitive tribes dwelling in the interior of the island.

Operator Wells visited Java and Japan on his way to the present location in Borneo. He reported that in spite of the monthly fee of one yen to the government, the Japanese are great followers of broadcasting, as is well demonstrated by the large numbers of bamboo poles used as antenna supports. Also there is a growing feeling against the present government prohibition against the operation of amateur radio stations. Portable equipment has been constructed which will be used by the advance and topographical sections of the expedition in keeping in touch with the base station, PMZ. PMZ now using this portable on 30-day trip.

WSBS

The June report appeared in last QST, and we are glad to be able to present the missing May report at this time, as this shows some of the difficulties of operating in the tropics: During May, conditions in general were excellent. Schedules were kept with K1AF in Manila; OMT1B in Sunay, Guam; JICT near Yokohama, Japan, and KUP in San Francisco. The contact with OMT1B enabled the expedition to arrange for a pilot three days before arrival at that port. It was noted that on the 31st of the month, neither K1AF nor JICT could hear WSBS, although signals had been excellent the preceding nights. This was interesting because the Manila Observatory weather reports, received through the courtesy of K1AF, indicated the presence of a typhoon in the region separating the Caroline from these two stations.

One by one the three new audio-amplifying transformers received at Apia, Samoa, went bad due to the harmful action of the tropic climates. At the end of the month, "IJ" was forced to receive with no audio amplification whatever, which limited WSBS to scheduled work. Signals in general were too weak to be heard above the clicking and working of the vessel under these conditions. The transmitting antenna also parted at about this time, making repair and replacement necessary. The expedition expresses thanks to those stations which so kindly cooperated in various ways. OMT1B handled various messages in addition to arranging for a pilot at Guam. K1AF supplied nightly weather reports. JICT furnished exceedingly accurate and useful information. KUP and K6DTG were very faithful in keeping schedules.

Amateurs the world over will miss the pleasant contacts with Operator Lawrence A. Jones of the Carnegie, better known to the fraternity as "IJ." Mr. Jones has found it necessary to resign before the vessel leaves San Francisco, but the Carnegie look forward to personal business which now requires his attention. The Carnegie Institute joins with us in regretting that he finds it impossible to continue the excellent work behind the key of WSBS. Mr. Stuart L. Session, W3HVL, and an active member of the A.R.R.L. since 1923, has been appointed to succeed Mr. Jones. Following a brief stay in Washington and some time at the Naval Research Laboratory, Mr. Session will join the Carnegie previous to the departure from San Francisco in late August. A.R.R.L. members are asked to give Mr. Session the same generous cooperation and support accorded Mr. Jones during the first year of the cruise.

WIMK

A.R.R.L. Headquarters' Station W1MK operates on frequencies of 3575 kc. and 7190 kc. Robert B. Parmenter, W1FQ, is next in line; his fist is familiar to most of the amateur fraternity. Occasionally other members of the Headquarters' staff operate at W1MK. Their personal signs may be found in the QRA Section of QST.

Throughout the following schedules Eastern Standard Time will be used.

OFFICIAL AND SPECIAL BROADCASTS are sent simultaneously on 3575 kc. and 7190 kc. at the following times:

<table>
<thead>
<tr>
<th>Time</th>
<th>Days and Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>800 p.m.</td>
<td>Sun., Mon., Tues., Thurs., and Fri.</td>
</tr>
<tr>
<td>1000 p.m.</td>
<td>Mon. and Fri.</td>
</tr>
<tr>
<td>1200 midnight (midnight)</td>
<td>Sun., Tues., and Thurs.</td>
</tr>
</tbody>
</table>

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

3500 kc.

3:30 p.m. to 9:00 p.m. on Sun., Mon., Tues., Thurs., and Fri.
10:00 p.m. to 11:00 p.m. on Tues. and Thurs. (No QSB before these periods.)
12:00 noon to 1:00 a.m. (or later) on Sunday night (Monday morning).

7000 kc.

10:10 p.m. to 11:00 p.m. on Sun., Mon., and Fri.
12:00 noon to 1:00 a.m. on the following nights (actually on the morning of the day following Sun., Mon., and Fri. (Only on Tues. and Thurs., does the OBC precede these periods.))

SCHEDULES are kept with the following listed stations, through any of which traffic will travel expeditiously to A.R.R.L. Headquarters. The frequency included within parentheses indicates the band in which each individual station keeps the schedule with W1MK:

<table>
<thead>
<tr>
<th>Station</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1BIG, Augusta, Maine (3500)</td>
<td>Mon., Tues., Thurs., and Fri.</td>
</tr>
<tr>
<td>W1XY, Canbridge, Mass. (3500)</td>
<td>Mon. and Fri.</td>
</tr>
<tr>
<td>W1VB, Newton, Conn. (3500)</td>
<td>Tues. and Fri.</td>
</tr>
<tr>
<td>W1JP, Jersey City, N. J. (3500)</td>
<td>Sun., Mon., Tues., Thurs., and Fri.</td>
</tr>
</tbody>
</table>
SEPTEMBER, 1929

W3EC, Fort Monroe, Va. (3500): Thurs.
W3FN, Fort Howard, Md. (3500): Tues. and Thurs.
W4AKW, Lancaster, Calif. (7000): Mon. and Thurs.
W5CIS, Sacramento, Calif. (7000): Mon. and Fri.
W9XN, Columbus, Ohio (3500): Mon., Tues., and Fri.
W9AL, Toronto, Ont. (3500): Tues. and Thurs.
W9AFY, Berwyn, III. (3500): Tues.
W12PA, Port Antonio, Jamaica (3500): Sun., Mon. and Thurs.

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1929 SIGNALS

3500-ke. band: W1MK, W2SC, W3ATF, W3ECP, W4DAOP, W5WQ, W5WQ, W9DX, W3ZJ, W3ER.

Notes — The stars indicate the number of extra code stations were reported.

ARMY-AMATEUR NOTES

SECOND CORPS AREA: New Jersey State Net: W2AOS has been Acting N. C. S. for 2nd Corps Area while W2AO was out of commission.

THIRD CORPS AREA: W3SN, Fort Howard, Md., is Control Station for 3rd Corps Area. Many schedules are left by this station on 3012 and 7225 ke.

FOURTH CORPS AREA: The 4th Corps Area recently received the death of Mr. J. M. Griffin, W4KY, who was killed in an airplane crash in Cuba on June 14. W4KY was Net Control Station for 4th Corps Area, and the loss of his help as such will be felt greatly.

FIFTH CORPS AREA: All data in this area are working very well. W5GZ-W5ZG is Radio Aide, 5th Corps Area, and is also Corps Area N. C. S. The State Net Control Stations are as follows: Ohio, W3BAU; West Virginia, W9OK; Indiana, W9EZ; Kentucky, W9CRC. Captain Baldwin, ex-W8BDX, is the new liaison Officer AA Radio at W9CLL.

WANTED, VOLUNTEERS

At the urgent request of numerous beginners, we are going to again devote space in this Department to list the schedules of 1750-ke. amateur stations who will broadcast information and code instruction to beginners. The beginners to the amateur ranks need code practice more than anything else, instruction in amateur operating practice, and two-way work with patient experienced operators as soon as they secure their licenses to increase their proficiency in using their stations. Thus it is, that again we are calling for volunteer transmitting stations in the 1750-2000-ke. (150-175 meter) band.

Roth C. W. and radiophone stations can engage profitably in broadcasting and two-way work for beginning "hams." Radiohame volunteers are really preferred, however, as by using such microphones and key instruction can be given most efficiently to the listeners. Last season those who took part in this work had gratifying results and built up large audiences and many friends, who listened regularly as soon as the schedules were announced. So if you have a 1750-ke. radiophone or telegraph transmitter and can engage in this most worthwhile work, please drop us a line at once, giving data on your exact frequency, hours of schedules, etc., and prepare to follow your schedule as soon as it is in print. We shall be glad to send you some manuscripted ideas and helps which will help you in putting this service over to those who copy your transmissions.

BEGINNERS, ATTENTION

In the Radio Amateurs Handbook you will find useful suggestions for memorizing and learning the code. Plans are afoot for printing in QST information designed to help you get your first license and to build simple equipment for receiving the transmissions which are being arranged for your benefit. In November QST we expect to start listing the "Volunteer stations" which will transmit code practice and other information for your especial benefit. A printed sheet explaining how to make a simple receiver to cover the 1750 and 3500-ke. amateur bands will be sent free of charge if you will drop a line to the Communications Department. In requesting this information, please be sure to ask for any other information you need, too, so that we may help out.

ELECTION NOTICES

To all A.R.R.L. Members residing in the Sections listed below:

The list gives the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of expiration of his term of office. This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from A.R.R.L. members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set ahead to the dates given herewith. In the absence of nominating petitions from Members of a Section, the present incumbent continues to hold his official position and carry on the work of the Section subject, of course, to the filling of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in Hartford on or before noon of the dates specified, all of which are 1929, except for the nominations in the Eastern Massachusetts, Section.

<table>
<thead>
<tr>
<th>Section</th>
<th>Closing date</th>
<th>Present SCM</th>
<th>Vacant term of office code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western N. Y.</td>
<td>Sept. 16 C. S. Taylor</td>
<td>July 1, 1928</td>
<td></td>
</tr>
<tr>
<td>Virginia</td>
<td>Sept. 16 C. B. Walsingham</td>
<td>Sept. 15, 1928</td>
<td></td>
</tr>
<tr>
<td>Arizona</td>
<td>Sept. 16 D. B. Lamb</td>
<td>Dec. 2, 1928</td>
<td></td>
</tr>
<tr>
<td>San Diego</td>
<td>Sept. 16 G. A. Ners</td>
<td>Jan. 5, 1929</td>
<td></td>
</tr>
<tr>
<td>Tennessee</td>
<td>Sept. 16 H. E. Barber</td>
<td>Feb. 2, 1929</td>
<td></td>
</tr>
<tr>
<td>Eastern N. Y.</td>
<td>Sept. 16 F. M. Holbrook</td>
<td>Oct. 2, 1929</td>
<td></td>
</tr>
<tr>
<td>Eastern Mass.</td>
<td>Sept. 16 E. L. butterfly</td>
<td>Nov. 2, 1929</td>
<td></td>
</tr>
<tr>
<td>New Mexico</td>
<td>Sept. 16 L. E. Radka</td>
<td>Aug. 2, 1929</td>
<td></td>
</tr>
<tr>
<td>Washington</td>
<td>Oct. 15 Otto Johnson</td>
<td>Nov. 5, 1929</td>
<td></td>
</tr>
<tr>
<td>Montana</td>
<td>Oct. 15 O. W. Wiers</td>
<td>Nov. 5, 1929</td>
<td></td>
</tr>
</tbody>
</table>

Due to the resignations of Mr. Polk Perdue, W9KF, in the Tennessee Section; of Mr. F. M. Holbrook, W9TCE, in the Eastern New Jersey Section, and of Mr. E. L. Battey, W1UE, in the Eastern Massachusetts Section, effective at once, nominating petitions are hereby solicited for the office of Section Communications Manager in these sections. Petitions must be in Hartford on or before noon of the closing date for receipt of nominations at 1929 H. L. Headquarters as specified above. September 16, 1929. Reports from ORS in Tennessee and Eastern Massachusetts should be sent to their Acting SCM, listed on page 4 of QST, Mr. Holbrook will handle the work in his section until a new man is elected.
BRASS POUNDERS' LEAGUE

Call | Orig. | Det. | Rel. Total
--- | --- | --- | ---
W0GH | 369 | 430 | 253 | 1062
W0FL | 123 | 28 | 227 | 608
W1HR | 238 | 99 | 196 | 533
W0ASH | 95 | 73 | 344 | 312
W0SR | 373 | 65 | 12 | 450
W0ERK | 125 | 62 | 250 | 437
W0FX | 101 | 289 | 40 | 430
W0CCE | 102 | 11 | 210 | 423
W0BYY | 141 | 197 | 44 | 382
W0ACK | 7 | 9 | 366 | 382
W1TC | 214 | 37 | 133 | 381
W1MK | 65 | 65 | 209 | 339
W0EEO | 41 | 218 | 76 | 335
W3BWT | 3 | 55 | 236 | 324
W3ZF | 41 | 53 | 237 | 321
K3DU | 262 | 25 | 4 | 301
W6DTU | 154 | 31 | 98 | 283
V62AC | 85 | 69 | 113 | 207
W6DTH | 48 | 58 | 133 | 239
W0GZ | 21 | 18 | 30 | 196
W0HR | 8 | 15 | 21 | 234
K0DWS | 18 | 39 | 74 | 131
W0CHA | 25 | 176 | 27 | 228
W0BML | 107 | 15 | 8 | 220
W0CMC | 18 | 20 | 180 | 218
W0J | 32 | 45 | 314 | 211
W0GP | 79 | 24 | 108 | 211
W0CHW | 68 | 10 | 126 | 210
W0QF | 144 | 33 | 205 | 309
W0JU | 101 | 94 | 195
W0AH | 28 | 60 | 104 | 192
K1AF | 59 | 45 | 40 | 78
W0ETJ | 32 | 54 | 54 | 170
W0GTY | 40 | 10 | 20 | 125
W0CJ | 37 | 50 | 26 | 119
W0AF | 11 | 55 | 46 | 112
W5RJ | 16 | 54 | 38 | 108
W7KO | 49 | 61 | 110
W0GCM | 10 | 60 | 16 | 86
W0HJ | 7 | 57 | 64

The several amateur stations responsible for the best traffic work—the ones that are "setting the pace" in worthwhile traffic handling—are listed right up near the top of our B.P.L., the figures giving the exact standing of each station accurately. All those stations appearing in the "Brass Pounders' League" are noted for their consistent schedule-keeping and dependable message-handling work in amateur radio. Special credit should be given to the following stations (in the order listed) responsible for over one hundred deliveries in the message month: W0ALX, W0BYY, W0CHA, W0EEO, W0EQF, W0CCE, W0FLG, W0GHI.

Deliveries count! A total of 300 or more bona fide messages handled and counted in accordance with A.R.R.L. practice, or just 50 or more deliveries will put you in line for a place in the B.P.L. Why not make more schedules with the reliable stations you hear and take steps to handle the traffic that will bear you out! This is the B.P.L. membership and it's yours for the asking.

96EJQ says that every allocation 28 mc. station has heard has been heard near WQA, some signals below and some above. QST gave WQA's frequency as 21.2 mc. which he checked as the third harmonic of 2070 kc. using an oscillating and a 700-band frequency meter. Will some one please advise if the entire 28 mc. gang has missed the third harmonic of 7000 kc. for the fourth or if WQA has actually moved to 28 mc. — it's got to be one or the other.

28 Mc.

W9EJQ says that every allocated 28 mc. station he has heard heard near WQA, some signals below and some above. QST gave WQA's frequency as 21.2 mc. which he checked as the third harmonic of 2070 kc. using an oscillating and a 700-band frequency meter. Will some one please advise if the entire 28 mc. gang has missed the third harmonic of 7000 kc. for the fourth or if WQA has actually moved to 28 mc. — it's got to be one or the other.
Another Headquarters Change

In addition to the changes in the QST staff which were mentioned in last QST, the A.R.R.L. field organization will be interested in some Communications Department news. We announce with regret that Mr. Louis B. Huber has resigned his position as Assistant to the Communications Manager to vacation in Iowa and to continue his college work in the fall. Just at present Louis is busy "reactivating" his station WDDO and we understand that he will be active in Midwest Division affairs.

Mr. E. L. Battey, formerly Section Communications Manager of the Eastern M.A., is expected to take Mr. Huber's place. Everett is equally well known as Section Manager and as "EF" at his station W1EF which will be on the air in Hartford very shortly. You will recognize him by the same "sine" when he operates Headquarters station W1MK.


TRAFFIC BRIEFS

W6AM offers a good suggestion to those amateurs who travel: On his trips across the country he wires ahead to locate the most important cities so that, upon his arrival, he can meet his contacts. In this way he has time either to visit the local stations or have a good rag chew before the train moves on, FB. Try it, travellers!

Inexpensive notebooks take up much less room around the shack than loose papers and are not so easily lost. They are excellent for use when copying messages. W2HiV has separate ones for originated, delivered and relayed traffic.

Rather than waste time blindly thumbing the pages of your call book searching for a certain district, why not index the book with numbered tabs?

California and New Zealand traffic may be routed through W4AQ who keeps a regular schedule with San Francisco and works 2L and VK constantly.

Mr. Leo G. Sands, W7PH, 2119 McDougall Ave., Everett, Wash., will broadcast code practice to beginners, if schedules are made beforehand. Write him, if interested, fellows.

W8XE, the well-known call of the Pennsylvania State College, has been changed to WNYA. The call W8XE had been held since 1914.

W6DNO took a message from Spain and made delivery at Uniontown, Pa., in 48 hours. FB, OM!

Most all stations are favored with visits from brother hams during the vacation season. It is an excellent opportunity to make plans for the coming cold weather. Why not take advantage of the chance and make schedules with your visitors before they leave? In that way you can make some skeds which you know will be real stuff.

Many amateurs have formed the habit of running the filaments of transmitting tubes below the rated voltages, thinking that by so doing the life of the tube will be lengthened. In a number of cases where we have seen tubes run at full output rating with the filament voltage half to two-thirds of a volt low, in most such cases a slow paralysis of the filament has slowly been effected, necessitating recalculation of the tube at an early date. The life of thoriated filaments depends more than anything else on the treatment they receive during operation. It is important to secure best results and longest useful life, to run the filament at normal...
ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections on or before the closing dates that had been announced for receipt of such petitions. As provided by our Constitution and By-laws, when but one candidate is named in one or more valid nominating petitions, this candidate shall be declared elected. Accordingly, election certificates have been mailed to the following officials:

<table>
<thead>
<tr>
<th>Section</th>
<th>Address</th>
<th>Two-year term begins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manitoba</td>
<td>A. V. Chase, VE4HR</td>
<td>July 15, 1929</td>
</tr>
<tr>
<td></td>
<td>109 Lamarke St.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Winipeg, Man.</td>
<td></td>
</tr>
<tr>
<td>Arizona</td>
<td>H. R. Shortman, W0BWS</td>
<td>July 15, 1929</td>
</tr>
<tr>
<td></td>
<td>519 W. Madison St.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phoenix, Ariz.</td>
<td></td>
</tr>
<tr>
<td>Porto Rico</td>
<td>E. W. Mayer, K4KD</td>
<td>July 15, 1929</td>
</tr>
<tr>
<td></td>
<td>Virgin Is.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Box 104, Eschenfeld, P. H.</td>
<td></td>
</tr>
<tr>
<td>Eastern Pa.</td>
<td>Don L. Lusk, W3ZF</td>
<td>July 15, 1929</td>
</tr>
<tr>
<td></td>
<td>Box 188, Ardelay, Pa.</td>
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In the North Carolina Section of the Roanoke Division, Mr. F. M. Whitaker, W40C, 516 Wilkinson Ave., Durham, and Mr. Hal S. Justice, W4TS, Box 552, Canton, were nominated. Following a close election Mr. Whitaker withdrew his name in favor of Mr. Justice who has therefore been declared elected, his term of office beginning July 31, 1929.

TRAFFIC BRIEFS

One way to keep the station on the air after you are married is to marry a YL ham. OM W9EHN had that all doped out when he married YL W9EIW, FB and good luck!

On June 4th, VE3ET played a game of checkers via radio with WA43WV. The game took just 50 minutes and VE3ET came through the victor, FB, OMs.

Let's have more lists of High Quality Signals and Well Operated stations. And say, OM, is your call listed under that heading?

F. E. Handy, Communications Manager.

voltage, that is, to run the tubes as nearly as possible at the rating given by the manufacturers.

W3IS, W3IX, W3ACGT and W3AUE, all of the College Amateur Union, are playing chess and checkers with other.

Canadian Union members on ten meters. W3ACGT is national head-quarters of the Union. Any station wishing to join should communicate with W1YB, W2HII, W3A0A or W8SO.

VE3VC recounts the following: One night while listening in the low (frequency commercial bands) he tuned in on a message from W—(call withheld) being received by WBL. This message was filed by an amateur, signed with his call and had reference to another amateur call. W—counted both calls as one word each in text and signature. WBL questioned this, stating that mixed letter and figure groups count a word per letter except in address. After some arguing W— said, "Please cancel that message, customer's request." Apparently the amateur who filed the message at W— had argued the operator into accepting the message with the calls counting one word each.

CANADA

Nominating petitions for Section Managers in Canada should be addressed to Canadian General Manager A. H. K. Russell, VE3AI, 5 Mail Building, Toronto, Ontario. To be valid, petitions must be filed with him on or before the closing dates named.

British Columbia Sept. 16 E. S. Brooks Dec. 2, 1928
Saskatchewan Sept. 16 W. J. Pickering Dec. 2, 1928
Maritime Sept. 16

To all A.R.R.L. Members residing the Sections listed:

1. You are hereby notified that an election for an A.R.R.L. Section Communications Manager, for the next two-year term of office, is about to be held in each of these Sections in accordance with the provisions of By-laws, 5, 6, 7 and 8.
2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections. The ballots mailed from Headquarters will list the names of all eligible candidates nominated for the position by A.R.R.L. members residing in the Sections concerned.
3. Nominating petitions from the Sections named are hereby solicited. Five or more A.R.R.L. members residing in any Section have the privilege of nominating any member of the League who holds an O.R.S. appointment in their Section as candidate for Section Manager. The following form for nomination is suggested.

(Place and date)
Communications Manager, A.R.R.L.
1711 Park St., Hartford, Conn.
We, the undersigned members of the A.R.R.L. residing in the Section of the Division hereby nominate ———— as candidate for Section Communications Manager for this Section for the next two-year term of office.
(Place or more signatures of A.R.R.L. members are required.)

The candidate and five or more signers must be League members in good standing and the candidate must be the holder of a Communications Department, Official Relay Station appointment of the petition will be thrown out as invalid. The complete name, address, and station call of the candidate should be included. All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the closing date given for receipt of nominating petitions. There is no limit on the number of petitions that may be filed, but no member shall sign more than one such petition.

Members are urged to take initiative immediately, filing petitions for the offices for each Section listed above. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

F. E. Handy, Communications Manager.

NDZ is a naval Reserve drill station and may be heard every Thursday night on 4045 kc. at 7:30 p.m., C.S.T.

TRAFFIC BRIEFS

W3BSH says that those fellows working FLAB and desiring a QSL should write to Operator L. O'Clery, in care of the American Legation, Monrovia, Liberia, West Africa.

56 mc. (5 meter) contact over a distance of 170 miles is reported to us by the Contact Bureau of the Radio Society of Great Britain. The transmitting station in this instance was G6TW. The receiving station was RRS 125. Power used was 25 watts. The date of the contact was 19 May 1929. FB — comes on. America!!

DIVISIONAL REPORTS

ATLANTIC DIVISION

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Forrest Callahan, W3BBW — Maryland: W3BBW has fallen by the wayside. Hi. But look out this look, W3BCX has moved his transmitter, W3AGJ, to W3BBW's shack. W3MI has been operated on here. Here's wishing you a speedy recovery, OM. W3ASHF, our latest QRS, is sure stepping. W3AFF in Cumberland wants some skeds. W3AUX is with us again and handled some traffic. W3ADO, the Naval Academy Radio Club station, is on with D. C. Delaware. This state is surely poorly represented. W3BWT says that none of the fellows send in reports, whether you are ORS or not. W3AJH spent two weeks with the Naval Reserve in Bethany Beach and had a fine time. District of Columbia: We have another old-timer back again, ex3EE, now W3AVH. He wants an OHS, W3BWT sends us all this month and makes the BPL, FB, OM, W3ALF is on again, and has a YL op at his shack. Steady, OM. W3AHP says that screen-grid tubes lose their sensitivity after a moderate period of operation. Let's hear more about this.

This month less than half the gang reported. Another month like this and I'll get the boom out for another clean-up. So let's have those reports.


EASTERN PENNSYLVANIA — SCM, Don L. Lux, W3ZF — Greetings, OM! I want to thank all concerned in electing me SCM, I shall always give you my best, and if you will cooperate by sending in the up-to-the-minute news items and traffic reports, it will help a lot toward making this section outstanding. Please note my new QTH, given on page 3 of QST. Several reports went to my old address and were not received in time to forward to QST.

Raymond Rosen Co., 49 North 7th St., Philadelphia, has several hundred handy reference sheets containing the new International prefixes and Q-signs. A request to them will bring you one by return mail. Thanks are due W3DB for this. Miss W3AAB says that her vacation has QRMD traffic, but promises a much better total next month. W3CDS reports no traffic. W3NF, our RM, has been busy organizing the Lehigh Valley Radio Club, and is looking for new members. W3AFA has been working 3.5 mc. and handling traffic. W3ATS is trying to get an S5Q perking on 1mc. W3AHS has a good tone on 3.5 mc. W3CJN and W3AXD are doing good work on 14, 7 and 3.5 mc. W3AWB is doing quite a bit of DX work. W3VD says that QRM's hitting his totals. W3JC blew his junk, but is back on now. W3DFTU complains of inactivity in his parts. W3CWO, now in Chicago, is ready to use his new call W3BYZ and requests temporary QSL of ORS. W3AWO left on his vacation, but sent his report in. W3BQ made his first report. W3RO is trying to break into traffic circles. W3ZF makes the BPL.


WESTERN NEW YORK — SCM, C. S. Taylor, W3NP — W3DME and W3BRP have been handling traffic. W3RGN has been searching the ether for old-timers and chatting with same. W3BRR worked Byrd expedition WFA, PF, EAR, W3BJO also worked WFA. W3DHE is handling traffic. W3DOA uses a self-starting Overland engine for power plant. He handled some traffic for the famous avistorix, lady Mary Heath, while she was in this country. W3DQK has his sister in training, so we may hear another YL soon. He has his OHS again and reports traffic. W3DRJ is now an OHS. He uses TPTG circuit and a 50-watt P.A. W3DSP is handling traffic from his Syracuse station. W3JH has a new ham in Western New York reports. W3P3 has just returned from a cruise on board the U. S. S. Frazier. Shake off the dust, gang, and put pep into the district report on the 15th of each month.


SOUTHERN NEW JERSEY — SCM, M. J. Lorty, W3FCF — The SCM regrets no report was sent in last month due to his being away on vacation. Only W3ATJ and W3KJ report this month, and neither handled any traffic. Now is the time to do your rebuilding for fall, so let's get it out of our system early. W3FCF is in New York City as a technical operator on the transatlantic telephone circuits, and only gets home over weekends. His totals will be missed. Let's have more reports from now on.

WESTERN PENNSYLVANIA — SCM, A. W. Mealy, W3CFL — A fair number of reports came in this month despite poor radio weather. W3CUG was on for only two weeks, but he leads the bunch, nevertheless. W3BNR ran a good second. He is going to Chicago to school. W3CDE and W3CENZ have a perfect record for reporting. W3CFL will have to move his transmitter again on account of mill building changes. W3XNE have had their call changed to W8YA. W3DHW reports no success with 5-meter tests with Great Britain. W3DZV is called for traffic. W3DSK has a new Zepp antenna, W3CENZ and W3SEO tried hard to pick up KHEJ, but failed. W3SAMU is rebuilding. W3COA is applying for an ORS. W3DLG is cracking crystals in his spare time. W3DNO has a new outfit working on 14,000 kc. W3HBN reports a fine time at the Philadelphia Convention. Although the committee has not given out the date of the Annual Banquet of the Erie Amateur Radio Club, they have stated that there will be no rubber chesnuts this year. W3AVY5 is requested to send his correct address to the SCM for check. W3AYH has been visiting in Erie. Thompson, recently an operator at W3ASQ, is putting his station, W3AJE, on the air. W3AJU is active again. Better weather coming, gang. Let's get set.

KENTUCKY — SCM, J. B. Watthen, Ill., W9BZ —

The extremely hot weather accounted for several absences this month. Some very nice totals were turned in by W9BZ on DX (over 100 points) and home work. W9JL is off for the summer. Although W9BKK dropped all skeds for the summer, he still ran good total. Business won't let W9BBW come home yet. W9QFN says he has the best receiver in town. We're from Missouri on that, OSM. W9QFY got most of his DX from K6VR and W9FZQ. He is doing a lot of talking at the end of the sked. W9FZQ is getting his skeds all lined up for the fall. A new band opening up in Danville says W9GGB did everything but learn the code for him. HJ. W96JJ has built a good receiver in Arizona. Now he has been punished by his doctor. Take care of yourself, OM. W9BGC continues the good work with another fine total. He is half owner in a $10 Ford. W9FBV promises a photo of his outfit to every station that sends in DX reports of his size. W9FJKN tries to remark that he passed his exam. W9BAN is playing tennis with local postmaster to insure quick delivery of ham mail. FB. Get your reports in early.


WISCONSIN — SCM, C. N. Crapo, W9VD — W9EMD is not keeping many schedules, but keeps quite a bit of traffic moving. W9BBW has schedules with W9EK and W9EKW in person, and is a VL in Climax. W9FQX is proving his station and now uses a 210 Harley on 7000 and 14,000 kc. W9BKK is on occasion, and says radio weather comparatively good lately. W9DLH has a weekly pow-wow with W9ERU during Sunday, and attended a hamfest at Rockford, Ill., on July 4th. W9FKS has discontinued all schedules. W9ASL operates occasionally on 14,000 kc. W9DJK-W9CYF is operating on 7000 and 14,000 kc. during the summer. W9FPH says he is busy having W9DTK station up to a better standard for the summer, and will be going two weeks. W9DKA expects to be on the air all summer.


ILLINOIS — SCM, F. J. Hinds, W9APY — Stations reporting seem to be holding their own in spite of the usual summer lull in traffic. FB. W9FQ worked W9A and ZL this month with his new 852 and 210 MOPA. W9FQF is rebuilding. W9BVK (also W8SCW) is located in the DC district and is having a tense struggle with some power supply. W9BKR is making schedules, W9ACU is using B battery supply on a 171A. W9IZ blew a few 291's on 14,000 kc. W9BBB is stationed. A new tube is getting along fine. W9BKH is operating a 210 Harley with S.S. Climax. W9RML is operating a Zeppa and a 210. W9BNT did a little globe trotting, visiting W9DQX, W9BCA and the boys in Rockford. W9AFC has his 832 on the 20-meter band with 500-watt 4000-volt kick in a voltage doublers circuit. He worked OA-4QF, getting a report of QSL. W9CUE is also on 14,000 kc. W9DKC is rebuilding for the 3500 band. W9DCK says no DX to speak of this month, but traffic is good. W9AFK is quitting his self-electro circuit and is phasing in a MOPA. We have two new QRs prospecting in W9EPF and W9AQN. W9BPN has a 210 in a 1929 Hi-C Harley. The Austin "Y" Club has turned out two new hams under the supervision of W9QG. FB, OM. W9GJJ wants to find out what the gang thinks of a station that uses a 6000-kc. band for testing purposes all night, sending such stuff as magazine clippings. Cut it out, gang. There is enough QRM without that. W9CQK is not quite done with his new receiver and transmitter. W9ALK is a member of the College Radio Union. W9AVL has hot attic QRM. W9CFFC worked his first foreign station on July 4th. HJ. W9HMQ is being rebuilt for a busy fall season. W9AIW knows what to do with a present of 3 sveratters. HJ. W9CVG is a new ORS. W9CVG and W9AAS are knowing their own DX records in fine shape. W9FQU is getting ready for fall features by obtaining a new schedule stand. He says he has a U. S. N. R. unit will soon be started in Rockford. W9DII is working Australia regularly. W9BZO is rebuilding, which, together with a nice crystal, will make him a "smart" DXer. W9BDD is coming out this month and is going to do what W9BZQ is doing. HJ. W9HLC has a new 392A, and...
has a little crystal-controlled outfit using a couple of 210s that get out fine. WSDAQ is pounding through in great shape. W5PFF of Monroe reports good results from an 802 with UX686 for rectifiers. WSBOY is getting to be quite a DX point, and we think he is in a nice total. The same. W5YIH has the honors for this month and is keeping seven daily schedules. Earl Seeley of W5CZ hasn't been very active, but he didn't forget to report. W5BR5 reports being QSO with our old friend W5DEK, who is now at W5CXL. WA5XW is building a 210, but expects to do more later. The steamier Stellaris now has W5AUB at the key. W5QHF will soon have a new shack and be on 3000, 7000 and 14,000 with two new transmitters. W5JD had some hard luck with the plate supply, but is all FB again. He has handled a good part of our DX traffic on 14 meters at W5HFO at Calumet reports that they will move to a new location soon. W8SE is leaving for a three-year trip to Russia. Best of luck, OM.


INDIANA — SCM, D. J. Augs, W5CYG — Report compiled at Headquarters. W5WY had a visit from W6MD. W5IBX is doing some rebuilding. W5PFP has schedule with W5DAQ and W5EVB, W5DHJ is also rebuilding for cooler weather. Reports were received from W5AIJ and W5FCG.


DAKOTA DIVISION.

NORTHERN MINNESOTA — SCM, Carl L. Jahn, W5BEM — The usual summer slump is here. Only four stations reported traffic. W5HCX comes to the front with a nice total. W5CIY has his transmitter fixed so he can work 3000, 7000, 14,000 kc. W5BHQ received the SCM’s traffic from W7AUJ and delivered it. W6DPT has put his receiver back into use. W5DHJ is back on the air. W5BBT had a visitor, W5AMV. W5EUG is on occasionally and says he has had a great time at Great Lakes. W5CFL is too busy with low frequency radio to work high frequency, but will soon be on with a transmitter that will knock ‘em all dead. The SCM just returned from a five-weeks trip to the west coast, covering a distance of 7500 miles. Lack of time prevented him from visiting many hamlets, but he managed to visit W7AEK, W5TFP, W5AAK and W5WAM.

Traffic: W9RBC 100, W5CIY 14, W5EHO 8, W5DQG 2.

NORTH DAKOTA — SCM, B. S. Warner, W5DYU — Not a single ORS reported this month! It’s probably the last weather and vacations. The SCM has not use outside in QST to good advantage. Please try to send in the card, fellows — it only takes a couple minutes.

SOUTH DAKOTA — SCM, Dwight Haack, W5DGR — W5DLY is putting in lots of time like a printer’s devil and is coming out of his summer slump at the same time. W5BHJ had some company and, contrary to all experience and expectations, 9 out of 12 foreigners came when cabled with. He reports some activity by W5FOQ on 14 meters. W5DIJ is on 7 or 8 meters, where the So. Dak. gang is at noon. W5DYU was the only WQ Falls station to report. The rest of the gang is presumably on vacations and in the summer slump. Don’t wait too long, fellows, before you start in. W5DIJ shows he is up for good DX.

Traffic: W5IDB 9, W5DIJ 5, W5DIJ 4, W5DLY 2.

SOUTHERN MINNESOTA — SCM, J. C. Pehounek, W5FCF — W5EJH has中小企业 gathering on the transmitter, but he leads the section. Hi, W5BEM is rebuilding. W5M7M and W5QFO transmitter that makes the journey from 7 to 14 kc. W5COS has a sked with KF2B, whose dad is at Rochester. W5DGE is on the same boat as last year and pouring lots of brass on the low frequencies. W5EJL has a new Ford. W5DQG is about to head out for a long time but has handed in his resignation. W5DHJ has been away for the last 25 days. W5CTO has skipped the black hills and points west. W5DPF is getting back on as soon as the new Rectohills arrive. W5RCD is still in Wisconsin and on using 400 volts B bats. W5DJA’s transmitter is like any other. He knows what it’s going to do next. W5EJF is at a new location.

W9DCR says a combination of ear, YLs and a tough job makes for low total. W5FLE, a new man at Vesta, is keeping a couple of skeds. FB, OM, W5DQH another new Minnesotan is getting out nicely with a 1929 Harley and one UX-210. W5CDX is busy 24 hours with a combination of crystal and gridle. W5BBZ has been heard on a few times. W5ELA handled a little traffic and worked some DX. The SCM had a most pleasant trip through Northern Minnesota and Canada and visited W9WEQ, W5PQ, W6EGN, W5CGU, W5DIV and W5AOU. The TCRC has elected next year’s officers and promises a convention sometime next spring. Any suggestions as to program, speakers, dates, etc. will be welcome by the Convention Committee. Reports on the 16th sure are nice. New QRA, 60 Melbourne Ave., S.E., Minneapolis, Minn.


DELTA DIVISION.

TENNESSEE — SCM, Polk Perdue, W5FI — The SCM is very sorry that he must resign his appointment. He has made connections with W5DP, Birmingham, Ala., and is leaving W5AWA, August 1st. Send your reports to James B. Witt, 832 N. Fifth Ave., Knoxville, Tenn., until further notice. W4AJQ has been busy, but will be on soon. W4RP is back in Memphis. W4CA has a 50-watt transmitter and MG supply. W4CD is doing fine and built in suitcase, using UX250. W4ACK has skeds with 1NIC and Panama. W4DR is on with UX-210. W4ACP has turned commercial op on ship, W4AGW forget to renew. W4AEK gets FB reports with UX-210. W4BH is a 250-watt in MG supply. W4FJ is not at home key regularly as he is commercial op. W4GCC is trying for commercial ticket. W4AQI has 220-D with mercury arc on 7000, UX-210 on 14,000, and gets good DX. W4SEB is on the sick list. W4GR has had power supply. W5ACM was at a new station at Buntyn, using a UX-210. W5AEP is working crystal and high power. He reports DX FB on 14 mc. and wants tests on 28 mc. W4AGJ is off for the summer. W4AVG has rebuilt and works traffic. W5FZ, ex-A6MH, a new station at Lawrenceburg, is rebuilding to use crystal and more power. W5SP is getting ready for winter. Well, gang, the SCM wishes you good luck, DX. and hopes to QSO to W4PL. Stand by your next SCM, OMs.


MISSISSIPPI — SCM, J. W. Culliet, W5AKP — W5AED filed application for an ORS, but failed to send in a report. W5FO failed to report this month and, if he fails next month, he will be minus an OHS certificate. W5FJ is mailing some reports, but W5FOQ reports working the west coast regularly. W5Q5VQ is very busy these days installing broadcast equipment at WCCO. W5AEP says phone doesn’t seem to get through the heavy college traffic, and he has had to make changes. W5AAL is still working foreigners, and has been QSO all U. S. districts. W5BEV has a MOPA now and says the messages have been coming through in good style. W5BBX blew his 75-watt watter and borrowed a 1UV-292 from W5BEX. He is getting two 216-B rectifying tubes so as to get away from that AC note. W5BLX will be on the air as soon as he receives the stopping condensers that he ordered from Chicago 21 days ago. (Some service, eh?) We have a new amateur at Cardon, Miss., and we hope to hear from him soon. W5AAC has plenty of QTH from business but he will be heard regularly before long.

Traffic: W5BBX 11, W5AVP 3.

LOUISIANA — SCM, M. M. Hill, W5FHR — Summer conditions have cut down activity in this section almost to a minimum. Several of the fellows are rebuilding for next winter. W5AD has a 75-watt xtal on 7000 kc. W5BFR has just completed a 1929 screen grid receiver. W5BAT has moved to Baton for the summer and has a 210-watt for the winter. W5AXS is having trouble with his crystal unit. He is going after a commercial ticket this month. W5AMA has moved to 14,000 kc. for life unless 56 or mc. gets better. Joy rides and swimming parties take up all of W5FHR’s time. W5FRT turned a ship out but a couple of trips this summer. W5SF says lack of time keeps him out of the BPL. W5BE has just completed a shielded
textual content for 14.7 and 3.0 mc. W5WG has returned from Penna. with an OW but has a 210 on 14,000 kc. in spite of her.

Traffic: W5WF 43.

HUDSON DIVISION

NEW YORK CITY AND LONG ISLAND — Acting SCML, V. T. Kenney, W2BCO — Manhattan: W2BCB and W2BDJ are tied for first with a very low total in their booth. Both complain of power leak QRM: W2BDJ has his 420 going at 200 and W2M0V report. Ex-W1BY reports that he and his roommate, W3CFG, will be going strong in our section in the near future. Welcome and good luck. Bronx: W2CYX is still keeping his seat with Europe and sends in a good total. W2AET should have another report.

W2FAM is rebuilding his 17 meter and W2M0V has changed over from a 201A to a 210 and promises some real traffic work. W2ABS complains of the heat. W2AF has changed over to a MOPA outfit. W2BBX is in a new QRA with a 10-meter. Brooklyn: W2IV has a sky with NJ2PA and is moving traffic. W2CCD is a new IRS. Long Island: W2AVP is operated by W2AEK, while AVP and CUD are at sea and lend the traffic in section. W2AS has rebuilt and is QSO foreigners regularly on 20. W2ATT is a very busy place. He is the man in W2YM. His Roy Scout troop and can also be heard from his portable W2IPF, W2TV is still going strong.


EASTERN NEW YORK — SCM, F. M. Holbrook, W2CSN — The music is mostly off again. Only four reports received. W2Q0 is building superlatives and made 6PL by scheduled traffic with m1NIC. W2LU handled good traffic in Northern end of section. W2ALL finds auto and YL cut down traffic considerably. W2IJK worked E0SIP. Some reports may not have reached the SCM this month as he was off on vacation.

Traffic: W2Q0 19, W2L1 29, W2ALL 8, W2BKN 2.

NORTHERN NEW JERSEY — SCM, A. G. Waster, W2WR — Again we find a very lean report from the IRS and failure of the same ones to report. August will find some IRS being cancelled, as there are some stations who have not reported for four months. W2PF has been kept busy with skeds with W1MK and W5QG at sea. He would like some early morning skeds on 7000 kc. W2AOS was Acting Corps Area NCS for July and handled some traffic with W2CXL. W2DX is now W5QD at Detroit and wants skeds with this station. W2HFQ is still QRL with W5AM. W2CJX blanketing on the fine weather and sunburns. Hi, W2AOP completely wrecked his new flyer trying to move a tree at 45 per. W2A0Y, an IRS from NYC, is vacationing in Allenhurst and has installed a 210 with 200 volts on truck and will use W2DD.


MIDWEST DIVISION

NEBRASKA — SCM, C. B. Diehl, W9BYG — W9QY is very busy harvesting, so radio gets a rest. W9DRV has the usual summer company QRM. W9FAM is on again, but has no schedules at his new location. W9D1 rebuilt his receiver and is building a monitor between links. W9D1 is away at school studying for commercial license. W9BBS is very busy, and by this time should be a conductor. W9BQR, W9FEF and W9JFI are very busy. W9BYG let his license expire and had to go back before the R. L. for renewal.


ILLINOIS — SCM, J. A. Amb. W9CET — Kansas has again broken all records for traffic, FB, gang. W9GHF is a close second and is using CW on 7000 kc. for the summer. W9WED and W9D1M is rebuilding his 17 meter W9COE reports for the first time, and would like skeds in all directions. W9CJR is also a newcomer and is on 7000 kc. W9BTG is having a lot of trouble bewildering condensers and W9GE is busy getting his National Guard communication platoon ready to go to camp in August. W9DIE

says the op at CT7, in a fit of Demoniac fury, reduced his signal to so small a fraction of normal things, including three blocking condensers. W9DEB is going strong again. W9BS has been on a motor trip and stopped to see the SCM. W9CFN is working in the harvest fields. W9HL enjoyed a visit from W9CWX and W9DCE. W9MLQ reports for the first time. W9D11, W9D11M and W9D1Z have low power 14,000 kc. operation against a 50-watt on the QRM band. W9BBS is suffering from the heat and YL QRM. W9FYP gave the SCM a boost with news of the doings of W9EY, W9AHZ, W9DL1 and W9DZ with low power tones. Cross town chinning is the order of the day with these sets W9ALC is going on 7000 kc. with a 210, and wants to handle all traffic possible. W9ACX took the exam for U. S. N. R.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, C. A. Weidenhammer, W1L — This report finds the SCM enjoying a trip through Pennsylvania. W1AMC is in New York.

W1BGC left for Montreal recently. He quantity termed it "America's Filling Station." HL W1DWM promises a surprising amount of DX ing as he knows what it is. W1LQ passed his amateur exam and rebuilt his station. FB! W1TD built a monitor and erected a 3.3-me. Zellante antenna.

W1AMQ of Milford, an OH5G prospect, is coming along nicely. W1AMG also proved to the R. L. that he knew him from the old days with delicious traffic. W1VGB worked a lot of DX on 14 mc. with his CX310. W1CIT reports a visit from W1CQ of New Bedford. W1VB gets better signal reports in his new location. The old attic shack is too hot for operation at W1BSN these days. W1MK manages to survive the heat. Content on 14 mc. is splendid at W1BK. W1CIP will be inactive until Labor Day.

W1RP gets on when les femmes permit him to. W1BOD states that 14-me. traffic is usually more important in content at his station than 3.5-me. Better yet, W1-FI-BQG has fair luck with a portable in the White Mountains. W1APP is sailing under the Hudson flag and operates a British installation. W1AJB reported for the first time, W1ARL has started on the air in Denbury. W1VE enjoys his Ward Lab this month. W1CBQ reports from the Channel Zone. W1ACR is out for an OH5S appointment.

W1ZL will be in Pennsylvania until October. Send reports as usual to his home address. The SCM asks W1BOD's pardon for listing his April total as 6 instead of 10 messages. Sorry, OM. W1WMA has a new S-M, 6-b. emitter kicking out Q5AS — born July 19th, FB!

Traffic: W1BID, W1RP 30, W1CIP 52, W1BK 8, W1MK 339, W1BNS 2, W1VB 1, W1CI 1, W1A6 16, W1AMC 17, W1AMQ 44, W1BLQ 7, W1BGC 6, W1AMC 11, W1ZT 2, W1AJB 21.

EASTERN MASSACHUSETTS — Acting SCM, E. R. Sharp, W1AIC — Well, gang, we are very sorry to lose our SCM, but we are glad that EQ is to be the gainer by the addition of W1UE as Assistant Communications Manager. We assure you Ev all the successes in the world. Let's carry on and show him some good traffic totals next month, W1WU reports that he is skedding with the YL for life. Hi. Good luck, OM, and hope you make an op out of the tow, W1K8H is keeping a very worthwhile sked with WOSAE, and wants to know what has become of the early 7:00 a.m. sked for skeds. W1VY finds DX poor and has turned to a new Florida network broadcast set for consumption; he also has a sked with W1WEK. W1K8H is still trying to put W1AJB to listen for him once in a while. Keep up your courage, FM!

W1BRL reports good DX on 14,000 kc. W1RLR has bought a new car and hence traffic has taken a slump. W1KY et al. (and others) distribute W1BRL, W1ASI and W1LQ sked in good totals and W1CQ was QSO a Dutch boat off Bermuda on 3500 kc. FB. W1ACIA has a portable with him on his vacation. W1AAM has a commercial ticket. W1BBT is off the air until fall.

W1RY worked W2D2E and handled some traffic. W1AGP has been experimenting with various arrangements. W1AOT has a new antenna. Don't forget to report, gang, even if there is not much station activity. Some ORS are very lax in this respect.

Traffic: W1LQ 72, W1AI 34, W1KY 23, W1AIC 28, W1K8H 26, W1RRY 21, W1WV 20, W1BLD 18, W1WU 17, W1LM 12, W1AAM 2, W1AOT 2.

WESTERN MASSACHUSETTS — SCM, J. A. Tassner, W1UM — W1UM has three transmitters on the air, but only one at a time on 14,000, 7000 and 3500 kc. We are sorry to hear W1BIZ is sick. W1BNR, who is one of the operators at W1AG, says he took 25 messages from W1SRG and has a schedule every night now. W1BSN worked P. I. and W1BLC is working P. I. W1AEK has schedule with Byrd. W1BS6 is making a new sked and receiver. W1AMZ is visiting at Everett, W1RAKZ does an occasional QSO from Boston and W1CIT is in a health center. W1CITZ is at Everett, W1RAKZ has a rectifier with "creepitum." W1E60 is moving, W1HHR is still on 7210 kc. W1UM is having his transmitter repaired. W1ETK is checking W1BRD's schedule with Byrd.

Traffic: W1LQ 72, W1AI 34, W1KY 23, W1AIC 28, W1K8H 26, W1RRY 21, W1WV 20, W1BLD 18, W1WU 17, W1LM 12, W1AAM 2, W1AOT 2.

NORTHEASTERN DIVISION

REGION — SCM, W. S. Claypool, W7UN — This month we have two of his reports. W7UN is the only one to send us anything. W7VMY, the RM, sent out over twenty cards with return postage, but failed to get any response from organization. If this continues, there will be many ORS without certificates. W7W5 suggests that we name W7T "The Vasquand Lover." Ask W7AMQ about particulars. W7OIF reports and says push-pull FB. W7PQ says QRL with farming. W7PE is getting ready to show the boys how to enjoy the Northern Division Convention in Portland.

W7AMF, W7WJ and W7EAK reported between convention work, experimenting with push-pull and preceding at RDO Club, the SCM finds a few spare moments. W7FB is getting started in Army Net. FB, OM, W7ALM says walking contests are NO. Hi, W7LT, W7WJ and W7LHP are spending vacations at nearby beaches. W7AMQ was listed as W7ANQ in the BPL in July QST. It won't happen again, OM. Let's show the folks we can handle traffic, gang, so everyone get some good skeds and be sure to report.

Traffic: W7TF 48, W7PE 39, W7MY 36, W7UN 37, W7AMF 30, W7WJ 43, W7EAK 37, with W7MF 14, W7TIF 10.

WASHINGTON — SCM, Otto Johnson, W7FD — W7PE in Everett steps up and takes the prize this month for traffic handled. W7ACW worked W7TFEP 19,500 miles away. W7VMY, W7WJ and W7TIF sent 12,000-loc.

W7TIF, W7VMY and W7WJ are conducting P. I. operations with W7EPD and W7SM. W7TFAP reports. W7SM is on SG receivers. TUN is still on the job, although W7STAF was the only station reporting. He reports that he is the
W6EC/6. W6QL worked all continents in 18 hours on 18 kc, with 210 tube. W6ELK has been helping hams get started. W6ETC is rebuilding. W6DLN came out at Palos Verdes hills with home brew audio, W6CHV and W6ACL alone. They worked KLPW with 7 watt input power. W6CCH is put in a new ashmore keying system in 6-phase plate supply. W6ASS, W6ELZ, W6EKE, W6GCH and W6EPN send in good reports. W6VEA (YL) is starting on a trip to Vanuatu and New Caledonia (also YL), and will try to visit all hams they have QSO’d. W6JU report vacant vacationed seeds, and traffic fell off badly. W6DHS and W6KKK of Ft. Monroe got commercial licenses OK. W6YDL and W6ELY of Monrovia and W6JU are still working on portable transmitters and antennas. W6WXX, W6LIP, W6HSU, W6OGQ and W6CZO in Kenya has been well and sent a good total just the same. W6AGR, W6LWZ, W6DZK and W6ABR report as usual. W6ANN reports QRM from Cal. Tech YLs. W6HT has been elected Assistant Route Manager for the Long Beach District. W6AG has been very QHT during the summer months. W6DZI cut down his shed for a few weeks. W6AXE was QSO with W6RS. He is now secretary of the Parasene Short Wave Club. W6AVZ, W6KMR, reports W6AET as new Assistant Route Managers, W6QL, and W6HT, James A. Chapelle, Radio Inspector, is a member of the Short Wave Club of Parasene. W6BLSL reports that the station will be active with four operators when college starts. W6DPY is working CW with 1000 kc, and W6KMR sends in his first report. W6HS has finished his new receiver and will be on wheelends. W6AEC is going to work nights now, so will have time for some day skeds. W6CUT is kept pretty busy with both school and work during the summer. W6FIJ just returned from San Francisco where he saw several bars. W6DYZ is laying for South Africa. W6ZGA reports that 225 portable Ray-O-Vac lasted 14 years in W6ZGA. W6KMA has been playing on 14.000 kc, his spark plug QRM had. W6DUJ is on air regularly. W6OFQ is moving his station. W6AWZ just moved down from Oakland and will be on the air soon. W6DJI is spending the month on vacation and finds it is hard on his traffic total. W6BZJ still is in camp trying to keep the boys from hitting the traffic makes. W6EAF spends his time trying to QSO Army Amateurs. W6DLO visited him.

The Pacific Division Convention will be at Los Angeles, and the dates are November 29th and 30th. Headquarters Alexandria Hotel, L.A.

The Hollywood gang put on a farewell June 15th, and about 100 attended. The Associated Radio Amateurs was invited to the meeting of the Short Wave Club of Pasadena on July 15th. The ARRs had a very enjoyable time. At the ARA meeting July 12th and operated some Long Beach stations. W6BQ, former SCM of San Diego, has moved to Los Angeles. W6ENB from Mission Beach visited ARA July 12.


EAST BAY — SCM, J. Walter Frates, W6CR — Traffic took another rise this month, due to the very FB work of Houston and Davenport opening W6KAL-A, which is under the Tional Guard encampment at San Luis Obispo. They kept the Gardemans in camp in touch with their relatives at home. W6ASW made a very fine record through seeds with the camp and other stations. W6OZ is the section’s leading operator, ran up another high total through seeds with the camp. W6EBI came in with the leaders, maintaining his usual fine schedules. W6TP, the S.S.P., ran up a high total in spades of arranging Naval Reserve seeds, routes for beginners, and writing for the various Aluminum units where good work is being done. W6AWF, a new ORS in the section, did himself proud this month. He has been relaying messages for WFA in the South Pole. W6CGM reports contact with P. L. fair.
He is keeping a sked with W1LPW. W6HJ turned in his last report before closing his station at Vallejo and moving to the San Francisco section. We are very sorry to lose him as he has been a most consistent amateur and one of the younger fellows in amateur radio. W6EMS says he has been kept very busy studying for his commercial ticket. W6BMS announces that he added one more to his filter and got 50% more output and 50% worse noise. Hl. W6EDR, his buddy, says he has not been on the air much because he has stolen W6EDR's XL. W6ATA has also been fine shape. He has a UX210 in a Hartley with about 550 volts on the old saucer. W6JH had to give up his old standby, 3500 kc., because of a power leak and is going to open up on 7000 and 14,000 kc., with a low-power MOPA, W6BZU. The Pride of Concord, refuses to let the summer months keep him from hammering his old xmitter. W6BFO is building a new receiver and is putting up an antenna with a reflector. Hope he doesn't take the reflector off W6DZ's Ford. W6ASJ has just returned from Napa, where he put in an ice plant and has gone to Salinas to repeat the performance. He expects to be on the air from Salinas under his portable outfit. W6BY has been getting more and more into W6AU, at Loring, Alaska. His son, W6CFD, has just opened up on 3500 kc. with a low-power job, W6CZIR and W6BZU are both off the air.


SANTA CLARA VALLEY — SCM, F. J. Quenault. W6UXH proved the only station in trans-Pacific communication during the past month, ably filling in the vacancy occasioned by W6BYY's lack of duty due to business. K1AU and KGDT handled their end in good shape. In the last month's report, it was mentioned that W6BYT had joined the Signal Corps of the U. S. Army. This was erroneous and should have stated that W6BYY had signified his intentions of joining the U. S. N. R. Communication Branch, W6AU has cancelled all skeds for the summer. W6BMW is putting in an 852 for 14,000-kc. work and is also rebuilding transmitter for 3750 kc. U. S. N. R. drill communication. The ops at W6AME were favored by a visit from the YLs, W6ETA and W6EVA. W6BAX was QSL'd for communication 345 hours in addition to a nice QSO with WPTA. W6NX drills twice weekly in the U. S. N. R. radio net on 3750 kc.

Traffic: W6BYY 332, W6UBY 125, W6JU 53, W6HMW 15, W6AME 20, W6WX 12, W6BAX 2, W6HJ 10, W6ECS, C. F. Hana. W6WB — Eighteen stations report again in this month's report, F6, follows. W6ERK leads the section, making the MPL both ways. He is getting to be known as the "sleepless wonder." W6AD, our old star, has been rebuilding and will be back again soon. W6EPR sends in a fine report. W6AYC perks up this month and sends in a good total. W6DZJ has been getting nice results with his new MO-PA. He edged out W6HP in traffic this month, so it must be FB, W6BIP and W6DYPB dropped down this month on account of vacation, as did a number of the boys. W6WMW has evidently decided to get the gang that he can out on the traffic, as he hands in nice total this month. I'm mighty sorry to see that W6WN, our RM, has found that the amplifier business takes up too much time to devote any to the RM job. Mr. Redegg, W6BIL, is his successor, and is doing a splendid job. W6DBD, his successor, and is doing a splendid job. W6CHRS reports traffic better. I wonder if W6DPF is an OLT, or if I just dreamed it? W6EEH is rebuilding. W6DPR is having fine success as Army-Amateur uncle on the traffic net. Regularly, W6VOS and W6AYC are very fine total for his first time up. W6JH brightens up this month with much better total than usual. W6DSS is now OLT. W6EEG says the Colpita circuit is the best ever, and the new set is stepping out in fine shape. W6DJZQ says he is getting settled in asking to make his 10 meter peak work. W6WN reports. W6BZ is using MO-PA and expects to have xtal going before very long. W6FK also has his eye on

xtal. We are glad to see W6HJ back in the section, and sure hope he reports regularly. Let's go, you old-timers. The new boys are certainly showing us how it should be done. What has happened to the new W6BZU? W6EJZ I shall be very glad to hear from any new stations on the northern part of the section.


SAN DIEGO — Acting SCM, H. A. Ambler, W6EOP — W6ACJ again leads the section in traffic. W6EOS, our new OBS, has a lot of work and is working lots of DX. W6OP holds sked with K6DTC twice a week and will list your Hawaii traffic. W6EOP is back on the air with QRO and is getting more skeds lined up, W6DCW is on 14 mc. W6EOP was very QRL vacation and cancelled all skeds for two weeks. W6OM is very QRL, hag hanging over the meat counter. HL. W6BAM is on the 11-me, band now.

Several of the ORS failed to report this time. Come on, fellows, let's have your reports.


SACRAMENTO VALLEY — SCM, Everest Davies, W6DON — Once again W6EOE makes the BPL with over two hundred deliveries. With a total of over three hundred messages, he is in fine shape, and the bad slump is that I was off the air for fourteen days this month due to35 six five qats. " There is a ham for you! W6EEO keeps daily skeds with ACSHV and K1HR. Miss W6ETA has been spending her vacation with Miss W6EVA. She sends in her report from the S. L. Barbee, going to Portland, Ore.

W6HAU makes the BPL with deliveries from the National Guard Camp. W6EOW made Byrd and LCFH, W6ER has a portable call, W6QCE, W6BHX has a new Ford. W6AEM got a new MO-PA. W6EJZ is having lots of fun with his new "printer" on the ABC net at KFPH. W6AIS has a RS card from Japan. W6DON was able to handle a little traffic with LCFH, and is now trying to make an inductively coupled MOPA work. The Sacramento Valley Amateur Radio Club wants the 1930 Pacific Convention.


PHILIPPINES — SCM, A. I. Felizardo, K1AU — This report was sent in by K1COY — On June 2nd, K1A8, KL1AC, three ops from K1BD, K1DL, K1EL, K1HZ, three ops from K1HR, K1XA, K1XR and K1ZC were the guests of John R. Schultz, K1JR, as a ham fest. They all reported a wonderful time, and think K1JR a fine host. K1MC is now crystal calibrated with monitor, and will give checkups frequency whenever requested. FB, K7OE has returned from the States with a MG and parts for a 50-watter. K1AF is using remote control. K1HE, an old 1911 snack man, is back on the air. K1OM is handling most of Fort Mills traffic, and K1PN reports a large number of the boys have left large total. FB. He is keeping same schedules as were in August QST report. DX weather has been poor but the traffic men have been pounding away FB — keep it up, fellow! ACSHV, Shanghai, also reported via W6EOE and is doing some nice work.

KilR: K1HR 383, ACSRY 137, K1AF 191.

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, C. R. Stedman, W6CAA — W6DQD finally got his rig going and started out the month with a nice traffic total. W69EAM has been too busy selling gas to Ford owners to do much radio work. W6CVR has been vacating, W6CBA has been off most of the month being rebuilt to a considerable extent. W6CDE is on 14,000 and 7000 kc. W6PZM is trying to burn up the ether with a bug, W6CLD says it's so hot he keeps the stove burning to cool the air off. W6DXW, W6CBA's station in the mountains, has been on week ends. W6BQO had a couple of recent jobs fail a total, and he is waiting for the promised replacements to reach Denver. W6CHK will be on the air soon as he gets hold of a power transformer. W6GGW got his mercury are working OK, W6CWE sends in a report. Lue's have moved south and W6CZM has been working CA. W6CWO made W6CWX a present of a 250-watter. Who says there isn't any Santa Claus? W6GTC has left the state, but he
did a little work at the last minute. W9EXW is working out in fine shape with his Ford coil CW. W9FDM has been having a lot of grief with his set. W9TX, a supposedly dead one, says he is about ready to go again. KB, W3BDY has been working as some are using a 2C and W9KLE. We W9RFB says he is having a lot of trouble moving his traffic. The annual convention of the Rocky Mt. Division will be held in Denver September 6th and 7th, and the Denver gang extend a cordial invitation to all hams to attend. W8AGV C-21 has been working his time that it will pay you while. The SCM will be glad to answer any inquiries.


A YONNING - SCM, P. N., W8VZ - W8VZ in the air this month, handling more traffic than the rest of the section put together. It only takes a few minutes a day to keep a few reliable skeds, follows. W8DPO is working 12 to 14 hours a day, but managed to push a little traffic through, W9KF left for the northwest, so we will not hear from him for a month or so. W6RJ had a hard time seeing up a few messages on 7000 kc. W8CNX is working hard for his WAC. In two weeks he worked 20 countries, including England, on 14,000 kc. W8RHF is out of sight and not doing much at all.


ROANOKE DIVISION

WEST VIRGINIA — SCM, F. D. Reynolds, W8VZ — Things took a turn for the better this month. Through the courtesy of W8ACZ, a hamlet was held at his station in July by 15th, W8CON, W8CNZ, Pitts-burgh, W8AII, W8WCN, W8AWT, W8JM, W8ACZ, W8VZ, W8HU, W8SCN, W8BDP and W8SCR were present, W8BCN and W8JM helped with the program. Several of the bunch argued the DX question while others tried to make the transmitter operate on 7000 kc. We finally wound up with three transmitters for 14,000, 7000 and 3500 kc. The bunch visited the local stations and finished by inspecting the BC station, W8MMN. From there they went to a park to partake of some eats. This turned out to be an endurance course, because there was more than enough food to go around. We think W8ALG gained several avoirdupois during this session. Hi. After the eats, everyone returned to W8ACZ's from the party broke up. Before they left, everyone agreed that we should hold another such get-together next month at Mannington. By the time this gets into print, we will be looking forward to a meeting at Shinnston, so I'll see you at W8ALG's.

The gang in the southern part of the state seem to be slowing down a bit, except W8OK, who has his army skeds, and W8SK, who handles navy work. W8OK has a very businesslike-looking station. W8DNN dropped in the other day from Parkersburg and asked that we set aside his ORS appointment, due to his busy holiday. He headed back south the following day by half OM. We understand that W8ODY of Wheeling is married. Congrats, OM, and good luck. W8HD says he is on 3500, 7000 and 14,000 kc. now. W8BCN has been having tough luck with his tubes. Better get a drip-can for your grid lead. Hi. W8CCN is looking for a big tube now that summer vacation is here. W8ALG is using a 210 and intends to enroll at WVU this fall for their radio course. W8CQW and W8AIC are working Morse wire. W983 is busy cleaning up his station after the hamlet, and promises more traffic for next month. W8JN borrowed W8BDP's transmitter, and has been doing pretty good. W8SV returned from California and started right to work. W8BDP intends to get a job in Pittsburgh, W8BDP and W8ZV report their frequency us 880 kc. from now on, as they have the xtal on the BC plant now. W8SCR is busy with the roofing business. Kliner of W3:40 ex W8SP was in town last week. The SCM extends his thanks to W8ACZ, W8BCN and W8JN for the hamlet. Together they put over, Good luck to everyone until next month.


VIRGINIA — SCM, J. F. Washlife, W8A — W8EC is using the 2A-1A, one-tube, and 5000 watts for rectifiers. They are building a shielded short wave receiver now. This station has six operators. They work remote control in connection with W1EF and handle a lot of Army traffic when QRM is too heavy on long waves. The station holds an ORS certificate, and is on the air about fifteen hours per day. Following are the skeds at W8EC: W5N, W3WM, W8IK, W8IK, W3NK. Skeds are wanted in turtled and north districts. Experimental station Dr-1 (W3ARU) is doing fine work with planes on 7000 and 3500 kc., using one 50-watter in Hi-C Hartley. W8ARI is on one in a while, and says DX, FB, W3ZJ and W80J will combine their stations and be on the air this fall. W8ATM is on when business and YC, can spare the time. W8MIO is hanging with the gang and has a fine DC note. W8PF has a 252 now, and is working some DX. W30CF has returned from college. W8AKL is building a new receiver. W8SW is doing very little, due to heavy QRM from static and street ears.

Traffic: W8EC 322, W8ARI 27, W8ALS 42.

NORTH CAROLINA — W8TS and W8AB are tied for high plaque this month. W8AB is back on from school. W8ACQ says that FQPM brought him a parrot from Africa — he thinks he will name it "P.M." Hi. W80C is keeping some fine skeds. W8TN has been operating on 14,000 kc. to escape the QRN. W8ABH is helping W8AIC get his gang. He is a fine fellow and will be working. W8ABW is a B.M. W8AKU worked X7T, which he thinks was somewhere off the coast of South America.


SOUTHEASTERN DIVISION

ALABAMA — SCM, S. J. Bayne, W8AAQ — W4AM and W4AX have about completed the 150-watt job to be installed at the Armory. W1AHZ is considerably under the weather. W4JY has completed a new 100-watt outfit. W4Z works DX on 14 mc. with a 201A. It weighs with the 5000 kc. plate. The twin at W4TF will soon be ready for an ORS certificate. W4AP was in N. Y., W9ALV is home for the summer and gounding away. W4HC attended CMTC in August. W9UV now reports a commercial ticket, W4AQ has closed down for the summer. W4AHQ is attending the Auburn Summer School. W1AKM has forsaken the Hartley for tuned plate-tuned grid. W4TT hasn't missed a single Army-Amateur schedule. W4A and W4T are partners at Bridge. W4AHF spent the entire month at CMTC. W4AJA has moved into a flat shack. W4AHF and W4AP will spend their vacation together in Florida. W4AKB can't understand why his 210 blunders. W4MT finds DX fine on 14 mc. W4HB, makes his first report. W4M spent two weeks in Florida and is now back on the air. The SCM wishes to announce the following new stations: W4JQ, W4ALG, W4EW. We would like to hear from the following new stations: W4AHY, W4AYL, W4AYW, W4ABF, W4AJX, W4AWF, W4AYD, W4AXT, W4AXT, W4APF, W4AWT, W4AYH, W4ALW, W4AFD, W4AJA, W4AW, W4ALW, W4AHF, W4ABF, W4AJX, W4ALW, W4AHF, W4ABF. W4AJX is W4AHF painting the walls.


FLORIDA — SCM, Harvey Chappin, W41L — We regret the loss of W4KY, killed on June 13th at Nacogdoches, Texas, in one of the Pan-American airships. He was at the radio control wheu the plane fell to the ground. W4HY has a DC note on 7100 kc. W2ZP reaches the highest traffic honors this month. W4QL and W4NB are new stations in Miami. That radio club is sure making boys. W4AKY and W4AKD are the loss of his schedule with J. N. Grifin, W4KY, and says his silent key will never be forgotten. W4AKF has a new push pull Hartley for 14 mc. work and has schedules with NDB, W5SEQ, W8BV, W4AW, W8BV. W4AQ, W4AW, W8BV, W8BW, W8BV, W8BV, W8BV, W8BV. W4AD, and W4AKB are members of the Pan-American Airways of Miami. W8ZK, W8AI, W8PP, W8AO, W8AY and W4ABA are also connected with P. A. A. W4AGY has a schedule with W4UK, W4AJH is touring through Georgia and Florida on a fifteen trip accorded him by C. Tullington and W4AY. Please send your reports in on the 16th of each month.


PORTO RICO-VIRGIN ISLANDS — SCM, E. W. Mayer, K4KD — K4KD has been elected SCM and makes
W H I L E  v i s i t i n g  W R A P  i n  F t .  W o r t h .  h e  w a s  m a d e  a w o m e n  n o w  has  a  real filter and a note to be proud of. He continues to be a VE5 station. VE5FT and VE5AR are both employed away from home, and will not be on the air again until full. VE3FC clicked with ZL2AC once again, July 6th on 14,000 kc.

Traffic: VE9AL 21, VE3VY 0, VE6CL 2, VE6BT 2, VE6PC 2.

V E N T U R A L  D I V I S I O N

A L B E R T A — S C M , E .  J .  T a y l o r ,  V E 4 H A  — W e  j u s t  passed a nice DX period. VE4HI worked his first G. VE4EY gets his usual ZL and VK. Many of the gang are out of town enjoying well-earned holidays. We hope VE4HO's family is all well again. H VE4GD and VE4AP keep up, we are going to have two more WAC in this section before long. Our real traffic star is VE4CC. He has nice skills and knows how to take care of them. The SCM wants to thank VE4GD for his splendid support in reporting and would like a little more from the gang in the north.

Traffic: VE4GHM 2, VE4EY 4, VE4BI 9, VE4CC 9.

P R A I R I E  D I V I S I O N

M A N T O B A — S C M , A .  V .  C h a s e ,  V E 4 I R — R e p o r t s have taken a decided slump. VE4FJ is attending the summer course at Stout Tech, Menomonie, Wis. VE4ZZ has built himself a push-pull TP7G transmitter and is receiving AI reports on 7000 kc., but cannot get the xmitter to work decently on 14,000 kc. VE4UH has started up again with an exceptionally confused Ham of the 1929 R-6 variety. He wants SQ9 with Winnipeg on 3500 kc. VE4HR has been heard in the Old Country and in New Zealand on 14,000 kc. VE4DJ is still in pursuit of DX. VE4AL is again building. He claims this xmitter will not be the last.

Traffic: VE4FZ 3, VE4FIR 2, VE4RU 1.

L A T E  A N D  A D D I T I O N A L  R E P O R T S

S W A H I  expects ORS appointment soon. W6DTU says there is DX, radio amateurs are engaging in several types of traffic on 20 meters. Traffic: W5AHI 53, W6DTU 288.

Traffic Briefs

Portable transmitters are now becoming the vogue with the warm weather. Amateurists who contemplate building such units are advised that there are a few rules for portable transmitters. The first is issued to a portable station that is to be used only within the boundaries of one inspection district. This type of license is issued for a period of one year. The second type of license is issued for a portable transmitter that is to be taken on one specific trip. If the trip takes the transmitter through other inspection districts beside the one from which the license is issued, the license can authorize operation within the other inspection districts concerned. This type of license expires with the conclusion of the trip for which it is issued.

General bad conditions brought about by the hot summer weather have called a halt to the Beginners' 1750-kc. Code Practice Program. With the coming of fall and the return of good radio weather, this activity, which proved so popular during the past radio season, will be resumed.

The College Amateur Union has invented a combined checkerboard and chessboard that has several features to recommend it for general use among amateur checker and chess circles. The plan of the board is printed below. It will be noted that the scheme operates in a fashion similar to any standard map. To locate a given square on the board, it is necessary only to follow the line of squares to the right of and immediately below the square that is in consideration. For example, the square marked "DR" on the diagram is found to be opposite "E" (to the right) and immediately above "D" (below). Thus it is designated as "D-." When a move is to be designated, it is necessary to say, for example, "1D to DN," which indicates that the piece resting on square "DK" was to be moved to square "DN,"
WORLD, are entitled to membership in the W.A.C. only a stone's throw from that continent (so to speak) across the Strait of Gibraltar.

THE W.A.C. CLUB

As probably most of the readers of QST know, those amateurs who, with their amateur transmitters, have succeeded in working all the six continents of the world, are entitled to membership in the W.A.C. Club.

W.A.C. certificates are issued by A.R.R.L. Headquarters. To obtain one, an amateur should send to the League QSL cards confirming two-way communication between his station and stations in North America, South America, Europe, Asia, Africa and Oceania.

Just what constitutes Oceania seems to be a source of some trouble and worry to many amateurs who petition for W.A.C. certificates. For the information of all readers, we will note that the following are classified under the heading of Oceania: Australia, New Zealand, the Philippines, Hawaii, Java, Sumatra, Borneo, New Guinea, the Celebes, and the Samoan, Fiji, Solomon and New Hebrides island groups.

Some hams feel that Java, Sumatra and the Philippines should constitute an Asiatic contact because they are so near Asia. We are afraid we can't allow this. Every atlas we can find lists these places as part of Oceania. Oceania they are and Oceania they must remain. To argue that they should count as Asia because they are near that continent is equivalent to saying that southern Spain should count as Africa because it is only a stone's throw from that continent (so to speak) across the Strait of Gibraltar.

In South America, four countries are represented on the W.A.C. rolls; Brazil leads with 9, followed by Chile with 7, Uruguay 5, and Argentina 1.

Other certificates are scattered throughout the world as follows: Australia, 29; South Africa, 14; New Zealand, 7; the Philippines, 5; China, 4; Hawaii, 3; and one each in Canada, Straits Settlements, Tasmania, Jamaica, India and Porto Rico.

It may be stated in closing that one of the requirements for the issuance of the W.A.C. award is that the applicant must be a member of the A.R.R.L.

If you comply with all the requirements, shoot in your cards, and get your certificate. We still have plenty on hand, OM's.
September, 1929

Last month we mentioned that some amateurs were using amateur QSL cards as a means of disseminating class propaganda, and urged strongly that such things be kept out of our international hobby.

In the meantime it has come to our attention that a certain European society is writing to most of the other amateur societies of the world urging that they refuse to adopt the new prefix system prescribed by the Washington Conference, and continue to use the old I.A.R.U. international intermediates.

Union headquarters deplores this action, and trusts that no amateur who has been officially instructed by his government to use a designated prefix will disregard such instructions and use the old intermediates. The question of relative convenience has nothing to do with the matter. If we amateurs are to secure recognition at future international radio conferences, we must show ourselves to be law-abiding and worthy of such recognition. International prefixes have been agreed upon by the authorities of most of the nations of the world as the means of designation of amateur nationality. The members of the Union, and most of the other prominent national societies throughout the world are using these prefixes. The petty gesture of any small group to disregard them accomplishes no good and merely tends to put amateurs as a whole in disrepute.

Forget it!

At last! Word has just come through that the Dutch hams are now going to be licensed, and that, furthermore, the license regulations are favorable. This is a splendid tribute to the efforts of our Dutch co-workers. For years they were discouraged at every turn by official restrictions. It is doubtful if the amateurs of any country anywhere were "up against" any harder proposition than were those of Holland. In spite of this, they banded together, formed a splendid organization, the N.V.I.R., and set to work to convert the governmental departments from an attitude of hostility to one of friendly cooperation. In this they have succeeded — how well can be appreciated by those who are fully familiar with the circumstances.

We congratulate our member-society in Holland, and through it offer congratulations to all Holland amateurs.

Part of the story of the new era is told in the following report from Mr. W. Keeman, Traffic Manager of the N.V.I.R.:

HOLLAND

Two great events are lying behind us this month. First was the third annual radio exhibition in the Kurhaus at Scheveningen, near the Hague (Hague-on-sea) Holland. The second,

![Image]

THE STATIONERY BOOTH OF THE N.V.I.R. AT THE HAGUE SHOW

THIS IS THE GANG THAT PUT OVER THE N.V.I.R. EXHIBIT

(‘Never mind that sign in the background’)

(Continued on page 84)
A New Slant on 'Phone Reception
Wichita Falls, Tex.
Editor, QST:

Have just finished reading "More About 'Phone" in the Correspondence column of the May QST, where Mr. Heald, Jr., of Spencer, Ia., takes the 'phones to task. Much is said, and in concluding, Mr. Heald says that very nearly all 'phones have the same horrible distortion, and asks if it is exceedingly difficult to adjust a 'phone transmitter so that the output will sound anything like the input signal.

His letter caused me to chew the back off of QST, and I got down to page 15 before I could be reconciled. After regaining consciousness, I began reading the description of a wonderful 1929 'phone receiver, all of which gives me the idea that something should be done.

Back in the days when the League denounced radio telephony for amateurs, I was one of the amateurs who clamored for its recognition, but today, thanks to the foresight of the Directors and Executives of the A.R.R.L., the columns of QST are now free and accessible to us amateurs who find the very thrill of the amateur game in handling the intricate audio frequencies which are mingled with radio frequencies for transmission. To be sure, it takes money and apparatus aplenty for a good 'phone; also it takes work, patience, and a working knowledge of radio telephony. With the assistance of the A.R.R.L., we hope to rid the air of wretched 'phones that now infest the bands and substitute in their place 'phones which will radiate the very personality of their operators, and develop apparatus which can command and maintain the respect of the modern broadcasting stations.

During the winter of 1928 and 1929, two hundred enjoyable and nearly perfect QSOs were completed with a receiver having an audio end suitable for phone reception. A two-way contact in the 1750-ke. band was made with Canadian 9AT with loud speakers in use at both ends. In most of the instances, modulation was fair, and in some instances excellent. In fact many amateur stations were using the broadcast equipment which the operator either worked or owned, the wavelength being temporarily reduced for operation in the amateur band.

Let's do a little reasoning, gang. Don't try to listen to the 'phones with your telegraph receivers, and before making any complaint about 'phones, let's be sure the receivers we use are capable of an output which is nearly like that of the input.

— Wm. E. Archer, W5AAG

Another QSLL Suggestion

6452 Hayes Drive, Los Angeles, Calif.

Editor, QST:

In the March issue of QST, Mr. Howard T. Chasman gave us a new slant on the QSLL situation. His remarks would lead us to believe that he is a statistician of the "swivel chair" type. He takes the absurd hypothesis that if he could QSL everyone with whom he makes contact it would cost him thirty-six dollars a year and eight hours a month out of his operating time. I do not question the validity of the statistics presented, but what I would like to know is, who is expected to QSL everyone worked?

If one is really in earnest about not desiring to QSL, the only fair thing to do is to return the card to the sender. It doesn't cost a cent. All that is necessary to be done is to tell the postman that you refuse to receive said mail, whereupon the card will be stamped "REFUSED" and will be returned to the sender. The other operator, when his card is returned to him with the reason for non-delivery stamped all over it, will suddenly be smitten with a vague shadow of a suspicion that perhaps his card was NOT wanted.

When I receive a card which I accept, I make it my duty to return the compliment. It is no more than common courtesy to the other party. Let's have some more comment on this QSL situation, fellows, and see if we can relieve the hard feelings already in existence.

— I. S. Liner, W6EIZ

"Nil Hr Now, Cul—"

Bellmore, N. Y.

Editor, QST:

We talk much of d.c. notes, crystal-controlled, 1929 practice, and key thumps. We spend weeks of patient effort to smooth out that last little ripple and eliminate that last little chirp. We cut and try, string wires, read meters, and swear to give our signals a firm start on their journey around the earth.
Operates experimental station W2XV on various schedules to determine the
qualities and efficiency of REL short wave receiving and transmitting equip-
ment. This station employs the most modern features in both the transmitter
and the receiver. Most of the individual parts employed are standard REL
apparatus exactly the same as that which is finding more and more increased
popularity in every well known short wave station. The worth of REL parts
are proven in actual operation and any defects can be readily uncovered and corrected. W2XV is
working for you, that is the story we want to tell.

A brief description of W2XV is as follows: The operating room is completely enclosed in glass and located in one corner
of the testing laboratory —

THE TRANSMITTER is crystal control with thermostatic heat regulator — employs either telephone or telegraph —
100% system of modulation — final power amplifier 750 watts output — complete shielding — rigid cast aluminum end
frames with heavy sheet aluminum panels and sides.

THE RECEIVER employs short wave super heterodyne circuit — untuned screen grid RF stage — screen grid inter-
termediate amplifier stages — frequency calibration for each plug-in coil — completely shielded battery compartment.

THE MASTER CONTROL PANEL mounts directly in front of the operator on the operating table — pilot lamps
indicate all major circuits.

THE STATION AMPLIFIER is used in conjunction with two button microphones — A phonograph turn table
(directly behind transmitter) also feeds into the station amplifier.

THE POWER SUPPLY for all of the smaller tubes in the transmitter is derived from rectified AC — plate supply to
the 75-watt and 750-watt tubes is obtained from 4000-volt motor generator unit — motor generator unit remotely
controlled.

Transmission from W2XV is within an accuracy of 100 cycles of the specified frequencies. Use this for a frequency
check station. The following schedule is in effect for the balance of 1929.

12:00 Noon to 1:00 A.M. — Aug. 26th to Sept. 13th 8650 KC.
1:00 to 9:00 A.M. — Sept. 14th to Oct. 24th 8650 KC.
11:00 to 12:00 A.M. — Oct. 25th to Dec. 12th 11,300 KC.
2:00 to 4:00 P.M. — Oct. 25th to Nov. 15th 975 KC.
7:00 to 9:00 P.M. — Oct. 25th to Nov. 15th 975 KC.

You are invited to listen in — Please let us hear from you
manufactures a complete line of apparatus for short wave
transmission and reception. Write for Bulletin Z

Radio Engineering Laboratories
100 Wilbur Avenue, Long Island City, New York
YOU know exactly how important the Power Amplifier is in any P.A., or similar installation.

You know how hard it is to secure a Power Amplifier with a flat curve extending from 25 to 8000 cycles, without resonant peaks at any frequency!

You know exactly what you want...what you need. And you know how hard it has been to get.

Into the pages of a NEW book on Power Amplifiers, designed by Ferranti Engineers, there is packed more helpful information than ever before given on Power Amplifiers.

Diagrams and Components enabling you to build ten different Power Amplifiers from a 1-stage using 171 tube to a 3-stage using 250 tubes in push-pull are part of this helpful volume.


Boys, it's great, after all our patience, all our effort, all our stringing of wires, and all our swearing, to hear an Australian answer our call on some calm, cool morning, as the dawn is breaking in the east. The other side of the globe — and talking to us! We, in our snug Long Island home, or our wood shed out in Kansas, are in conversation with far-away New Zealand, or a boat on the plains of Western Australia.

There are many things to say; many questions to ask! How does the other fellow live; what does he do to pass the other sixteen hours a day; is he a lawyer, merchant, or a herder of sheep? What does his part of the world look like? Yes, there are many things to say; many questions to ask: a new friend to make across the earth; tales to tell. Here we sit, in our own home, in our own easy chair; there he sits, across the fireside, so to speak, our guest from a strange land. Ours is the joy to welcome him, with some interesting stories about the things we know; his, the pleasure of responding with tales of his own land.

And, what do we really say?

"Your signals vy fb OM. Gud d.c. note and stdy. Not much funding. How do I cum in over there? Nm no, OM, so cul. Cheerio, 73, GN."

Why, it's like welcoming an old friend in the evening with a hearty handshake, a slap on the back, and, "You're looking well, old kid. Isn't the weather lovely? Now it's bedtime. Sorry. But you'll find a hotel around the corner. Very comfortable. I'm sure."

Yes, for all the talk of raw a.c., swinging signals, and rotten fists, our stations function rather well. We are in touch with the four corners of the earth (Heaviside permitting). What a chance for international friendships!

Let's learn the gentle art of radio conversation.
— Cliff Himoe, W2AW, ex-WNP

A Newcomer Speaks

3838 Weston Pl., Long Beach, Calif.

Editor, QST:

A few months ago the undersigned commenced reading QST, learning the code, and accumulating meters, condensers and whatever looked to be usable in a ham station. From reading some of the letters in QST, it was evident that a beginner could not expect any silver-tongued orator of the key to come down from the rostrum and enjoy a pleasant three hours' conversation with a slightly deaf graduate of some stammerers institute.

As I expected nothing more than the warmth and cordiality accorded Mrs. Gann, I certainly was due for a pleasant surprise. Everyone has been friendly, and particularly, M. L. Smith, a Western Union operator for the past twenty years, who shows up for beginners at W6EAF, Independence, Calif. By chance appointment, W6EAF pounded out one-way code, 300 miles away, for weeks with only an occasional postcard of thanks. He also answered questions with an accuracy that would make any reputable correspondence school truly envious. Thanks to his en-
New S-M Custom Receiver Designs
Shatter All Records

Single Control
Perfect convenience in operation, with a tremendous gain in selectivity and sensitivity—that's what has been accomplished in the new S-M receivers. Newly developed shielded coils make possible, with straight single control, a degree of selectivity never before achieved, even with multiple controls or verniers. One tuning control, one volume control, an on-off switch—that's all. All these receivers have push-pull 245 output stages and both broadcast receivers embody the latest band-selector tuning.

All-A.C. Operation
These receivers are absolutely all-electric—even the 735 short-wave set, the first of its kind ever offered on the market. Power supplies are built into the receivers—not separate. The full advantages of the new a.c. screen-grid tubes are secured. The characteristic superior S-M tone quality, distance-range, and selectivity are in these receivers as never before, due not alone to band-selector tuning but also to still greater refinements of design and accuracy of manufacture.

S-M Speakers and Power Amplifiers
Nothing more beautiful in sound reproduction has ever been heard than the new S-M dynamic speakers, when supplied from a powerful S-M push-pull audio amplifier—giving straight-line amplification from 500 cycles down even to below 50. These new medium-voltage high-power two-stage amplifiers, using 245 tubes in push-pull are built into the 722 and 735, and an extra high-grade Clough-system amplifier is obtainable separately, as the 677.

Beautiful Cabinets
The handsome new 707 table-model shielding cabinet, finished in rich crystalline brown and gold, suitable for 722, 735, or 735DC, is only $7.75. Special arrangements have also been made whereby these receivers may be housed in magazine consoles especially adapted to them. Be sure to send for the new Fall S-M General Parts Catalog, for details of these cabinets.

722 Band-SelectorSeven
Providing practically all 1930 features found in most new $200 receivers, the S-M 722 is priced absurdly low in comparison. 3 screen-grid tubes (including detector), band-filter, 245 push-pull stage—these help make the 722 the outstanding buy of the year at $74.75 net, completely wired, less tubes and cabinet. Component parts total $42.90. Tubes required: 3-24, 1-27, 2-45, 1-80.

712 Tuner
Far more selective and sensitive even than the Sargent-Raybent 710, the new single-control 712 with band-filter and power detector stands far beyond competition regardless of price. Feeds perfectly into any audio amplifier. Tubes required: 3-24, 1-27. Price, only $64.90, less tubes, in shielding cabinet. Component parts total $40.90.

677 Amplifier
Superb push-pull amplification is here, available for only $38.50, less tubes. Ideal for the 712. Tubes required: 2-45, 1-27, 1-80. Component parts total $43.40.

735 Short-Wave Receiver
A screen-grid r.f. stage, new plug-in coils covering the bands from 17 to 204 meters, regenerative detector, a typical S-M audio amplifier, all help to make this first a.c. short-wave set first also in performance. Price wired complete with built-in power unit, less cabinet and tubes, only $64.90. Component parts total $44.90. Tubes required: 1-24, 2-45, 1-80. Two extra coils, 131P and 131Q, cover the broadcast band at an extra cost of $1.65. Adapted for battery use (735DC) price, $44.90, less cabinet and tubes. Component parts total $36.80. Tubes required: 1-22, 4-12A.

Keep up-to-date on Silver-Marshall progress: don't be without THE RADIOBUILDER. New products appear in it in advance of public announcements—all of the receivers and cabinets above were described in detail and illustrated in THE RADIOBUILDER for July. Many hints on operating and building appear in it. Use the coupon.

Custom-builders using S-M parts have profited tremendously through the Authorized S-M Service Station franchises. If you build professionally, let us tell you all about it—write at once.

SILVER-MARSHALL, Inc., 6409 West 65th St., Chicago, U. S. A.

Silver-Marshall Inc.
6409 West 65th St., Chicago, U. S. A.

...Send your new fall catalog, with sample copy of the Radiobuilder.

...For enclosed 10c; send five new selected Data Sheets, including those on 722, 712, and 735.

Name..........................
Address..........................

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

65
To obtain your radio operators' license—

See this book. It contains information essential for all men who are preparing to become licensed amateur and commercial radio operators. It contains hundreds of practical radio questions and answers.

Radio Operating Questions and Answers

By Arthur R. Nilson and J. L. Hornung

Second Edition

267 pages, 5 1/2 x 8, 94 Illustrations $2.00

This is the enlarged second edition of a book formerly published as Radio Questions and Answers. It covers the great advances which have been made since 1921 in the art of radio communication; it takes into account the new techniques of broadcast-station operation which have been evolved through electrical, mechanical and physical improvements.

Chapters


Fill out this coupon—

You will receive the new second edition for 10 cents FREE examination. It covers the latest laws and regulations governing radio operation and the operation of radio stations. ORDER NOW.

McGRAW-HILL FREE EXAMINATION COUPON

You may send the Nilson and Hornung's Radio Operating Questions and Answers $2.00 postpaid. I will either return the book, postage prepaid, in 10 days, or remit for it at that time.

Name

Street and No.

City

State

Name of Company

Official Position

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

On Standard Frequency Signals

Editor, QST:

The writer has noticed with regret the various communications appearing of late in QST commenting upon the failure of some American amateurs to stay within the assigned frequency bands. Particular regret is felt upon reading the complaints directed to amateurs who, in attempting to comply with rules for decent practice by calibrating their meters, have been seriously handicapped by the interference of heedless amateurs during the official broadcasting periods.

That this interference is caused by failure to realize the importance of cooperation, is strongly felt. The writer has known many amateurs over a lengthy period, and never yet has run across the type of amateur who was so constituted that he would not join hands if given the feeling that he was part of the plan and upon him there rested a certain responsibility for effecting the desired result. It is the same morale that prevails when an army private (with a rather dubious record of irresponsibility) is placed over a squad of men. The man's attitude changes. He realizes that he is part of the mechanism.

It is to be supposed that failure to coordinate perfectly with set rules for operating is to be encountered by reason of the youth and its attendant viewpoint which prevails in the amateur organization; a certain carelessness brought about by failure to realize the gravity of the situation facing the amateur today; and failure to understand the necessity of the most rigorous adherence to law and principles governing a democratic organization as our League is.

A series of articles in QST dealing with the subject of cooperation would seem to be the most effective means available to strengthen the appreciation of the fraternity as a whole toward air-tight team work in this respect. The older amateur has a background of sentiment toward amateur radio that new amateurs cannot be expected to have. These older chaps know the struggles the League has gone through, and appreciate the power of teamwork. They sense the position the amateur occupies in this period of radio unrest, competition, if you will, where only the worthwhile and the efficient can survive.

Acquaint the newer men with the precepts that obtain in our organization. Show how teamwork accomplished every worthwhile thing in amateur radio's long list of achievement. And funda-
FOR THE NEW UX866 RECTIFIER TUBES THE T3680 FILAMENT SUPPLY TRANSFORMER IS AN IDEAL UNIT

JUST WAIT 'TILL I SHOOT MY SIGS OUT IN THE AIR WITH MY NEW THORDARSON POWER SUPPLY. I'LL MAKE 'EM ALL SIT UP AN' TAKE NOTICE.

THORDARSON

ELECTRIC MFG. COMPANY
500 WEST HURON STREET
CORNER KINGSBURY
CHICAGO, ILL.
mentally, bring home the knowledge that every American amateur has the responsibility placed in his hands of either building up, by earnest and cooperative effort, the good name of American amateur radio, or tearing it down by heedless, slip-shod practices.

In an organization of our kind, where every man's activity is governed, for good or bad, by his own attitude, one indifferent man can adversely affect painstaking and law-abiding efforts on the parts of many men.

— J. C. Flippin, ex-W5YD

Facts About QSL Cards

Editor, QST:

In reading the various comments from time to time regarding QSL conditions, I became curious to know what the log book of this station showed. The following may be of interest to others anxious to receive cards and who take pride in collecting them. Districts are listed on a percentage basis of cards received here verifying contacts and according to their standing at this station.

<table>
<thead>
<tr>
<th>District</th>
<th>Cards Received</th>
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<tr>
<td>2nd</td>
<td>49.98%</td>
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<tr>
<td>3rd</td>
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<td>4th</td>
<td>31.55%</td>
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Ending December 31, 1928, and counting only first contacts, the total number of stations worked was 553 and the QSL receipts only 37.98%, 553 cards were mailed from this station, an average of 99.11%.

And believe me, fellows, the log book, so far, for 1929 looks much worse.

— E. J. Andrews, W9AAE, W6DNY

Calls Heard

(Continued from page 61)

...
JEWELL
199 SET ANALYZER
A High Grade Instrument
Backed by a thorough Data Service

THE inherent accuracy and complete reliability of the Pattern 199 have gained for it the confidence of service men from coast to coast.

Nearly thirty years' manufacturing experience, combined with painstaking care in design, has perfected the large 3 1/4 inch face instruments used in the 199. Thousands of these instruments have been proved in exacting industrial applications. The Jewell 199 not only makes every worth while radio test, but does it accurately, stands up well in service, and at the same time is the lowest priced, high grade set analyzer on the market today.

In addition to the high quality and low cost of the Jewell Pattern 199, it is backed by the most thorough and complete data service available. Jewell "Instructions for Servicing Radio Receivers," furnished with every Pattern 199 Set Analyzer, contains checking data on sets of leading radio manufacturers.

Pattern 198 includes the 199 in a large case with compartments for replacement tubes and tools.

Mail the coupon for a free copy of the valuable booklet.
"Instructions for Servicing Radio Receivers."

Pattern 499, 4-Instrument Set Analyzer, designed especially for expert radio service men, gives plate voltage, plate current, filament, and grid voltages simultaneously. Same high quality throughout as Pattern 199.

Jewell Pattern 210 Tube Tester gives direct reading on all tubes from UX100 to UX250, including half and full wave rectifier and screen grid tubes. Every dealer should have this valuable tube tester.

Jewell Electrical Instrument Co.
1658 Walnut Street, Chicago, Ill.

Please send us your booklet, "Instructions for Servicing Radio Receivers," and literature covering Jewell High Grade Radio Service Instruments.

Name:________________________
Address:______________________

Jewell 199 Set Analyzer
Say You Saw It in QST — It Identifies You and Helps QST
Like a CAR
with a balked
Gas Lever
—in heavy traffic

Your foot on the gas brings a jerky
response . . . you're holding up traffic
that's anxious to move.

Your variable resistance feeds the "gas"
to your radio receiver . . . and there's
all the difference in the world if it's a
CENTRALAB.
Quiet, even flow of current without a
clack or a sputter . . . that's CENTRALAB performance . . . a scientifically
constructed precision resistance control
for the modern radio receiver.

Central Radio Laboratories
20 Keefe Ave.
Milwaukee, Wis.

SAFETY FIRST

have you a
SPARE
Radio
TUBE?

ARCTURUS
BLUE
AC
LONG LIFE TUBES
are IMMUNE to
CURRENT CHANGES

ARCTURUS RADIO TUBE CO.
Newark, New Jersey

Doings at Headquarters

(Continued from page 71)

Atlanta was also one of the visitors, Mr. C. R.
Myers of Chicago showed up to say "hello." Former 1KC of Northampton, Mass., well known
when we started working foreign DX below 150
meters, dropped in to talk over old times.

"KB" and Bud spent two weeks in July at
summer camp with the Connecticut National
Guard observation squadron, the 43rd Division
Aviation. They both seem to have enjoyed
themselves.

The "gang" all attended a farewell banquet for
Harold P. Westman, who severed his connections
with this outfit to "carry on" with the L. R. E.

The Communications Department had a
vacancy for a few days when L. R. Huber resigned
to return to Iowa for a vacation and to resume his
college career in the fall. Mr. E. L. Battey, W1UE
of Wollaston, Mass., has joined us at Headquar-
ters to fill this vacancy in the C. D.

Jim Lamb and Bev Dudley were not on the air
much during July, as they were expending their
energies on a "low-cost" phone transmitter.
Results of this work are related elsewhere in this
issue.

Congratulations are in order, Miss Julia Har-
wood is now sporting a diamond solitaire, "HJ" is
well known as the efficient young lady in the
Secretary's office who spends her spare time for-
twarding stacks of QSL cards received from
foreign countries to our members.

Rod has been getting up early mornings firing
up the boiler under W18Z and working "RAH"
who is at present in Sydney, Australia, pounding
brass from VK2IW.

F. E. ("Ned") Handy is busy devising bigger
and better apparatus and signals for W1MK this
fall.
National Transmitting Condenser
We carry a complete line of parts made by “NATIONAL.”

ELECTRAD Truvolt Wire
Fixed Resistances from 1 ohm to 100,000 ohms can be tapped at any resistance.

We carry a complete line of Electrad products.

Make your own transmitting and receiving coils. Copper tubing transmitting inductance.

Size of tubing

<table>
<thead>
<tr>
<th>Inside Dia.</th>
<th>3/16&quot;</th>
<th>1/4&quot;</th>
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Ham Green, double silk covered, No. 16 receiving inductance.

*Prices per turn

Aluminum Shield cans and panels of every description to order.

Ham Green, double silk covered, No. 16 receiving inductance.

F E A T U R I N G

3 new items — Leeds Radio Lab. — others to follow in future issues. This department under the supervision of the Short Wave Specialist Jerome Gross. We design, construct and advise on any material for the “Ham” Broadcasting station or laboratory. Write Jerry Gross for advice on any of your problems.

New LEEDS all aluminum plug in Short Wave Receiver. Coils not exposed, thereby insuring 100% shielded job. Short Wave — 3-tube Receiver — detector — 2 audio, using three 201-A tubes. Universal type, continuous range 15 to 100 meters; amateur type covers Ham bands 20-40-80 meters with generous spread on the dial.

List price $60
Special Offer, not ............... $37.50

New LEEDS 15-watt Hartley type Transmitter. Ideal for the beginner or anyone desiring a transmitter extremely simple to adjust and operate. Will operate with a 201-A tube, with 50 volts on the plate, up to a DX-210, with 30 watts input; has plug in transmitting coils. List price $45.00. Completely constructed $70.

Please Print Your Name and Address Plainly to Avoid Delay

Cardwell condensers, double spaced for transmitting, #00025 cup.

New York’s Headquarters for Transmitting Apparatus
When in Town Visit Our Store

Everything in Cardwell
Acme
Thordarson
Jewell
Flecktheim
Signal
Bradley
Tobe
Pyrex
Fleron
IN STOCK

We carry the largest stock of General Radio Parts in the country.

*Prices subject to change without notice.

F R O M  T H E  H  O M E  O F  R A D I O
45 VESEY STREET
NEW YORK

Cardwell con- $4.45
densers, double
spaced for trans-
mittng, #00025 cup.

NEON GLOW LAMPS
Made by General Electric Co., type C-10, standard base, with 110 volts, as illustrated in QST May issue page 17. Price only......... $60

$7. THORDARSON R-195 TRANSFORMER
for B-Eliminator using the Raytheon R-10 tube. Will carry the maximum current consumption without overheating. Low 285 volts either side of centre tap — high 285 volts either side of centre. Just 50 left, after that no more at any price.

$2.25

By Insistent Demand
LEEDS 50-watt socket, positive contact; heavy phosphor bronze springs, heavy brass shell; will hold your tube in one position.

Special ............... $2.50

Say You Saw It in QST — It Identifies You and Helps QST 71
The New Radio Set Tester

The radio industry is familiar with the Weston Model 537 Radio Set Tester — for A.C. and D.C. receivers. Service men hailed it with great acclaim a year ago, noting its many advantages over the Weston Model 519 — for D.C. only.

And NOW — here is another great advance — the Weston Model 547 — incorporating many additional features to meet the service testing requirements of radio's latest developments.

But with this NEW SET TESTER radio servicing is still further simplified, even taking into account the number of new tubes, sets and circuits.

Space won't permit description here — nor would words alone do this new set tester justice. You must see it for yourself — operate it — try to think up some service problem it can't solve. Try as you will the Model 547 will give you a quick and accurate answer every time. Convenient — complete — light and rugged. Handsome in appearance — and it will yield you handsome profits. It will increase your business and your prestige. YOU CAN BANK ON IT!

This instrument has many outstanding service features. But first of all it is a Weston — assuring you exquisite workmanship and complete service reliability. It is provided with three instruments — all 3½" diameter and furnished with bakelite cases. Carrying case, removable cover, panel and fittings are also made of sturdy bakelite.

WESTON ELECTRICAL INSTRUMENT CORPORATION
602 Fredricksen Ave., Newark, N. J.

Bob Parmenter was away during part of July on a vacation touring parts of these eastern states. "RP" is back now and full of pep for the coming months.

Dave Houghton has been smacking out some 275-yard drives on the golf links recently and is now in form to meet all comers.

Mr. Hebert has been active on the river lately, spending his spare time working on his motorboat and cranking his movie camera. (He is vice-commodore of the Hartford Yacht Club.)

The rest of the "gang" is engrossed in keeping cool and taking their kiddies to the circus when not carrying on with their duties here at HQ.

— C. C. R.

"XYL"

(Continued from page 54)

But it is not only the "thoughts" of our game; it is the friendships that intrigue us. Only we, who have sat in a fast-chilling room, listening with queer, hypnotic fascination to a friend, a mile, a thousand — or even ten thousand miles away, saying "75," can understand. We snap on our transmitter and out through the clear air go thin, etheric fingers; out through the infinite goes a handclasp of friendship. So we, sitting alone by our set, become suddenly warm and happy, for the Angel of Friendship has entered and we know that across the miles we have found a friend. Outside the pale stars gleam down on our invisible bond, a bond stronger than the strongest steel. Of such stuff are amateur friendships made.

Another question often asked me — do I build my own apparatus? I boss the job, generally, if that's what you mean. and at that I am QSA 5. Do I actually do the constructional work myself? Well, what do you expect from an "XYL"? "You can't teach an old dog new tricks," you know. When one enters a strange field of endeavor in the way I did, it takes a long, long time to catch up with even the worst of the lot. However, I feel that I am learning and getting better and, if I don't die too soon, may know something about it yet.

How does it fare with a woman in the ham game? I wish I were a man when it comes to that. The QSO's between the OM's are much more to my liking, since I do not seem to "fall" for what some of them say when they find a woman at the other end. It's not often any more that I tell them I am not one of the male of the species and have become quite used to answering to the titles of OM, OT, and OB, thank you.

Idiosyncrasies? And how! It is rather a delicate thing to discuss. It seems that no matter how bold or how bashful they are, a large percentage of the hams are building Romeos over the air — or by mail. "SS'S" are the rule rather than the exception, but they are accepted in the ham spirit, as they are given.

There is no doubt in my mind that most hams, were it possible, would prefer to have a YL who could pound brass. The word pictures they paint
Western Electric Dynamometer System No. C W. 927. Two 27-350 volt dynamometers in shock-proof housing. May be used in parallel for generator tests. A good test at 35,000 ft. In watertight housing. May be used to operate transmitters up to 50 watts output for 34 volt 12C mains. Ideal for Deley systems.

Two dynamometers in housing $3.00
two single dynamometer without housing $1.50

Western Electric Switchboard C W. 928. Control board for Dynamometer System C W. 927. Consists of starting switches, fuses, 0-50-500 volt multi-meter with switches for testing main lines and output. Also contains complete filter system. Very special.

Voltsmeter, Westinghouse, No. 09310 cabinet portable, 3 scale 0-5-100, List $6.50
Amp. hour meter, Vanier, full chart and discharge, type W S 2 does 0-400 and 0-800. List $3.00
Voltsmeter, Westinghouse, A.C. 870th div. with external res., 0-150
Ammeter, Westing 457 thermocouple 0-2 amps. Complete on board with large double pole knife switch
Ammeter, Rollers-Smith hot wire, 0-25 A.
Dynamometer, General Electric Navy airplane, 24,000 volts, aluminum frame, unusually good for airplane test work. Specially priced
Dynamometer, jumper type C W. 900 volt, 200 watt, oscillating shaft
Motor Generator, Crocker Wheeler, 110 D.C., 200 A.C.
Meters, Edison, microammeter, 50 watt, double shaft, 110 volt
Motors, Edison, D.C., 10 volt, double shaft (List $10.50)
Motor, 110 volt, 3000 R.P.M.
Meters, Condenser, 45 volt, 75 watt, double shaft, 1200 R.P.M., 110 volt
Dynamometer, Gen. Elec. triple or quadruple, condenser, D.C. 12,750 volt and 24,1500 volt. Complete with ball bearings (build and molder)
Transformers, Peckess, 120 input, 5-15 volt output. 9 V. K., 60 cycle
Transformers, General Electric, C.F. current transformers, 125A. to 2500A. with centerless 100 cycle, 200 watt
Transformers, Amer. Trans., 220 to 8000, closed core, 1 1/2 kw., 300 cycle
Transformers, Simon, 220 to 11500 closed core, 5 kw., 60 cycle
Transformers, Am. Trans., 220 to 12500 closed core, 5 kw.
Gasoline engine, 1 cylinder 2 cycle Smith 2 horsepower, complete
Gasoline engine, 2 cylinder 2 cycle Saling 5 horsepower, complete
Western Electric 1910 Receiver tube, De. Vanek. 19A. Filament a. 14 volts. Maximum plate voltage 1300 at 250 MA. Specially priced
Condensers, Dublizer, micro, working volts 34 volt 12C. Mains. $3.00

BARGAINS

ARMY AND NAVY
RADIO SURPLUS

WESTERN ELECTRIC FIXED CONDENSER 200A. 1 MICRO Farad. 1,000 volt A.C. test. Ideal filter condenser for low power transmitters. Fully guaranteed. Excellent value.

Condensers, Century, 500 volt, 4 mfd 1.25
Condensers, Dublizer, micro, working volts 12,000, cap. 1000. 10.00
Condensers, Dublizer, micro, working volts 4000, cap. 32. 10.00
Condensers, Century, volts 500 A.C., cap. 4 micro. 1.25
Condensers, Weismann Specialty, Dublizer glass jar, 10,000 working voltage 002 mfd, 2.00
Condensers, Dublizer, micro, transformers, 8000 working voltage 004 mfd.
Condensers, Dublizer, micro, transformers, 12,000 working voltage 004 mfd. Prices on request.

Condensers, weismann specialty, 12,500 volt 004 mfd. Prices on request.

Keys, transmitting, Army practice 1.00
Keys, transmitting, Airplane flameproof, silver 1.40
Keys, transmitting, Airplane flameproof, silver. 1.40
Headphone, Army, with clip, 120 ohm. 1.75
Headphone, Navy Radio school type, leather headband, 75 ohm.

Transmitter, telephone, U.S. N., 30 ohm used.

Rubberphone transmitter unit, Western Electric CW 424.

Magnets, Army type and rifle type, has 4 large used magnets, good value 5.00

Varistors, Gen. Radio No. 107D and 1016K, with series and parallel connection 5.00

Telegraph and buzzer portable sets, many good cases, tone tinplate contact high treble, buzzer, telephone tone switches, potentiometer, sending key. 3 volt condenser transformers, 200 volt, 1/2 kw. coils, receiver, 250 volt value.

Heterodyne, Signal Corps, type B.C. 104. For use with SCR 97. 1000 to 3000 meters, with detector.

Receiver, Signal Corps, type B.C. 107, 4000-5000 meters, with c.r. set, and Century buzzer in portable case.

Receiver, Navy, C.C. No. 113, 4000-2500 meters.

Receivers, Western Electric, 300-2500 meters, with built-in tube detector, portable.

Receivers, Marconi, 300-2500 meters, type 1011, commercial ship type.

Receivers, S.E. 143 and L.P. 500, Prices on request.

Transmitters, Electro, strain 7", 15", 35", 18".

Switch, Telephone, toggle, 2-1/2" cut point.

Western Electric Loudspeaker Unit W 94, ideal for monitoring your transmitter. Without cord.

Condensers, Biddle, 1500 mark, 250 volt, 5000 mfd.

Rutters, Marine, Central high freq., 2 vol.

Rutters, West, Eler, extra quality high freq., 1.50

Condensers, Western, 100 mfd., 300 volt, 5000 mfd., McClellan high pitch buzzer, 32 volt headphone, mounted on Bakelite base with 2 large binding posts, some with extra D.P.T. switches.

Air condensers, kellogg, Model T. 1½ in. dia. max., weight 6 lbs., 600 F. P. 125-150 pressure.

Milliammeter, Westernhouse, type C.A., 0-250, zero adjustment, flame mounting.

Ammeter, Westernhouse, type C.A., 0-1, zero adjustment, flame mounting.

Voltmeters, Westernhouse, type C.A., 0-150, flame mounting.

All above type C.A. meters operate on either A.C. or D.C. Regular price.

D.C. Ammeter, Westernhouse, type F.X., 0-8, regular price.

Largest Radio and Electric Supply House in U.S. devoting eight floors to and specializing on Army and Navy Surplus. Due to rapidly moving stock and as new items are continually arriving we are unable to publish a catalog. Write us your particular requirements. Sufficient postage and deposit of 10% required on C.O.D. orders. NO C.O.D. ON CANADIAN ORDERS.

WANTED


DETECTORS. TUBE — SE-1071, SE-1071A.

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

MANHATTAN ELECTRIC BARGAIN HOUSE, Dept. Q, 105-7 Fulton St., New York City
Two Big Features of the Bradleyunit Resistor

Two Big Features of Permanency

THE outstanding noiseless performance of the Bradleyunity Resistor compared with other types of resistors is clearly revealed by laboratory tests. Quiet performance and permanence of resistance rating are highly essential qualifications for fixed resistors used in modern receivers of high amplification. Continued repeat orders from leading set manufacturers is ample proof that the Bradleyunity maintains its remarkable performance for the life of the set. It is unaffected by moisture, temperature and age. Use the Bradleyunit on your set for insurance against noise and distortion.

Standard Bradleyunits are furnished in ratings from 500 ohms to 10 megohms. Special ratings supplied on request. Units are equipped without leads or with leads up to six inches in length. Color coded for quick identification and checking purposes.

Write today, giving complete specifications, for data and prices.

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

Say You Saw It in QST — It Identifies You and Helps QST
IT is now a matter of proven record that Aluminum's workability, lightness, resistance to corrosion and high electrical conductivity make it the one metal that most efficiently meets the differing conditions encountered in radio design.

Used as shielding Aluminum reduces interference. It eliminates electrostatic and electro-magnetic interaction between the various stages of radio-frequency amplification. It eliminates modulation of radio frequency stages by feed back from audio-frequency amplifier. It is so easily worked into cans, boxes or casings that it presents few limitations of sizes and shapes, and makes possible more compact designs.

Used as variable condenser blades, Aluminum is available in special sheets of accuracy and uniformity beyond anything previously developed for that purpose. Gauge tolerance in thickness is limited to ±.001 inch, with a total variation within one sheet never exceeding .0005 inch.

For fixed condensers Aluminum Foil is ideal, because of its high electrical conductivity and its great covering area. A pound of Aluminum Foil .0003 in thickness covers 34,000 square inches.

And Aluminum Die Castings combine lightness, strength and accuracy. They are used with great success for loud speaker frames and bases, condensers and condenser frames, drum dials, chassis and cabinets.

We solicit inquiries for Aluminum foil, sheet, wire, rod, tubing, stamping, die castings, sand castings, extruded shapes, screw machine products, wood grain panels, strong Aluminum alloys and magnesium products.

Aluminum Company of America
2439 Oliver Building Pittsburgh, Pa.
Offices in 19 Principal American Cities

ALUMINUM
The mark of quality in Radio
U.S. Government Commercial

RADIO

Operator's License

WE specialize in training students for U.S. Government license.

30 licensed graduates in four months without a failure. One student made 99.7%.

All graduates placed and shortage now exists.

Learn under “old timers” with 20 and 25 years experience in radio. Ownership management insures success.

Same faculty for seven years


Radio Service Classes begin Sept. 10th

Send for Catalog

MASSACHUSETTS

RADIO SCHOOL

18 Boylston Street
BOSTON, MASS.

Call WIYS—20-40-80 meters


Choice of 1200 Newest Radio Values

SEND for our 1929 catalog:

Filled with amazing values in screen grid radios, push pull radios, consoles, kits, parts. All standard makes and guaranteed merchandise.

FREE

WESTERN RADIO MFG. CO.

Election Notices

(Continued from page 24)

eligible candidates nominated for the position by League members residing in Canada, Newfoundland and Labrador.

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

(Place and date)

Executive Committee,

American Radio Relay League,
Hartford, Conn.

Gentlemen:

We, the undersigned members of the A.R.R.L. residing in the Dominion of Canada, Newfoundland or Labrador, hereby nominate , , , , , , , , , as a candidate for A.R.R.L. Canadian General Manager for the 1930-1931 term.

(Signatures and addresses)

The signers must be League members in good standing. The nominee must be a Canadian member of the League in good standing, and must be without commercial radio connections. His complete name and address should be given. All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the first day of November, 1929. There is no limit on the number of petitions that may be filed, but no member shall append his signature to more than one such petition.

4. Mr. A. H. Keith Russell, of Toronto, Ont., is the present Canadian General Manager.

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

For the Board of Directors:

K. B. WARNER, Secretary.
Hartford, Conn., 1 August 1929.

Utilizing the Standard Frequency Transmissions

(Continued from page 37)

of the same frequency as the incoming signal, and so on for each point.

The foregoing method is not very good, however, both because the point of resonance cannot be determined very precisely and because it will not occur each time at the same setting of the condenser of the meter unless the coil of the meter and the coil of the receiver are the same distance apart and in the same relative positions.

It's really not a 1929 method at all. If the standard frequency signal is being received with a fair amount of volume, a much better method is to remove the meter somewhat farther from the coil of the receiver and then slowly vary the con-
Readers of *QST* appreciate the need for good radio books. What we consider to be the best standard text books are handled by A. R. R. L. Headquarters for the convenience of members of the League and readers of *QST*. Those listed below pretty well cover the requirements of the average amateur or experimenter.

<table>
<thead>
<tr>
<th>Title</th>
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<tr>
<td><strong>Radio Simplified</strong>, by Kendall &amp; Koehler, revised by J. M. Clayton</td>
<td>$1.00</td>
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<tr>
<td><strong>Radio Operating Questions and Answers</strong>, by Nilson &amp; Hornung</td>
<td>$2.00</td>
</tr>
<tr>
<td><strong>Experimental Radio</strong>, by Prof.-R. R. Ramsey, Third Edition.</td>
<td>$2.75</td>
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<tr>
<td><strong>Elements of Radio Communication</strong>, by Ellery W. Stone</td>
<td>$3.00</td>
</tr>
<tr>
<td><strong>Practical Radio Telegraphy</strong>, by Nilson &amp; Hornung.</td>
<td>$3.00</td>
</tr>
<tr>
<td><strong>Radio Engineering Principles</strong>, by Lauer &amp; Brown.</td>
<td>$3.50</td>
</tr>
<tr>
<td><strong>Radio Theory and Operating</strong>, by Loomis.</td>
<td>$3.50</td>
</tr>
<tr>
<td><strong>Manual of Radio Telegraphy and Telephony</strong>, by Commander (now Admiral) S. S. Robinson, U. S. N., published by the Naval Institute.</td>
<td>$4.00</td>
</tr>
<tr>
<td><strong>Thermionic Vacuum Tube</strong>, by H. J. Van der Bijl</td>
<td>$5.00</td>
</tr>
<tr>
<td><strong>Principles of Radio Communication</strong>, by Prof. J. H. Morecroft.</td>
<td>$7.50</td>
</tr>
<tr>
<td><strong>Ideas for The Radio Experimenter's Laboratory</strong>, by M. B. Sleeper.</td>
<td>$.25</td>
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Prices include postage

*Read 'em and learn!*

**AMERICAN RADIO RELAY LEAGUE, INC.**

1711 Park Street
Hartford, Conn.
A Resistance Unit

that embodies an entirely new development in construction -- the only doubly-insulated, moisture-proof, wire-wound, non-inductive accurate resistor. It 32 screw terminals permit its instant use in any type of circuit in any convenient manner as well as in standard grid-leaf mountings or fuse-clip mountings or by soldering.

The SUPER AKRA-OHM

besides containing all these unusual features has a very low temperature coefficient, a minimum distributed capacity. Made to dissipate one watt but will withstand a period without injury. The AKRA-OHM has a tolerance of accuracy of approximately ±1% plus or minus. Closer tolerances made on special order.

Complete stock of all values enable us to make immediate shipments. Full information and prices will be furnished promptly on request.

Wholesale Prices

for Dealers, Agents and Set Builders—prompt deliveries

OUR huge Wholesale Radio catalog No. 19 (2ND EDITION) is a valuable encyclopedia -- a liberal Radio education. Mailed immediately on request—absolutely FREE

1500 Illustrations and 6000 articles

FROM many years in the Radio Mail Order Business, we have learned how an organization must be efficiently run to win and retain the good will of our customers. Radio Specialty Co. ship orders promptly—offers you 100% quality merchandise on a strict money-back basis if not thoroughly satisfied — and sells at rock-bottom net prices.

Our catalog contains the largest assortment of completely assembled all-electric AC Receivers as amazingly low prices, and other Radio Merchandise including such lines as


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Radio Specialty Co. 100S Park Place
New York Radio's Oldest Mail Order House

denser. This time only a slight shift in the beat note, between the incoming signal and the receiver, will be heard as the resonance point is passed. In this manner the exact point of resonance can be determined with much greater precision, and will always occur at the same setting until the floor rise up and hits the meter. This assumes that your meter has been well and substantially constructed.

If the standard frequency signal is not being received with fair volume, an auxiliary oscillator may be resorted to. Don't let the big words scare you into thinking they mean some high-hat and hard-to-construct laboratory apparatus. It's just another way of saying "an extra receiver." Tune in the standard frequency signal to zero beat or a low beat note. Next tune the auxiliary oscillator until its signal is heard in the receiver, and adjust to some convenient beat note. This time as the meter is varied a slight shift will be heard in the beat note of the oscillator with the receiver. If some incoming signals are loud enough to disturb the operator the antenna may be disconnected during this part of the work, provided the antenna coupling is loose enough so that this does not appreciably change the frequency of the receiver.

If the auxiliary oscillator be especially made for the purpose, it may be calibrated, and is then called an oscillating or heterodyne frequency meter. If properly constructed, it will hold its calibration much better than an ordinary receiver, and will be sufficiently accurate and much more convenient for the average traffic station. It need be calibrated and operated in but one band. If operating in the 3500-kc. band, its second harmonic will fall in the 7000-kc. band and will be readily heard in the receiver. The frequency of a distant station in the 7000-kc. band will be exactly twice the frequency indicated by the meter. For further description of the use of harmonics, see the article by Mr. Graumer above referred to.

The standard frequency stations have gone to the trouble of hand you just what you want, if you want it in such a way that your meter can be calibrated with the least amount of work, time, and trouble. But though this reduces your work to a minimum it does the exact opposite for the transmitting station. The transmission of these frequencies at the high degree of accuracy maintained is a real job, not the sinecure it is generally assumed to be. Even the matter of making sure that each transmission is sent when scheduled regardless of colds, headaches, heartaches, YLS, OWs, or what have you, is something that very few stations can accomplish with regularity.

The only "remuneration" these stations receive is the written thanks their operators receive from those who use their work. These stations, at least in regard to standard frequency work, are engaged in rendering a service, not a DX contest, and the written thanks of the man in the same state are as much appreciated as those of the man many thousands of miles away. Such letters
THIS FROM A HAM IN TEXAS—

Los Fresnos, Tex.
6-24-29

Sirs:

I am contemplating upon building a good Amateur Transmitter in the very near future and would appreciate a catalogue from you. When it comes to condensers for transmitting, I can think of nothing better than Cardwells.

Any pointers or late ideas in Amateur Transmitters would be appreciated.

Very truly yours,
J. A. B., Jr.

◆ ◆ ◆ ◆

IT IS refreshing these days to see untainted testimonials. A product that lives up to its promises for superlative performance will always have enthusiastic endorsers. Cardwell has never suffered from a lack of them.

◆ ◆ ◆ ◆

RECEIVING Condensers in all standard capacities. Transmitting Condensers for powers up to 50 K.W.-Fixed (Airdielectric) transmitting condensers. Literature will be promptly sent on request.
ACME WIRE PRODUCTS

Coils — Magnet Wire Wound
Magnet Wire All Insulations
Varnished Insulations
Parvoit Filter and By Pass Condensers

All products made to Recognized Commercial Standards including those of:

Radio Manufacturers Assn.
American Society for Testing Materials

For 25 years manufacturers and suppliers to the largest and most discriminating users.

THE ACME WIRE CO.
NEW HAVEN, CONN.

Branch Offices:
Chicago 842 N. Michigan Ave.

AEROVOX
BUILT BETTER
CONDENSERS AND RESISTORS

Takes Out the Hum
In Any Dynamic

In spite of the many methods utilized to eliminate the hum in A. C. dynamic speakers, many of the best dynamics still have a hum which is sufficiently pronounced to be objectionable.

You will be surprised at the completeness with which an Aerovox 1500 mfd. "A" condenser, connected across the field coil or across the rectifier output will eliminate the hum and increase the sensitivity of the speaker.

Complete details and comparative data showing the results of using an "A" condenser to eliminate hum will be furnished on request.

A complete catalog of all Aerovox condensers and resistors will be sent free on request.

AEROVOX WIRELESS CORP.
78½ Washington St., Bklyn., N. Y.

PRODUCTS THAT ENDURE

should be addressed to Experimenters' Section, A.R.R.L., 1711 Park Street, Hartford, Conn., where their data are recorded in connection with wave-propagation problems and then forwarded to the station concerned. Not more than one station should be reported on the same page or card. For those who will report with some degree of regularity, the Section will furnish mimeographed reporting blanks upon request.

Above all, fellows, show your appreciation to the stations if you wish these services continued.

The writer is always glad to receive criticisms or suggestions for the improvement of these services, provided they are not of such nature as would materially increase the work of the transmitting stations.

The A.R.R.L. Official Frequency System

(Continued from page 28)

announced for the benefit of those able to use such accuracy, but for all general amateur purposes the frequency of transmission of both stations may be assumed equal to the figures as herein given. While no responsibility, financial or otherwise, is assumed for the accuracy of these transmissions, every effort will be made to have it exceed the figure given.

Reports on Standard Frequency Transmissions are solicited from all who take advantage of this service. No matter how far from or how near to the transmitting station you may be, your report will be of value to us. Standard blanks which will facilitate your filling out and our handling of the reports are available on request. All such requests and reports should be addressed to: Experimenters' Section, American Radio Relay League, 1711 Park St., Hartford, Conn.

After your report has been checked and acknowledged, it will be forwarded to the Standard Frequency Station upon whose signals it comments.

OFFICIAL FREQUENCY STATIONS

(Required accuracy 3—10 of 1%)


STANDARD FREQUENCY TRANSMISSIONS OF WWV

Schedules of standard frequency transmissions from WWV, The Bureau of Standards, Wash-
ASTOUNDING RADIO VALUES

P. T. 537
FILAMENT RHEOSTATS
Rated to carry 15 amperes.
An absolute necessity for the control of U.V. 203, 203A, 204, 204A and U.V.
51 Transmitting Tubes and 217, 217A, 217C and U.V. 1651 Rectifying Tubes.

PORTCLAIN LOW-LOSS
SOCKETS
MODEL U.R. 542
For use with U.X. 866, 862, 865, 860, 265, 210 and 290 tubes
On account of its low specific inductivc

capacity and its high insulating
qualities, these Sockets are especially
for Short Wave work and especially
adapted to the above tubes.

Special $3.75

2 HENRY FILTER REACTORS
D. C. Resistance 20 ohms

Special $3.50

AEROVOX
or Dubilier

HIGH VOLTAGE
FILTER CONDENSER BLOCKS

Finest non-inductive High Voltage Filter Block ever made. Designed for use with UX-250 Power Tubes but can be used in other circuits of transmitters or high power Amplifiers in any combination of capacities desired.

Each Unit is equipped with long, heavy, flexible leads, convenient for easy wiring, and also has mounting brackets.

The insulation resistance of these Condenser Blocks is in excess of R.M.A. and N.E.M.A. standard requirements.

Due to the request of manufacturers of these Condenser Blocks we cannot divulge the high list price of same.

All brand new, never been used, latest design.

50 HENRIES
FILTER CHOKE
85 MILLS

These are very efficient Chokes for use in Filter Circuits for your Transmitter, A and B. Eliminators or Power Packs.

The Choke Coils are very well constructed and are made with air gaps to prevent magnetic saturation from direct current.

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NUT CABINET WITH BUILT-IN 210 POWER
AMPLIFIER. LIST $175

SPECIAL
$49.50

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85 MILLS

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Kolster K5 Dynamic Reproducers. List $175
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Gould Karhmann Unipower, Automatic Radio "A" Power (6 volts), list $39.50
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Kolster 135 Volt "B" Eliminators, List $39.50 (without UX213 or 280 tube)

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

Say You Saw It in QST — It Identifies You and Helps QST
Start the Radio Season

with a

Real Power Amplifier

Power Parts by Dongan

Designed especially for UX 245 Tube the following Parts will build you the very latest and finest kind of Power Amplifier — the type used with the new high-priced receivers.

No. 994 Power Amplifier Transformer or
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Get complete information on the new and approved types of Power Amplifiers using UX 245 and UX 250 Tubes and Dongan Approved Parts. For immediate delivery of any of these parts send check or money order.

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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,
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SEND IT AT ONCE.

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In addition to building reliable and satisfactory motor generators, "Esco" has had many years of experience in building electric motors for a great variety of applications.

Synchronous motors, small, compact, reliable self starting are now offered for Television equipment. They require no direct current for excitation, are quiet running and fully guaranteed.

Other types of motors suitable for Television may also be supplied.

Write us about your requirements.

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Oscillating Quartz Crystals
Increased Production Methods allow us to announce new prices effective immediately on our guaranteed crystals — easy oscillators that are built for Power Work.

We grind these crystals to your approximate frequency, the frequency of each crystal stated accurately to within one tenth of one percent.

1715-2000 Kilocycle band .............. $12.50
2500-3000 Kilocycle band .............. 17.50
One-inch oscillating blanks .............. 5.00

We are in position to supply power crystals for broadcast and commercial station work complying with the necessary requirements of frequency precision as demanded by Governmental regulations. Prices will be sent on request.

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WLBF .............................................. W9BKO

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$50

Finest broadcast microphone made. Double button. Stretched diaphragm type. Covers entire frequency range. Write for circular.

Broadcasters Service Bureau  San Jose  California
The New and Better
WIRE-WOUND GRID LEAK
For Transmitters

**UNIQUE construction allows for use of more wire of larger diameter than in other types of wire-wound resistors. ** Metal contact points are soldered, assuring long life and positive connection. The grid leak can be guaranteed not to develop noise or open circuits. Made in three sizes (100, 40 and 15 watts) and tested to handle values, tapped for all usual needs, $1.50 to $5.50 each. Mail coupon for details.

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**DODGE RADIO SHORTKUT**
Masters Code—Kills Hesitation
Increases Speed—Produces Results

500 USERS CONFIRM STATEMENT
FEW REPORTS FROM FANS

**W6CHY** W6CSU states:— Letters quoted July QST written by neighbor using my stationery and name. Please do not reply.

**W7BC** 3 hours with DRS could read code as print

**W7RE** Quick fix ed in mind and say put

**W8UN** Spare time work one mastered code

**W9LE** Code impossible except with your method

**W9RH** Code memorizing made code simple and easy

**W9RX** Four hours, spare time work, to qualify

**W9BR** Easy to learn code your way and does stick

**W9RR** Scratch to license in spare time 2 weeks

**W9RV** For memorizing code DRS best thing seen

**W9AVO** One hour's study DRS secured my license

**W6SP** Mastered code in spare time one week

**W6AVH** One hour on code and soon had license

**K6HOJ** DRS for quick results—licensed in week

**W6CG** Until tried DRS thought knew the code

**W6GM** In 26 minutes had code put—soon licensed

**WWAD** In four hours came up from 4 to 11 per

**W7AI** Long stuck at 5—in 2 evenings copied 18

**W7FL** Long stuck at 2—in 3 weeks copied 15

**W9MJ** Four sessions few minutes each on code

**W9BJ** Old war waste of time—Code put in 2 hours

**W9KX** Mastered code in 7 hours. DRS is all OK

**W9AK** Stuck at 5 — first evening did 12—now 25

**W9BT** Failed on Sig Maker—made grade with DRS

**W9SM** Hour on code, Passed easily in 2 weeks

**W9BSL** Old war 3 months 5 per—DRS 1 stuck 15 per

**W9BWW** Long stuck at 5. Qualified in one hour

**W9DJ** Mastered code in 20 minutes; soon licensed

WANTED—REPORTS FROM DRS USERS

**DODGE HIGH SPEED**
THE Booster—Comul Op speed 27 raised to 42 in 4 weeks—few min. practice each evening.


**C. K. DODGE**
Box 100 Mamaroneck, New York

Notes on Ethereal Adornments

(Continued from page 28)
taken in erecting and operating a single-feed Hertz antenna:

1. Choose the frequency on which you desire to operate.

2. Construct the antenna by following either of the two formulas given above or the graphs. If you are more meticulous you may follow the entire procedure outlined.

3. Tune the transmitter to the fundamental (the chosen frequency) by means of an accurate frequency meter. Leave it there. A Hertz must be operated as near the fundamental or a harmonic as possible to secure high efficiency. Operating away from the fundamental or harmonic throws the whole system off.

Always remember the station is no better than the operator or the emitted signal, so before you tell us how rotten the antenna is, take the other factors into account.

I.A.R.U. News

(Continued from page 38)
is still growing rapidly, and has received several compliments from Dutch officials due to its good organization. Our official booth at the exhibition also brought us into close contact with several high Dutch officials, who were quite astonished to find such a perfect organization where they had always supposed there was only a disorderly group of ether-pirates. Our stand was visited by H. R. H. the Prince, by several ministers, our future radio inspector, Mr. G. Emmenker, and several other officials.

Now for a short description of the exhibit:
First, we had a complete station, the first licensed amateur station in Holland, working under the call PAOAA and built and operated entirely by our members. The booth and transmitter are shown herewith. Although they may not be clearly discernible, there are included, from left to right, an electric pick-up, modulator,
For Short-Wave Phone Reception

A new NATIONAL Screen-Grid Thrill Box, the Screen-Grid SW-4 THRILL BOX, has been especially designed for reception of phone as well as code. The special audio system, with a high-mu tube in the first stage and a 171-A Power Tube, gives excellent loudspeaker performance. Code comes in just as well.

A Screen-Grid R.F. tube eliminates "tuning holes" and prevents annoying radiation. Design gives steady reception with swinging antenna, adapting the THRILL BOX to use on motorboats and yachts. Operates on batteries or takes plate supply when desired from lighting circuit, through NATIONAL Velvet-B. Tuning and sensitivity control unusually constant and smooth throughout range of 15-300 meters.

Provided with dignified and attractive nickel cabinet that harmonizes with any surroundings. Made by the makers of the NATIONAL Velvet Vernier Dial, used by Amateurs the world over.

NATIONAL
4 Tube Screen-Grid THRILL BOX SW-4
NATIONAL CO. INC., Malden, Mass.

National Products
Rectobulb

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

Normal Rating
250 Mils
Normal Plate Volts
3000
Filament Volts
10

The accepted standard for Ham Work—of increasing appeal to the Engineer in small Phone Transmitters as used in Patrol Work and Air Service—ideal for Small Broadcasters.

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

Price, $10 each
Announcing repair of UX852. $16.50
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WE 211 tubes $16.50
WE 212 tubes $40.00

ALL REPAIRS FULLY GUARANTEED

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Rectifier Tubes

CHARACTERISTICS
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Peak Plate Amps. 0.6
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Diameter 2 ¾"

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For full utilization of radio energy, use PYREX Insulators throughout

PERFECT transmission or reception demands this. To know important differences between what your radio system should do and what it actually does, send for and read the PYREX Insulator booklet. Then if your dealer offers an interior substitute, insist upon PYREX Insulators and if necessary, buy from us direct.

CORNING GLASS WORKS
Dept. 64, Industrial and Laboratory Division
Corning, N. Y.

microphone, a clock with pointers (nobody could see how late it was), the receivers, a charging panel, a monitor, several switches, the r.f. power amplifier, and on the wall the antenna panel with a couple of G.R. hot-wire ammeters and three condensers to tune the feeders of our Zeppelin-system to any band desired. Around to the right we find the crystal oscillator, a 30-watt low-power transmitter; and the power panel. The receiving antenna is also used to hang several trophies, including some co-champagne bottles.

The transmission results during the show were splendid. Our phone, with 200-watt input, was heard in the Dutch East Indies, although the QRM of other demonstrations made the reception something which turned the average operator mad in about half an hour. Due to this, many QSO's were lost, and it was possible to copy only the loudest of loud signals. Many interested visitors who picked up the extra phones hanging near the railing laid them down instantly, with a face indicating wonder that it was possible to receive anything at all through the turmoil.

On the other side of the room the manager of our stationery office tried to sell huge masses of QST's, handbooks, and other material of similar nature. The rest of this booth gave a description of international and national amateur organizations, lots of photos (including the I.A.R.U. Congress at Paris, and of Mr. Maxim and Mr. Warner between them) and piles of ham apparatus of both recent and by-gone days. There was also an exhibit of wavemeters made by our QRH office, and other apparatus.

It was a great thing, that radio exhibition. Heaven only knows how many hours the members of the Hague section of the N.V.I.R. worked to get things fixed up. That last night before the opening of the show, when not a single milliwatt would go into the antenna, and the 'inside' of the power panel started to go up in smoke suddenly, will last forever in the memories of those present.

We kept awake that night only through the assistance of pepper-and-mustard sandwiches (cut up with tin-snips, incidentally) and many drinks out of a pyrex bowl.

By the time this gets into print, PAOAA will have become only a memory—but not a dim one. Once more amateurs have shown to the outer world a tiny bit of that strong spirit which will hold us together forever—international HAM SPIRIT.

BRITISH NOTES
From R.S.G.B.

No outstanding features were noticed during the early part of the summer. On the 7-mc band conditions were normal for the time of the year. This band, owing to severe interference, is being neglected by many Britishers. Much of the trouble is due to the invasion of semi-commercial sta-
JUST OUT!

September 1929

With these big features—

NEW AMATEUR CALLS

In many countries, due to the adoption of the new prefixes, lists of amateur calls have been changed completely.

WHO'S WHO

ON SHORT WAVES

A brand new section, giving frequency, call, and location of commercials, shortwave fones, television stations, etc., heard between 3,000 and 30,000 Kilocycles.

NEW PREFIXES

You need this big number to identify stations heard, new Prefixes, such as D, OA, X, ZS, etc. We have the most complete list published.

Issued quarterly, March, June, September and December. Single copies $1.00 each in U. S. and Canada, $1.10 Foreign. Yearly subscription $3.25, Foreign $3.50.

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WE

eliminate any type of man-made static.

design and construct special Radio and Electrical relaying systems.

build Special Transmitters, and long or Short wave receivers to order. Amplifiers constructed and designed to order.

See the new SHORT WAVE 4 Just Announced by our Company. The Best Short Wave Set you can buy to-day.

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Next terms start Sept. 1st and Oct. 15th

For further information and circular, address

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TRANSFORMERS

Guaranteed — Mounted — Complete

250 W. 2000—2500 each side........................................ $40.00
700 watt 1000—1500 each side........................................ 14.50
250 watt 500—750—1000 each side.................................... 1.50

Auto-Transformers, Chokes, Polyphase and 25-cycle

Transformers. Add $3.00 for ill. winding

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New 1930
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NOW ready — Chi-Rad’s latest
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latest parts, accessories, kits and
sets such as: — New Super-Wasp
Shield-grid Short Wave Receiver,
kit $29.40 or completely constructed
$42.50. New National Shield-grid
Short Wave Receiver, kit $33.00 or
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volt New type R3 Rectobulbs
$10.00.

Send today for your free copy
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16-page Parts Catalog
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We want every reader of QST who
has not yet received a copy of our
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catalog contains a vast amount of useful
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W e a t h e r  B u l l e t i n


ditions into the band and the continued use of high
power for local use. At certain hours DX is quite
impossible, but many stations continue using
their high-power sets, knowing that they could
effect QSA5 contacts with less than 10 watts.
Unless concerted action is taken shortly it will
cause many low-power stations to leave this band
permanently.

On 14 mc. conditions continued to be favorable,
but towards the end of July, VK stations were
weaker in the early morning. It was noticed on
the evening of July 22nd that local European and
W stations were both very loud. This is rather an
unusual phenomena.

On 28 mc. very little actual DX has been ac-
complished, but many G stations are active, and
as soon as conditions improve it is anticipated
that much new work will be done.

Interest on 56 mc. is increasing, and in this con-
nection it is pleasing to record that two British
amateurs, Mr. Parry (G6PY) and Mr. Somerset
(BRS125), have offered special prizes to be won
by the pioneer DX men on these ultra-high fre-
quencies. R.S.G.B. will be pleased to put foreign
or colonial amateurs in touch with their members
experimenting on 56 mc.

In connection with the QSL card forwarding
service of the R.S.G.B., we wish to advise all
amateurs that in future we shall be pleased to
handle cards from all foreign amateurs, providing
they are sent to the Headquarters, at 53 Victoria
St., London, S.W. 1.

The Fourth Annual Convention of the Society
will be held in London on September 27–28, and
on this occasion we hope to welcome many of our
overseas and foreign colleagues. The annual
Radio Exhibition will take place at Olympia,
London, from September 23d to October 2d.

AUSTRALIA
From W.I.A.

Every month shows an increased development
in the activities of the Australian Section and a
stronger position in the Radio World. The ama-
ateur movement in Australia has now reached the
useful position where we are recognized as the au-
thority on matters pertaining to short wave and
low-powered transmitting apparatus, and a num-
ber of requests have been received lately by the
Federal Executive of the Institute for assistance
in solving technical problems. An inquiry con-
ducted by the Commonwealth Government re-
cently into the cause of a number of aeroplane
accidents in which radio equipment was proved to
be obsolete, the Institute was requested to give
evidence and suggest measures for future action
to insure the successful functioning of the radio
equipment in the event of a forced landing. The
recommendations have been embodied in the re-
port of the Commission.

Considerable interest has been taken in the
high frequency test of the G. E. Co. through
W2XAW for July and August, and arrangements
have been made for extensive observation to be
taken in every State of the Commonwealth. The
Naturally — every TRIAD tube is constantly, rigidly tested throughout its entire manufacturing process — a special test follows each individual operation. Yet TRIAD does more than that! When completed, each TRIAD tube is subjected to nine additional and final tests for vital characteristics — tests so stringent that nothing short of absolute perfection can survive them! This infinite care has made possible the guarantee that goes with every TRIAD tube — a minimum of six months' satisfactory service or a proper adjustment.

Tune in on the TRIADORS every Friday evening, from 8 to 8:30 P.M. (Eastern Daylight Time) over WJZ and associated N.B.C. stations.

TRIAD MFG. CO.,
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The NEW Easy-Working

VIBROPLEX No. 6
Reg. Trade Mark Vibroplex Bus: Lightning Bug

In Attractive Colors Blue Green Red

Hundreds of operators have traded in old models for this NEW Vibroplex, because it is EASIER to handle. Your old Vibroplex accepted as part payment.

Blue, Green, Red or Black...$17 Nickel-Plated, $19

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Special Radio Model Extra Large, Specially Constructed, Contact Points for direct use without relay, Colors Blue, Green, Red or Black... $25

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opportunity has also been taken of obtaining duplicate reports for our own use so that we can analyze the results and endeavor to discover something of the conditions affecting 28-mc. propagation. It is hoped that one result will be to prove whether the signals penetrate inland, as the work which has been attempted by men working there seems to indicate.

During the few months in which the Air Force Communication Reserve has been in operation, nearly 2000 words of traffic have been handled by reserve stations, and the success of the scheme has been better than we hoped for. A further development of our aero activities is the formation of a combined W.I.A.-Aero Club Section to undertake experimental work in connection with aero-plane installations. Experimental apparatus of members of the section will be utilized in planes supplied for the purpose by the Aero Club in each state.

A fair amount of short wave phone activity is taking place in all states at present on the 14-mc. and 7-mc. bands in addition to the usual phone on the special 200-meter band used temporarily by permission of the P.M.G. Department here.

28-mc. work during the past month has not been any better than reported previously, although the results being attained by high frequency men are very good. Weather conditions during most week-ends when the best part of the work is done have been for the most part anything but ideal. Arrangements are being made by several stations for work to be undertaken above 28 mc., but so far nothing definite has been attempted.

— W. G. Sones,
Hon. Publicity Officer to the Federal Executive.

We record with deepest regret the death of Phil Nolan, VK2YI, a leader in amateur work in Australia and one of the best-known amateurs in the world.
Power Transformers and CHOSES

At Less Than Manufacturer’s Cost

This is the bankrupt stock of the Scanlan Transformer Co.

No. 505 Power Amp. Secondary 600 volts — 600 volts, 1 1/4, 1 1/2 and 1 3/4, Center Tapped $6.50

For two 281, two 256, two 250

No. 500 Secondary 300 volts — 300 volts, 1 1/4, 2 1/4, 8 and 8 Center Tapped and 2 Chokes $4.50

Will take care of a 10 tube set or less

No. 575 Secondary 375 volts — 375 volts, 5, 2 1/4, 1 1/2 and 1 1/4, High and low primary and 2 chokes $4.25

Suitable for a 10 tube set or less

No. 413 Filament Transformers for six 226, one 237, and 2 171 A tubes $1.95

No. 644 Scott double chokes $1.90

No. 401 Scott Audio input transformer $1.90

No. 642 Scott Audio output transformer $1.90

No. 640 Scott Audio copper shielded $1.90

No. 30 Henry Chokes, unmounted .90

No. 102 3 1/2 Amp. Dry Charger, less Raytheon cartridge $1.50

Vitrified Power Pack Resistances 180 volt, 16600 ohms, tapped at 1500, 7800, 15100 and 16600 .95

Used 5 tube radio sets in table model cabinets. Require minor adjustment $6.90

Write for list

Chas. Hoodwin Co.
4240 Lincoln Ave. Dept. 827, Chicago, Ill.

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SOME CLASS

To a station using mercury arc. Recent broadcast installation six-phase nine kilowatts. Commercial replacing 500 cycles with arc. They know why. A tip for relay and super-UX stations where absolute reliability and maximum kick must be realized to maintain the stations’ dominating position. Unparalleled performance, instantaneous automatic starting, long life, filters to pure DC for phone or LV, high peaks and overload limits.

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Non-magnetic. Holds screws tight! Replaces them INSTANTLY from inaccessible places, Factories, radio, electricians, machinery, etc., buy on sight! Indispensable. Price $1.50 only. Sent prepaid with receipt money order. DISTRIBUTORS: Write for details.

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NEW 1929 Radio and Electrical catalog will be sent to you absolutely free of charge. Our new 1930 catalog is bigger and better than before — everything that is worth while in radio is here. It is packed full of the cream of electrical appliances and radio apparatus.

We are now booking orders for the new HAMMARLUND HI-Q 30.

Send your order in early. The new Hammarlund job is a peach of a set — it supply does perform and we don’t mean maybe. The new 1930 HI-Q is complete — everything goes on the chassis — power supply and tuner.

No outside power supply — Uses 3 A.C. Screen Grid Tubes: 1 A.C. CX-67 Detector Tube; 2 No. 45 Power Tubes in push-pull. Permanent photograph pick-up outlet is incorporated. A real one dial receiver.

SEND YOUR ORDER PRONTO!

Of course, you want our catalog. So, write immediately. We know you will be pleased. Remember — We have been serving the Electrical and Radio trade for 32 years. You realize what it means to do business with a well established firm.

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A Radio Parts Guide

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Constant Temperature Control Equipment

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We also grind crystals for use in the Broadcast Band accurate to plus or minus 500 cycles of your assigned frequency for $55.00 fully mounted.

Prices for grinding crystals in the Amateur bands are as follows:

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Range</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1715 to 2000 Ke band</td>
<td>29.00, unmounted</td>
<td></td>
</tr>
<tr>
<td>3500 to 4000 Ke band</td>
<td>27.50,</td>
<td></td>
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<tr>
<td>7000 to 7300 Ke band</td>
<td>45.00,</td>
<td></td>
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