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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.

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ADDRESS ALL GENERAL CORRESPONDENCE TO THE EXECUTIVE HEADQUARTERS AT HARTFORD, CONN.
EDITORIALS

IN the spring of 1927 the Radio Division, Department of Commerce, abandoned the issuing of Amateur Extra First Grade Radio Operator Licenses because of the apparent lack of amateur interest. In the several years that this type of licenses was available only about 150 of them were issued. Immediately it was abandoned, great disappointment was expressed by amateurs, and during the year the feeling grew in amateur circles that we had not properly appreciated this recognition of the amateur by the Department and that we should have been more prompt in restoring it. By the time our Board met this spring there was a definite desire in amateur ranks to secure its restoration, and our Board accordingly petitioned the Radio Division. Now we are happy to announce that this grade of license has been reinstated, new blanks have been engraved, and all of the offices of the Radio Division throughout the country are prepared to issue them to amateur applicants. The offering of this superior grade of amateur operator’s license is a stimulus to amateur proficiency and achievement, and something in which great pride can be taken by the holder. In earlier days the quite capable amateur could establish his proficiency by taking out a commercial license but there is to-day such a great difference between amateur equipment and commercial equipment, because of the vast vast difference in wavelengths and methods, that it is only infrequently that an amateur is able to pass the commercial examination, and only after special study for that purpose. And even then it does not indicate particularly his greater proficiency as an amateur. The new form of “ticket”, on the brown form, is distinctively an amateur license, and the providing of it by the Division is a pretty recognition of amateur radio. To be eligible for this examination the applicant must have had at least two years’ experience as a radio operator and must not have been penalized for violation of the radio laws—his record with the Radio Division must be clean. A speed of not less than 20 words per minute in Continental Morse receiving and transmitting must be attained, the same speed as for a commercial license. A special examination broader in scope than the regular amateur examination is given, with the requirement of 75% as a passing mark. We wanted this grade of license restored. It has been done. It is now distinctly up to us to “patronize” it. Every amateur who can meet the requirements ought to undertake to possess himself of one of these licenses at the earliest possible date. It becomes the distinguishing mark of the superior amateur. The Radio Division itself, and the military branches which offer appointments to amateurs, will inevitably recognize it as such. It is a spur to individual achievement, something of which we may rightfully be proud. Let us show our appreciation of the Division’s kindness in restoring this special grade of license by giving them lots of “customers”. This business of monitoring all transmissions from an amateur station, as is consistently recommended in Mr. Hull’s series of transmitting articles, is a most useful and valuable idea. It is nothing short of strange that we went so many years without doing it. Its necessity is now perfectly apparent. Most amateurs go along for years listening to every signal in the world except those from their own transmitter, which should be the first ones they listen to! This failure undoubtedly is responsible for the poor notes one hears on the air. It may be demonstrated easily to anyone’s satisfaction that it is not possible to adjust any transmitter correctly, however good it is, by the use of meters alone. Adjustments for satisfactory output and for good efficiency are by no means sufficient, for in spite of these a good transmitter may still put out a signal of poor tone, chirping and creeping, infested with key clicks, and sensitive to every slight movement of the antenna. Yet all of these weaknesses are disclosed instantly by monitoring the transmission, so that one may know exactly what the signal sounds like to the distant station. When a monitor is used it becomes unnecessary to solicit numerous signal reports and attempt to secure some intelligent mean by discounting the over-enthusiastic ones and bolstering the ultra-conservative. What a tremendous amount of time and effort this saves, and what a vast amount of unnecessary interference it removes from the air! The only thing a distant receiver can report to the operator of a monitored transmitter which the latter does not already know about his signals is their audibility at the receiving station. The 1929 station whose signal goes bad in quality or whose frequency begins to crawl, will be completely out of luck, lost in the mêlée. Monitoring prevents this, for it is instantly known to the transmitting opera-
tor. Every amateur who desires to be successful in 1929 must arrange to monitor his missions.

The letter from Mr. Shaw, published in this month’s “Correspondence,” raises some interesting points. In addition to bringing us new technical difficulties, the Washington Convention presents us with some modifications in operating procedure and with several sets of entirely new abbreviations. Like the rest of the convention, these become effective on January 1st. In early issues *QST* will present all of this information which has an amateur application.

The changes in operating procedure itself are trivial and of course will be handled by our Communications Section in its codification of our Rules & Regulations. Then there are a simpler and much more sensible set of audibility signals, a brand new and much more extensive set of “Q” signals, and a rather extensive list of one-, two- and three-letter abbreviations. All of these have meanings internationally agreed and they are binding upon all classes of stations, so that we must adopt them and become familiar with them and drop our old abbreviations at the end of this year.

Amateur stations are neither stations of the “fixed service” nor of the “mobile service.” They are separately provided for as one of the classes of private experiment stations, and they have their own privileges and restrictions in the convention. All of this will be much better understood by studying a complete copy of the convention, which also includes, of course, all of the abbreviations and tables mentioned. Really a copy should be in every amateur “shack.” A copy of the English translation of the document, known as “International Radiotelegraph Convention, Together With General Regulations and Supplementary Regulations Attached Thereto,” may be obtained from the Superintendent of Documents, Government Printing Office, Washington, for twenty-five cents.

The prefix for a general call to all stations has been changed from “QST” to “CQ” and the former is now a blank in the international list of “Q” signals. That doesn’t mean that *QST* is going to change its name, though. If some uncomplimentary meaning had been assigned the letters “QST,” such as “You interfere with me—get out,” we might have to. But now that *QST* is left blank in the international list, it becomes exclusively the name of a good amateur magazine.

—K. B. W.

### Standard Frequency Transmissions from 9XL

Station 9XL is a special station, comprising one of the three portions of the “Gold Medal Station”, WCCO—9XL—9WI at Anoka, Minnesota. WCCO is operated as a broadcast station, 9XL purely as a standard frequency station and 9WI as a general amateur station, the three transmitters having independent equipment and antennas but a common power supply. Through arrangements made by K. V. R. Lansingh of the Official Wave Length Station Committee of the Experimenters’ Section, A. R. R. L., 9XL is operated on schedules regularly announced in *QST*. The work of operating the station is done without charge by Chief Operator Hugh S. McCartney with the assistance of Lyall K. Smith and Ivan H. Anderson also on the staff of WCCO.

While no guarantee of accuracy is made on a gratis service, it is the aim of the staff to maintain an accuracy of 1/10 of 1%, which is materially better than can be held by most frequency meters. The frequencies are measured by means of standards which have been especially standardized for this purpose by the Bureau of Standards.

A small percentage of tone modulation is employed so that the signal is distinctive and more quickly recognizable.

The fact that this service has been rendered in the past is no guarantee of its continuing indefinitely in the future. It depends upon whether the response received seems to warrant the amount of work and expense involved in maintaining this free service to all amateurs. If you take advantage of this service, please acknowledge that you are doing so by notifying the Experimenters’ Section, A.R.R.L., 1711 Park Street, Hartford, Conn. You may use ordinary stationery or special blanks that may be obtained from the above address. A goodly number of these blanks has been gathered and as the number grows we will gradually gain a unique and accurate record of transmission phenomena possible with no other station.

### Schedules

(Figures are frequencies in MEGA-CYCLES per second; approximate wavelength is given in parentheses.)

*Continued on Page 32*
The Oscillator-Amplifier Transmitter
A Practical Study of Its Suitability for 1929 Operation
By Ross A. Hull*

The first activities on the A.R.R.L. Technical Development Program, in the examination of 1929 difficulties, have been studies of the possible methods of adapting present-day transmitters for 1929 service. The first resulting article, reporting the work on self-excited transmitters, appeared in the August, *QST*. The second phase of the work has been on master-oscillator-amplifier transmitters. In this article Mr. Hull, the director of the program, presents the results of this examination. Here is a real "1929 transmitter."—Editor.

During the last two years, in particular, master-oscillator-amplifier transmitters have been given brilliant and comprehensive treatment in *QST*. A study of the articles included in the appended bibliography would provide the amateur not only with a splendid idea of the operation of these circuits, but also with complete constructional details of several types of practical transmitters. In view of the existence of this material, we do not propose to treat the history of the circuits, the theory of their operation or even the reasons behind their peculiar effectiveness, unless such treatment is involved in the consideration of their application to the solution of next year's problems. The objectives in our examination of master-oscillator-amplifier transmitters were to study the conventional circuits; to build one into a transmitter in the way that the average amateur would build it; to tune it with the care that the average amateur would take, and then to measure its performance. In this way we hoped to be able to gain some idea of the relative desirability of oscillator-amplifier and self-excited circuits in a general way. Our objectives included also the construction of a somewhat refined transmitter: the precise tuning of its circuits, and the measurement of what would then be something approaching the best possible performance that could be expected under normal conditions. These are the matters, therefore, to which we will give our attention.

"OSCILLATOR-OSCILLATOR" TRANSMITTER
We recall, five or six years ago, the construction of an elaborate master-oscillator-amplifier transmitter. We knew that such a transmitter would give steady signals of splendid character, and as a result we were not surprised to obtain some excellent reports during the first few QSO's. We recall as well, however, that shortly afterwards, the transmitter was started up with the oscillator accidentally disconnected. Behold! The antenna current was there just the same. Eventually, we were able to tune the thing properly but we were surprised to find that with the slightest misadjustment the performance would drop to that of a self-excited transmitter. Since that time, the development of effective neutralizing systems has simplified the tuning business very greatly. It must be understood at the start that even in these enlightened days the use of a master-oscillator-amplifier transmitter does not spell the end of swinging and creeping frequencies—that its use does not in any way eliminate the necessity of careful and exact tuning.

The first transmitter built in the Laboratory for this study consisted of a UX-171 oscillator using the Colpitts circuit, and supplied from 135 volts of "B" bat-
tery, driving a UX-210 amplifier powered by a 550-volt generator. It was, as our objective dictated, an average transmitter, built and tuned without any particular care. The oscillator was tuned to take 50 m.a. and the amplifier bias was adjusted until a plate current of 70 m.a. was obtained in normal operation. The amplifier was switched on the "Growler" and listened. To our surprise we found that the note was poor, that the frequency was creeping badly and that it responded to even slight vibration of the antenna. Further tuning adjustment was made with some considerable improvement in performance but it was not found possible to obtain the same efficiency in the amplifier as that obtained in the self-excited oscillator described in last month's QST. Plotting of the antenna-tuning-vs.-frequency characteristics showed that it was considerably better than that of the self-excited transmitter but on the other hand the plate-voltage-vs.-frequency curve was extremely poor. An increase of the oscillator plate voltage to 300 resulted in an enormous improvement of the amplifier efficiency and measurement showed us that we had far surpassed the self-excited set in this regard. Under these conditions, however, the frequency creep was as much as 10 kc. per minute and the oscillator was therefore run alone until the cause of the trouble was found. A process of elimination placed the responsibility on the small fixed condensers used across the oscillator inductance, which apparently were heating insufficiently to change their capacity appreciably. The replacement of these condensers with others of the air-
dielectric type or the change to a Hartley circuit, fitted with an ordinary variable condenser, immediately reduced the creep-age to a low figure. The use of a UX-210 in place of the UX-171 resulted in still further improvement.

MORE TROUBLES

Other weaknesses in the performance were frequency wobbles due to vibration of the inductances and wiring, and violent frequency swings resulting from movements of the operator in the vicinity of the set. All of these matters were given consideration in the design and construction of the second master-oscillator-amplifier transmitter pictured and described on these pages. Summing up our experiences we decided that the term, "master-oscillator-amplifier" is not the synonym for constant frequency that it is so often thought to be—that the system is capable of producing extremely satisfactory signals, but that tuning plays just as much or more of a part than in the case of self-excited outfits.

In the second transmitter, a UX-210 was used as the oscillator in a Hartley circuit, so avoiding the necessity of fixed "bridge" condensers. The mounting of the inductance and the wiring were made more substantial and the unit was assembled on an aluminum disk over which an ordinary aluminum kettle could be inverted. The shield, so provided, was not intended to prevent undesired couplings between the oscillator and amplifier but merely to avoid the frequency changes due to body capacity variations. It proved thoroughly effective for this purpose though it was found necessary to drill holes around the bottom edge and at the top to provide ventilation. Before these holes were drilled serious frequency creeping was caused by the heating of the apparatus within the kettle.

THE OSCILLATOR TANK

A High-C tank was used for the oscillator, the values of inductance and capacity being of the order of those found desirable in our previous study of self-excited oscillators. The low power of the oscillator, however, made it possible to use inductances of 3/16" outside diameter copper tubing. With input power to the oscillator of 10 or 12 watts it was not found necessary to use heavier conductor or more effective contact than that provided by the plugs and sockets shown in the photographs.

The amplifier, consisting of another UX-210 arranged in a conventional circuit, was mounted with its associate apparatus in a group just clear of the oscillator. In the plate circuit of this tube a High-C tank was avoided in order to permit a high degree of efficiency without the necessity of any particular refinement of its construction. In the case of a correctly neutralized amplifier tube, slight changes in the tube constants due to changes in the load or heating of the tube should have negligible effect on its performance and it is on account of this fact that a High-C amplifier plate tank is not particularly desirable. With amplifier plate inductances of the sizes shown in the photograph, the tank currents were not high enough to justify the use of heavier conductor than that used in the oscillator, nor the use of more elaborate connectors. In the antenna circuit, still lower currents are found and the same conductor was entirely suitable.

In this second transmitter, a change was made in the neutralizing method (as can be seen by a comparison of Figs. 1 and 2) since it was found possible in the second method to avoid the necessity of turns additional to those included in the tank cir-
cuit. This change, of course, considerably simplified the arrangement of the tank. The construction of the transmitter is quite conventional in all other respects and it

A "CLOSE-UP" OF THE OSCILLATOR UNIT
On the left of the tube is the grid leak and the grid condenser from which the combined connecting strip and coil mount is run to the variable condenser. A similar arrangement is used on the plate side of the tube. On the right side of the tube is the plate r.f. choke. The filament by-pass condensers can be seen mounted on the tube base in the immediate foreground.

should not be necessary to add to the information provided by the illustrations and diagrams.

THE ULTIMATE PERFORMANCE
We admit that the transmitter is a dizzy looking contraption but we must say that its performance was something very close to our idea of perfection, as soon as we had mastered its tuning. It could be left running with an automatic key for a couple of hours (monitored with a crystal oscillator) without a frequency drift of any serious proportion; it could have its plate voltage (both oscillator and amplifier) varied 10% with a frequency change that was only just observable; it could be "walked all over" with both hands without the monitor noticing it; it could give us a "pure musical d.c. note" with the simplest filter.

It performed so splendidly, as a matter of fact, that we dreamed that night of a world filled with master-oscillator-amplifier transmitters and Bourne acoustic filters. Truly it was a world of bliss!

But we cannot leave those statements without placing in juxtaposition the claims that tuning is even more important in master-oscillator-amplifier transmitters than in the self-excited sets and that the use of

a monitor or "Growler" for the work is of equivalent consequence.

THE TUNING PROCESS
In tuning the oscillator the same procedure will apply as that outlined for any self-excited transmitter. In tuning this oscillator with the aid of a monitor, we found it desirable to do the work with the plate supply filter disconnected. In this way it was more readily possible to decide upon

the adjustments giving the cleanest note than when a well-filtered plate supply was used. In the adjustment of this particular transmitter, the generator was run without any filter and the adjustment was considered satisfactory when the modulation of the note due to plate supply ripple had been reduced to the point where it could just be detected.

While tuning the oscillator, it is well to have the grid lead to the amplifier attached, but the amplifier should be run with its plate supply disconnected. Just as soon as the oscillator has been adjusted to give the cleanest and steadiest signal on the required frequency, with the input at about 10 watts, the preliminary neutralizing can then be undertaken. For this work, a two-turn coil connected to a flash lamp bulb should be coupled closely to the amplifier plate coil, and with the neutralizing condenser set at zero, the plate tuning condenser rotated until the maximum indication is obtained in the bulb. At this stage,
the neutralizing condenser should be adjusted until no such indication is obtained even after a slight readjustment has been made with the amplifier plate tuning condenser. The plate voltage to the amplifier can now be connected (the grid bias being at about 45 volts) and slight retuning of the amplifier plate tank can be made to reduce the amplifier plate current to the lowest value. Antenna coupling and tuning can now be effected, keeping in mind the fact that antenna coupling still plays an important part in master-oscillator-amplifier transmitters as far as efficiency is concerned, and that it still has some influence over the performance as far as frequency stability is concerned. In short, when the coupling has been adjusted until maximum antenna or feeder current has been obtained, the coupling should be backed off until the antenna current is about 85% of its former value. Unlike the self-excited transmitters no noticeable improvement was effected by detuning the antenna and any sacrifice of antenna current other than that resulting from the loose coupling was not considered necessary.

If the tuning has been followed in the monitor, the signal will probably be clean and extremely steady, but attention should be reverted to the neutralizing condenser for final adjustment. By listening to the transmitter with little or no plate-supply filter a magnificent final adjustment of neutralizing can be made. As the attainment of complete neutralizing is approached, the character of the note will improve greatly, and at the exact point of neutralization it will be far superior to that obtained on either side. The point at which the note clears is, indeed, so well defined that we are now of the opinion that much more exact adjustment of neutralizing can be obtained by checking with the monitor than with any method so far attempted. We admit, however, that the method previously mentioned (or a similar one) is indispensable in providing the approximate adjustment, since the monitor method can be put into use only when the transmitter is operating in a somewhat normal fashion. In all of our experimental work we found

FIG. 3. SHOWING THE EXTREME IMPORTANCE OF PRECISE NEUTRALIZATION

In taking these curves the neutralizing capacity Cn was set at various values, denoted for convenience, by the dial readings. At each adjustment the Antenna-tuning-vs. Frequency curve was plotted. It can be seen from curves Cn 27 or Cn 32 that adjustments of two or three degrees on a 500 µfd condenser can lower the performance almost to that of a self-excited transmitter. The correct adjustment in this particular case was somewhere between 29 and 30 degrees. With Cn at 29 the frequency swing was slightly upward while at 30 it was downward. If Cn could have been adjusted to about 29.3 the frequency change caused by tuning the antenna through resonance probably would have been not more than a few cycles and antenna swinging would then have had practically no influence on the frequency.

Oscillator, Amplifier and Antenna Coils for Four Bands

Made of 3/16" outside diameter copper tubing and wound by hand on a piece of iron pipe these coils serve for the four bands from 3,500 to 14,400 kc. in this particular transmitter. In a transmitter arranged differently some changes in the dimensions given may be necessary. Coils Aa and Ao are the amplifier and oscillator coils for the 3,500 kc. band. They have an internal diameter of 2½". Coils Ba and Bo are for the 7000 kc. band, Ca and Co for 14,000 kc., and Da, Do for 28,000 kc. For the last three bands the coils are wound to have an inside diameter of 3½". Coil E is used in the antenna circuit for 3500 kc., F for 7000 and 14,000 kc. and G for 28,000 kc. The number of turns used can be seen on the illustration. Coil H, fitted with a flash-lamp bulb, is that used for the preliminary neutralizing process.
that the adjustment of neutralizing was of extreme importance. In every case, it can be said without exaggeration, a 10-degree movement of the 50-mfd. neutralizing condenser spelled the difference between a 1928 and a 1929 type signal.

TRANSMITTERS OF HIGHER POWER

While the time set apart for this study of present-day master-oscillator-amplifier transmitters did not permit the construction of a higher-powered transmitter, we can see no reason why the same general ideals should not hold good. The choice of the oscillator and amplifier tubes will be a matter of greatest importance for it is certain, in our minds, that the complications involved in a master oscillator will not be justified unless the input of the oscillator, operating at normal efficiency, is at least one sixth of the amplifier input—the two tubes working on the same frequency—and unless the oscillator is being run well under its rating. This means that a UX-203-A or a UX-852 would be the only tubes suited for use as an oscillator controlling a tube of the latter type, while a UX-852 would be required to control a UV-204-A. It is not claimed, of course, that these combinations alone would prove satisfactory. It is merely suggested that under average conditions they would be very desirable.

In case this statement of master-oscillator and amplifier ratings would not appear to be checked by general crystal-control practice, it might be well to explain that conditions in the two instances are not by any means parallel. In the crystal-control transmitter the work of the oscillator is merely to supply sufficient excitation for the succeeding amplifier tube. In the case of the master oscillator (the term is used on account of its convenience but they are really both master oscillators) its work is to supply the amplifier excitation in a similar manner but to do the work without changing its frequency in accordance with any minor fluctuations of the load on it. In the crystal oscillator the crystal takes care of any such changes but in the master oscillator a stable frequency can be obtained in a practical manner only by making the energy drawn from it for amplifier excitation a fraction of the total radio frequency energy being developed.

We like the master-oscillator-amplifier transmitter. Its complications are minor; its tuning is straightforward; its performance, we'll tell the cross-eyed world is well-nigh supreme.

Recent QST articles treating the Oscillator-Amplifier Transmitter:
- Master Oscillators and Power Amplifiers (Kruse) March, 1927
- A Constant Frequency Transmitter (Hoffman) July, 1927
- A Low-Power Master-Oscillator Transmitter (Dudley) Feb., 1928
- Keying Master-Oscillator Circuits (Dudley) April, 1928
Radiovision

By Thornton P. Dewhirst

O late there has been considerable publicity concerning radiovision or television and the reception of such signals by the amateur and experimenter. There has been but little information in a form suitable for the amateur and it is the object of this article to give some pointers on the problem and show some of the limitations of the art in its existing state.

First of all, do not expect too much from your radiovision investment. A picture of only slight detail is possible when reception is to be accomplished on the present broadcast set and the transmitter is to stay within the ordinary assigned channels of today. The use of present-day channels limits the number of lines drawn per picture to approximately 24. This means that the bust of a single person is about the limit of recognizable reproduction in half tone work and that possibly two moving figures in silhouette may be accomplished at the most. However, let us go into detail about the apparatus proper and return to this phase of the subject when we have acquired a little more data concerning the methods of transmission and reception.

By means of a revolving disc at the transmitter, the object is scanned by a spot of light, the reflection of which is picked up by a bank of photo-electric cells and these electrical impulses so generated are used to modulate the carrier wave. At the receiving end we have another disc revolving in synchronism and the radio signal is employed to illuminate a lamp which is viewed through the disc. The number of holes in the disc will determine the number of lines per picture and the speed of the disc will determine the number of pictures transmitted each second; both of these factors are set by the transmitter.

In the case of the 24-line picture as transmitted by WGY, there is not much that need be said. These pictures may be received on the standard broadcast receiver providing a good audio-frequency amplifier is being used and the radio frequency end is such that the full 10-ke. band is passed.

Consider that each line is divided up into 24 separate elementary portions which means that for the whole picture we have $24 \times 24$ or 576 elementary areas that are being scanned by the beam of light. Now, if 20 pictures are being sent each second, each elementary area giving a large change in illumination compared with its immediate neighbors, the maximum frequency being transmitted will be $576 \times 20 = 11,520$ impulses per second. These impulses are uni-directional and two pulses would be equivalent to one cycle, which means that the equivalent frequency is half of this value or 5,760 cycles per second. In actual transmission of half tones, the change of illumination will not occur abruptly nor will there be a change for each elementary area. This results in the highest frequency being still further lowered so that if the amplifier will pass frequencies up to 6000 cycles, it will be satisfactory for the job. When silhouettes are being transmitted, the changes in illumination are apt to be more rapid and abrupt, resulting in a larger band of frequencies that must be passed by the system. To compensate for this, when receiving (or transmitting) silhouettes, the amplifier does not have to have as excellent frequency response characteristics as when half tones are being received, because in silhouettes we are interested in but two values of illumination, light and dark; whereas in half tones, the various shades between these values must be considered.

A 36-line picture sent 10 times per second will require a band but slightly wider than the 24-line, 20-per-second transmission. However, since the number of times a second a picture must be repeated in order that the phenomenon of persistence of vision be obtained is also a function of the intensity of the illumination, it can be appreciated that in order to obtain a steady smooth image using the above speed, a light source of considerable intrinsic brilliancy will be required. The stronger the
light, the fewer pictures per second necessary to obtain persistence of vision providing the speed is not reduced to a point where flicker is introduced. About 15 pictures per second is the lowest speed advisable.

A 48-line picture sent 15 times per second will require about 20 kcs. for each side band or about four present-day channels. For this work, receivers must differ considerably from those employed for present-day broadcast reception. One stunt is to use four channels for this transmission, splitting the picture up into four parts, each of which is handled by a separate transmitter and receiver.

The best type of audio amplifier for the job will be a resistance-coupled affair. High mu tubes of the "240 type" may be employed and the plate resistors should be of about 150,000 ohms (somewhere between 100,000 and 250,000 ohms will be about right), the coupling condenser around .1 mfd. and the grid leak around 500 megohms. These last two may be changed somewhat although it must be remembered that as the coupling condenser is made larger, the grid leak resistance must be reduced. If the condenser is too small, the low frequencies will not be amplified while if it is too large, the size will have to be reduced to a point where the amplification of all frequencies is lowered or the tube blocks. About 180 volts of B-battery will be needed for the amplifier.

In a stage of resistance-coupled amplification, the output signal is approximately 180 degrees out of phase in relation to the input signal. The number of stages needed does not then depend only upon the amount of gain necessary but also upon the fact that the image is to be a positive and not a negative one. Whether there shall be an odd or even number of stages will depend upon whether the transmission is of a negative or positive picture. When the correct number of stages has been found for a given transmission so that the picture received is a positive one, additional stages must be added in pairs so as to retain this phase relation. The grid bias should be adjusted with care. When receiving half tone pictures, adjust as for phone signals while if silhouettes are to be received, the bias should be slightly increased.

The use of the grid bias method of detection is to be recommended in preference to the leak and condenser system. While the sensitivity will be reduced, the amount of distortion will also be reduced, resulting in more satisfactory operation. Changing from one type of detection to the other will also cause a shift in the phase relation of the output. An r.f. choke may be needed between the plate circuit of the detector and the grid circuit of the first amplifier to prevent the r.f. that gets by the detector from loading up the audio amplifier.

The neon lamp should have a plate or target that is as large as the picture we wish to reproduce. This is necessary since we want to look directly at the lamp through the holes in the disc. The use of small lamps is not recommended as there is considerable improvement in the use of a lamp with a plate or target of ample proportions (about 1⅛ inches square). These may be readily obtained and are well worth the additional expense entailed. It is connected in the plate circuit of the last stage of the amplifier. This stage may consist of a 210 or a pair of 171's in parallel. See Figure 1.

The resistance of the lamp before it is ignited is infinite but after it has been ignited, its resistance is quite low, varying from several thousand to ten or twenty thousand ohms depending upon the amount of current passing through it. The voltage drop across the lamp is constant, its resistance varying in inverse proportion to the current flowing through it while the illumination is proportional to the current flow. In testing a lamp by connecting it across a battery, a.c. line, etcetera, it is essential that a resistance of a few thousand ohms be connected in the circuit or the target is liable to volatilize and render the lamp inoperative for this particular type of work. The resistor will control the amount of current that can flow and prevent this sort of breakdown.

The radio frequency amplifier offers more of a problem than does the audio system. When the width of the side bands is not much greater than the present day broadcast channels, it is possible to take a tuned radio frequency amplifier (the stages being tunable separately) and by adjusting the circuits slightly off tune with each other, the width of the band can be increased although the gain is reduced.

A step further in this line is the method described by Dr. F. K. Vreeland in his paper which appeared in the March, 1928, issue of the Proceedings of the Institute of Radio Engineers. He uses two tuned circuits loosely coupled by either an inductance or capacitance so as to resolve all the resonance curves into one with flat top and steep sides. It is in effect an adjustable band-pass filter. Such filters may be used either before or after the untuned amplifier stages or they may be employed as the coupling devices between the amplifier tubes.

One may also use a double-detection receiver (superhet) and insert a fixed band-pass filter between the first detector and first intermediate frequency amplifier or
The filter may be inserted somewhere between that point and the second detector.

Synchronization is a problem of considerable magnitude and has not been solved to date. There have been many solutions offered but in the majority of cases, they have been too expensive for general adaptation. Present practice is to use a series or shunt wound motor and by means of a resistor in the field circuit or in series with the line, adjust the speed to the desired value.

To determine the required speed, multiply the number of pictures per second by sixty, the product being in r.p.m. If you already have a revolution counter it will help you arrive at approximately the correct speed although if you have not one, it is not necessary to get one as after several trials you will find the approximate settings of the resistors for a given speed. Assuming everything else in working shape, as you approach the correct speed, the image will appear, although in distorted shape. If the image is continuously traveling up or down it indicates that either the speed is incorrect or not constant. If the image remains stationary but is not properly framed, the receiving disc is out of phase with the transmitting disc. This may be corrected by moving the lamp to a different part of the disc, dropping the motor speed a fraction of a revolution if possible or rotating the field of the motor.

The size of the disc depends upon the number of holes and the width of the picture. The distance between the outermost hole and the center may be calculated by the following:

\[
distance = \frac{number\ of\ holes \times width\ of\ picture}{2\pi}
\]

\[
size\ of\ holes = \frac{height\ of\ picture}{number\ of\ holes}
\]

For best results the size of the picture should be determined by the size of the target in the neon lamp. Assuming a 1½ inch square target, a 24-line picture requires a disc with a radius of approximately six inches while a 48-line picture would call for a twelve inch radius.

In laying out the spiral one can make use of a piece of drill rod or dowel, the circumference of which is the same as the height of the picture. By placing it at the center of the disc with a piece of string or wire tied firmly to it, a marker fastened to this string about ¼” from the edge of the disc will inscribe the desired spiral as it is rotated about the center. In speaking of the spiral one might refer to the distance between holes as the separation of the holes and the height of the picture or distance between the first line and the last line as the offset of the spiral.

When using the disc method of transmission very little in the way of refinement seems possible due to the huge size of the disc if better pictures are to be achieved. Mechanical improvements must be made and one method patented by Ramsey is to continue the spiral around gradually approaching the center of the disc. Each complete turn of the spiral has its own lamp which in turn is operated from a separate transmitting channel or a switch is provided to light the individual lamps in succession. This produces a larger picture than a given disc could normally accommodate. If the spiral is of two complete turns, the separation of the holes will be twice the spiral offset and two lamps will be needed. The switching device causes irregularities in contact which is important in half tone work and the sparking produced causes radio interference to the receiver. This may be partially reduced by switching ahead of the output tube and providing an output tube for each lamp.

Jenkins uses a number of helices drilled in a cylinder, each helix being illuminated by an individual target in a multi-target lamp similar to the manner in which Ramsey illuminates several spirals on a disc. Jenkins places the multi-target lamp at the center of the cylinder and by the use of quartz rods conducts the light to the periphery of the cylinder with very little loss. The individual targets of the lamp are small and thus a given amount of energy will produce a large amount of illumination. It is confronted with the same drawbacks as regards switching as is the Ramsey system.

Ramsey's method produced a gradual narrowing of the width of the image as the spiral approaches the center of the disc while the other produces a fading out of the image at the edges. The first may be corrected by proper framing and providing that care is exercised at the transmitter, no distortion will be caused. In
the cylinder method, a lens will correct the difficulty to some extent.

The disc can be used for both transmitting and receiving at the same time by continuing the spiral a quarter turn more. For a 24-line picture, lay out six more holes after the full spiral has been made and four for the 48-line disc there should be twelve additional holes. The picture is to be received one quarter of the circumference from the point where it is transmitted. A photo-electric cell (abbreviated P.E.) a light source and a few more stages of amplification will be needed. The number needed will depend upon the number of lines to the picture and the intensity of the light source. At least a 500-watt lamp on arc light should be employed. The arc should not be run from an alternating current source as the variations due to the a.c. (even 60 cycles) which are relatively slow will modulate the signal and cause trouble.

The connections to the P.E. cell are shown in Fig. 2. The resistance in series with the cell will vary between three and seven megs. It has been found advisable to use a low mu tube as the input tube which may be followed by high mu tubes in the rest of the amplifier. It would perhaps be best to start with silhouettes since then the P.E. cell may be adjusted at a value where the voltage is just below the point causing the cell to glow when the strongest light is on it for the longest time necessary. For half tone work, the cell must be worked down on its characteristic curve where a linear relationship exists between illumination and response. Under these conditions more amplification will be needed. Figure 3 shows the general arrangement for transmitting and receiving on the same disc. Try placing a key, small screwdriver, fingers, etcetera in the lighted area and see the outline of these objects in the receiving area. Next, a photographic film, preferably a positive, may be tried. After this has grown to be "old stuff" one can try putting the signal on a carrier wave to be picked up at a distance. With the 24-line picture the transmitter may be any good phone set. However, it must be good and there should be no a.c. hum in the carrier and the complete audio spectrum to about 5000 cycles should be transmitted without much distortion. Few of the present-day amateur phones will pass this test and the first step toward this type of transmission should be a thorough housecleaning of the phone set. It is useless to attempt the work with a poor transmitter.

The disc with the extra holes may be used and the receiving area employed for monitoring the signal. After you have done satisfactory work with the 24-line pictures, you can try transmitting a 36- or 48-line one. This transmission and reception problem should keep you employed for some time.

The use of the cathode ray tube for the receiver is worthy of consideration since it opens up the possibility of real radiovision. In this tube, a stream of electrons may be moved in two directions at right angles to each other by means of either an electric field or a magnetic field. The window of the tube is covered with a fluorescent material and the electrons upon striking it cause it to glow. By means of proper values of current or voltage and frequency, the small spot of light can be made to completely cover the window. For radiovision work, the use of a material for coating the window that was not only fluorescent (emits light when exposed to certain rays) but also continues to glow for a short period after the ray has been removed would be of material assistance. This will help in causing the vision to persist and thus give the effect of greater illumination as far as this characteristic is concerned.

Radiovision for the home is still in the very distant future and this constant hoodwinking of the public should cease. The radio industry will benefit enormously when it does. When the elementary area used to build up our picture bears the same proportion to the whole picture that the individual particles of the emulsion of the moving picture bears to the total number of particles in the exposure and some method of transmitting each of the individual parts with ease and the problem of synchronism has been completely and simply solved, radiovision will be ready for the public. Today it is merely a plaything for the amateur and experimenter. It is an interesting field of experiment but one should not expect too much from his present day equipment.

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A certain ingenious fifth district amateur has trained his parrot to yell "CQ". He had an automatic CQ disk for his telegraph transmitter but his phone set was wanting
We Ought to Talk Frequency
The Reasons Why, Including a Look at Our 1929 Bands

It is time that amateur radio thought and spoke in terms of kilocycles instead of wavelength in meters. All of the rest of the world has changed. By the terms of the Washington Convention of 1927 the primary standard in all assignments to radio stations is to be frequency, and it will be in terms of frequency that all of our amateur assignments are made. The term wavelength is such an inconvenient one, and so far-fetched as far as concerns the physical appearance of anything in a station, that it seems the sooner we forget all about it the easier it will be for us to figure things out. Electricity in general caused. It seems to us that this business of figuring things out. Electricity in general

In the first place, talk about wavelength is "the bunk" because it is a thing that cannot very well be measured. When we talk about the length of our radiated waves we mean, for example, that if we had an oscillator going at about 7,500,000 cycles per second, and coupled to an antenna, and then if, Joshua-like, we could command those waves to stand still, and then if we could see them, and then if we had a nice steel tape-line whose accuracy we could rely absolutely upon, and then if we measured those waves and found that it were 131 feet and 3 inches from a point in one wave to exactly a similar point in another wave, then our transmitter would be operating upon approximately 40 meters! Now we can't see the waves, and we can't stop them and have the same conditions that apply when they are radiating, and we can't rely too much upon our measuring sticks. The one thing that the world does have absolutely accurately is time, and it also has the ability to count, and the one thing which may be said with precision about our circuit is the number of times per second which it oscillates. Is it not ridiculous that we continue
to talk in terms evolved from as far around the bush as wavelength in meters?

It is perfectly easy to think in terms of frequency and to see why this is logical. Consider the simple oscillating circuit of Figure 1 and imagine that the condenser, C, has been charged by impressing a voltage across it. Seeking to equalize the difference in potential between the condenser plates, a current starts to flow, say in the direction of the heavy arrow. This current has to thread its way through the inductance, L, in which process it encounters electrical inertia because the inductance tends to prevent the flow of the current by taking up its power in the form of an electromagnetic field. Eventually all the power in the circuit exists in the form of these electromagnetic lines of force around the coil, instead of in the form of electrostatic lines of force in the condenser, as had been the case an instant before, and current flow ceases. But when the current through the coil ceases, the field around it collapses and the energy is returned to the circuit to proceed and charge the condenser, and in fact this same quality of inertia in the inductance now gives the current a "push," so that the condenser instead of merely having its charge neutralized, is now charged in the reverse of its original direction. The current now starts back in the direction of the light arrow and the same performance occurs again, this action continuing until the power is reduced below a certain critical value by losses from heating or radiation. This is simply the customary story of oscillation in an LC circuit, as is related in any radio textbook.

Now the one thing which is perfectly obvious about this procedure is that if the inductance L is a large inductance like that in Figure 2 it will take the current a longer time to thread its way through the circuit, and if the capacity C, as in Figure 2, is a large condenser, it will take a longer time for it to become charged. "Electricity" having a constant velocity, it is immediately apparent that this circuit is going to take a longer time to go through one complete
set of conditions (a cycle) than a circuit like Figure 3, in which both the inductance \( L \) and the capacity \( C \) are small. We have said in the past that the circuit of Figure 2 has a longer wavelength in meters than that of Figure 3 but we don't actually know how to express this left-handed measurement with any particular accuracy and the chief thing that we do know about Figure 2 is that it takes longer to oscillate, has a greater time-constant, oscillates more slowly, has a lower frequency in cycles per second. We can measure that because, from astronomy, we know exactly how long a second is. Is it not easier to deal with the more direct and obvious feature in the circuit, the rapidity with which it goes through its cycle?

Let us consider another example of the unreliability of attempting to deal in meters of wavelength. We say that the velocity of radio waves is 300,000 kilometers per second, the same as that of light. Obviously this velocity, divided by the frequency, should give the wavelength. Our circuit that oscillated 7,500,000 times per second comes out to have a wavelength of exactly 40 meters. And this is dead right if we know that the velocity is 300,000 kilometers per second. Unfortunately we don't know anything of the sort, even though that figure is frequently cited for this purpose. As a matter of fact, that figure is known to be somewhat incorrect and the latest scientific researches attribute to this figure the value of 299,820 kilometers per second. Our wavelength now turns out to be 39.98 meters! Which is right? Unfortunately we don't know. Some day science will set a still more accurate figure for the velocity of our waves, and then we will have still another measurement for our wavelength. All we can say to-day is that it is impossible for many small but dark reasons to give a wavelength accurately but that we are able to state our frequency with precision. For this reason the nations of the world have now agreed that the operating privilege to all radio stations will be stated primarily in terms of frequency, the approximate wavelength in meters to be stated as a secondary value, but with the frequency to be hewn to the line and letting the meters fall where they may.

There are other reasons why the terminology of wavelength is outgrown for us amateurs. Some of our 1929 bands are only a “meter” or so wide and any attempt to locate a wavelength within such bands is futile and meaningless unless it is carried out to the ten-thousandth part of a meter. It is easier to talk whole numbers in frequency. We know that we must learn greater precision for next year and that we must be able to recognize and discriminate between frequency differences of, say, 10,000 cycles (10 kilocycles) in our 40-meter band. Yet how can we deal in meters of wavelength with the two frequencies 7250 kilocycles and 7220 kilocycles when we think of them as being exactly the same thing, namely, “right around 41.3 meters”? Answer: we can't!

One more reason. Any intelligent examination of the capabilities of our various bands involves consideration of the number of stations which each will accommodate, which number varies with the frequency and in each case is to be expressed only in terms of width of channels, which again must be related to some percentage of the frequency. More about this later.

For these various reasons it is apparent that we amateurs ought now to abandon our outgrown wavelength nomenclature and get on the band-wagon and talk frequency. The standard way of going is to speak in terms of kilocycles per second, commonly called just kilocycles, and abbreviated “kc.” A kilocycle is a thousand cycles, which is to say that the actual frequency of an oscillator is to be divided by 1,000 to give the frequency in kilocycles. For example, our 40-meter oscillator which we said oscillated 7,500,000 times per second has a frequency of 7,500 kilocycles per second or 7500 kc.

QST is going to lead the way in this. Frankly, we find ourselves unable to express 1929 thoughts lucidly in terms of wavelengths and we know that all of us simply must get around to talking frequency to be able to deal intelligently with next year's activities. QST therefore is going to talk frequency. We will follow such references with the approximate wavelength in meters, in parentheses, the wavelength being based on the velocity 300,000 kilometers per second. Since frequency is the primary standard and wavelength at best an approximation, the basing of the wavelength expression on 300,000 is near enough accurate and ever so much more convenient than the figure 299,820. That also is exactly the practice of the International Radiotelegraph Convention and of our own Federal Radio Commission and Radio Division, Department of Commerce. For the small sum of 5c (stamps not accepted) the Superintendent of Documents, Government Printing Office, Washington, will send you a copy of the "Kilocycle-Meter Convention Table," based on the figure 300,000, which was published on March 1st of this year. It is a large card, 13" by 23", containing 60 columns of figures, and its examination will provide a profitable pastime for nights when static is bad.

The Headquarters "gang" is now pretty generally thinking and talking in terms of kilocycles and we find it much more understandable and easy to deal with. The story is told that one of the later members of the Federal Radio Commission did not
know much about technical radio and, shortly before some extensive hearings were held, received some elementary instruction in the basic theory. Of course it was all in terms of kilocycles. At the hearings one of the speakers referred frequently to wavelength each station might be permitted to, deviate a certain small percentage on either side of its assigned frequency. Suppose the deviation is 0.1 percent, then let us assume that, in the commercial bands, there should be a space of one kilocycle on either side of

<table>
<thead>
<tr>
<th>Kilocycles</th>
<th>Width in Kilocycles</th>
<th>Assignment</th>
<th>Approx. Meters on basis factor 3</th>
<th>Meters on basis factor 2.998</th>
<th>Harmonic Family for central or related positions</th>
<th>Amateur Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1715-2000</td>
<td>285</td>
<td>Amateur, Mobile, point-to-point</td>
<td>150 - 175</td>
<td>149.9 - 174.8</td>
<td>1775</td>
<td>168.92 Domestic</td>
</tr>
<tr>
<td>3500-4000</td>
<td>500</td>
<td>&quot;</td>
<td>75 - 85.7</td>
<td>74.96 - 85.66</td>
<td>3550</td>
<td>84.46 &quot;</td>
</tr>
<tr>
<td>7000-7300</td>
<td>300</td>
<td>Amateur Exclusively</td>
<td>41.1 - 42.9</td>
<td>40.07 - 42.83</td>
<td>7100</td>
<td>42.23 International Night</td>
</tr>
<tr>
<td>14,000-14,400</td>
<td>400</td>
<td>&quot;</td>
<td>20.83 - 21.43</td>
<td>20.82 - 21.42</td>
<td>14,200</td>
<td>21.11 International Day</td>
</tr>
<tr>
<td>28,000-30,000</td>
<td>2000</td>
<td>Amateur &amp; Experimental</td>
<td>10.00 - 10.71</td>
<td>9.99 - 10.71</td>
<td>28,400</td>
<td>10.56 Experimental</td>
</tr>
<tr>
<td>56,000-60,000</td>
<td>4000</td>
<td>&quot;</td>
<td>5.00 - 5.36</td>
<td>4.997 - 5.354</td>
<td>56,800</td>
<td>5.28 &quot;</td>
</tr>
</tbody>
</table>

FIG. 4

in meters. "What does he mean, wavelength?", said the member, leaning over towards a friend. "I never heard of it. Why doesn't he talk kilocycles?"

How much happier we'd all be if we had never heard of meters!

A LOOK AT OUR 1929 BANDS

Let us now examine the bands which will be available for amateur radio after the end of this year. Figure 4 shows the assignments, the width of each band in kilocycles, and the approximate location of each band in terms of wavelength in meters.

From this table, which band would you say was the "widest"? If we speak in terms of the number of stations which can be accommodated in any band we get quite a jolt when we discover that neither that band 4,000 kc. wide nor the one 2,000 kc. wide is the "widest." Even the best adjusted station occupies a little slice out of the spectrum and this "slice" is to be expressed as a percentage of its operating frequency, so that as we get into a higher frequency band we find that the width of the channel required for a single station is greater, and that a wider band will not necessarily accommodate more stations. Let us make some attempt to determine this "channel width." The Navy Department has calculated it out for the Federal Radio Commission on the basis of the 1929 assignments. It commences by assuming that this signal, to minimize the possibilities of interference. Understand that we amateurs aren't going to observe individual channels within our bands, but a consideration of the subject is useful in establishing the relative widths of our different bands. We find that on the basis just suggested the separation between channels in our "160-meter" band is 5.71 kc., 9.5 kc. in our "50-meter" band, 16.3 kc. in our "40-meter" band, 30.4 kc. in our "20-meter" band, and 60 kc. and 118 kc., respectively, in our two highest-frequency bands.

It is apparent that we need some new scale if we are to have an accurate gauge of the number of stations which can be accommodated in our various 1929 bands. This is supplied in Figure 5, which takes account of the fact that at double the frequency a signal occupies double the room in the spectrum. Now we are able to gauge the relative widths of our bands. We find that the "5-meter" and "10-meter" bands are the same in practical width, that our "20-meter" and "40-meter" bands are narrower than this but that our "80-meter" band is double this in width, and that our low-frequency band is our widest in point of number of stations that may be accommodated.

In Figure 5 the "40-meter, 20-meter and 5-meter" bands are shown extended by dotted lines to the extreme right-hand edge of the drawing. These are the former widths of
these bands, the territory which we are authorized to occupy during 1928, and thus the drawing shows graphically the extent of our losses at the Washington conference. There is a harmonic relation in this drawing. Any point on one line is the second harmonic of the point on the line immediately above it, the fourth harmonic of the corresponding point on the second line above it, etc. Thus our 1928 assignments were a true harmonic family, each higher-frequency band being of twice the width in kilocycles of the band which preceded it but each capable of accommodating the same number of stations, and with the additional feature, based upon the motto of the Third National Radio Conference that "Everybody should eat his own hash," that the harmonics of international agreement is that it is available for mobile, point-to-point and amateur services, but the present disposition of our Commission is to make no assignment in it other than amateur, considering the extent to which our high-frequency allocations have been clipped. We use the band chiefly for telephony, to which it is open throughout its extent. It is an excellent short-distance telegraphy band and our Communications Department is planning the expansion of this work as a beginner's wave. It will probably also be available soon for television and picture transmission experiments. It is to be noted that the portion 1715-1760 kc. has no harmonic relation to any of our other bands. The frequency in this band which is the center of harmonic relation is 1775 kc.

**FIG. 5**

<table>
<thead>
<tr>
<th>BAND</th>
<th>KILOCYCLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;160-METER&quot;</td>
<td>1715-2000</td>
</tr>
<tr>
<td>&quot;80-METER&quot;</td>
<td>3500-4000</td>
</tr>
<tr>
<td>&quot;40-METER&quot;</td>
<td>7000-8000</td>
</tr>
<tr>
<td>&quot;20-METER&quot;</td>
<td>14000-15000</td>
</tr>
<tr>
<td>&quot;10-METER&quot;</td>
<td>28000-30000</td>
</tr>
<tr>
<td>&quot;5-METER&quot;</td>
<td>56000-64000</td>
</tr>
</tbody>
</table>

SHOWING RELATIVE WIDTHS OF 1929 AMATEUR BANDS

an amateur transmission could fall only within a higher-frequency amateur band. Only small portions of our 1929 bands are harmonically related to all of the others. The center of the harmonic portion is shown in figures in Figure 4 and is illustrated by the dotted line in Figure 5. From this it may be seen that if one wishes to have a crystal which, by harmonics, is capable of working in every amateur band, the crystal should have a frequency between 1750 kc. and 1800 kc. (166.7-171.4 meters); or, if the "160-meter" band is not desired, between 3500 kc. and 3600 kc. (83.3-85.7 meters).

We might now with profit look a little more carefully at each of our bands.

**1750-ke. band.** This band actually runs from 1715 to 2,000 kc. (175 to 150 meters). It contains about 60 commercial channels on the basis on which our Commission is now making commercial assignments. The of the harmonically-related portion is 1775 kc.

**2500-ke. band.** This is our well-known "80-meter" band, 3500 to 4,000 kc. (85.7 to 75 meters). This band remains the same in 1929 as it is today. That is fortunate for us, for this is our traffic wave, the heart of our Communications Department, the backbone of the League. Most of our organized operating activities take place on it, and by far the bulk of our domestic communications. The Navy rates it as containing 82 commercial channels. The harmonic center is at 3550 kc. Telephony is permitted between 3500 and 3550 kc. (86.7 and 84.5 meters). The international agreement on this band is also that it is available for amateur, mobile, and fixed services. But the Federal Radio Commission, impressed with the necessity for our retaining it if our organized communication is not to perish, has decided that no
commercial mobile or fixed assignments will be made therein in this country. We retain in this band our old arrangement of the last several years with the government services, whereby we share this band with low-power Army, mobile stations working in daylight hours during the field training season, and with Naval aircraft while operating off-shore. The President has assigned to the Navy sixteen frequencies within this band for the use of Naval aircraft. The Navy has used frequencies here for many years and has not bothered us, so there is no reason to suspect that this means any additional inconvenience for us.

7000-ko. band. This is our million-dollar band, the center of the rumpus at Washington last fall, the one where we acquired the heartache and lost our shirt to Europe and Canada. Originally 7,000 to 8,000 kc., it contains 18 commercial channels, viewed with envy and cupidity by a crass and vulgar commercial world. It is our chief international night band, and Canada. Originally 7,000 to 8,000 kc., it contains 18 commercial channels, viewed with envy and cupidity by a crass and vulgar commercial world. It is our chief international night band, and Canada. Originally 7,000 to 8,000 kc., it contains 18 commercial channels, viewed with envy and cupidity by a crass and vulgar commercial world.

This band, once our joy and pride, extending from 14,000 to 16,000 kc. but never extensively occupied and held by amateurs, now reads 14,000 to 14,400 kc. (21.45 to 20.83 meters). Containing 18 commercial channels, it is our narrowest band in effective width, and as such dictates the center of the harmonically related portions of all of the bands, its center of course being at 14,200 kc. This is our daylight DX band, also used for super-DX at night. It is open only to amateur telegraphy. Considering that we have nearly 1,500 channels and “20-meter” bands combined. This is the informal sub-division of this band in the 7000-ko. band. This is our million-dollar band, the center of the rumpus at Washington last fall, the one where we acquired the heartache and lost our shirt to Europe and Canada. Originally 7,000 to 8,000 kc., it contains 18 commercial channels, viewed with envy and cupidity by a crass and vulgar commercial world.

This band and the 28,000 kc band are heavy-capped chiefly in our international bands, and used for experimental work over moderate distances but with no reliability. This band the 28,000 kc band are heavy for the experimenter, to whom we must look for methods which will eventually make them useful. 34 channels. The entire band is open for telephony work as well as telegraphy, and probably will be made available for amateur television and picture-transmission work.

As we conclude this informal analysis of our 1929 bands it seems all the more demonstrated to us that any proper appreciation of what we have and what we are doing next year must be in terms of frequency.

-K.B.W.

Errata

The following corrections should be made in the Bourne article on Acoustic Wave Filters in August QST:

p. 25, second paragraph, first sentence, should read “. . . and attenuates currents of all other frequencies,”

p. 26, next to last paragraph, last sentence, should read “. . . we have attenuation from 0 up to f, and from f, on up, . . .”

p. 27, third paragraph, for “diameter” read “distance.”
Opportunity

By Hiram Percy Maxim, President, American Radio Relay League

When I was a very small boy my father and I used to ponder at length over the problem: Is it the salt fish that makes the ocean salt, or is it the ocean that makes the salt fish salt?

There is a somewhat similar problem to-day but there is no joker in it. Is Amateur Radio what we amateurs have made it, or are we amateurs what Amateur Radio has made us?

Amateur Radio is one of the amazing products of this century. Where before has an amateur group been depended upon in great public emergencies? Where before has an amateur group been depended upon for communications by every kind of an exploring expedition that starts out? Where before has an amateur group been depended upon by a great railroad system for its communications in time of emergency? Where before has an amateur group been depended upon to carry a message from the President of the United States to an explorer in the polar regions? And where before has an amateur group led the way in an important field of scientific research?

The answer is: Nowhere. And hence the question: Is there something about Amateur Radio that carries us amateurs along with it and makes us what we are, or is it we amateurs who have made Amateur Radio the wonderful thing it has become?

I believe it is we amateurs. We built up a splendid organization, which gave us the tremendous advantage of being able to work as an efficiently coordinated whole, instead of a disorderly mob. And this brought us OPPORTUNITIES, which we never otherwise would have had.

And all the OPPORTUNITIES have not passed. Radio telegraphy brought broadcasting. The latter brought the talking moving picture. And then meanwhile amateur moving pictures came along. They have brought that latest marvel, full natural colored amateur motion pictures. Commercial full natural colored motion pictures will quickly come from these, and full natural colored talking moving pictures will follow it. And then will come radio television in full natural colors.

Amateurs are to have golden OPPORTUNITIES in all of them. And it leads one to wonder which of us, obscure to-day, are to shine with the lustre of a Lindbergh tomorrow.

Let's keep everlastingly at it, fellows.

Pacific Division Convention
Oakland, California, October 11-12-13

YES fellows, the 9th annual convention of the Pacific Division is to be held at the Key Route Inn, 22nd & Broadway, Oakland, on the above dates and some program has been prepared. No dry technical talks, but of course there will be discussions. The big motto is a good time for every one with trips to Idora Park, where free rides on all concessions will be had; swimming, roller skating, etc., on one of the days—the next day at Lakeside Park where free picnic lunch will be served and where a number of stunts will take place. A special trip will be made to San Francisco where the gang there will entertain the delegates.

The committee in charge is working hard to outclass all previous conventions but we will need your attendance to do this. Come one, come all—every one will be welcome.

Write S. G. Culver, the convention secretary, Box 549, Oakland, Calif., that you will be present.

Strays

Perhaps the simplest way to get a good musical note would be to paint the set with phonograph records dissolved in alcohol.

—SBWS
Adapting Medium and High-Powered Self-Excited Transmitters for 1929 Service

Some Design, Constructional and Tuning Considerations Involved

By Ross A. Hull

As a sequel to "Overhauling the Transmitter for 1929," which appeared in the August QST, this article treats the particular modifications which are desirable in transmitters of medium or high power. It is assumed that the reader will have made a detailed study of the preceding article. If this is not so, a complete understanding of the present outline will be impossible.—Editor.

No one will deny the existence of a belief, among radio amateurs, that a transmitter assembled neatly behind a shining panel and equipped with a fine array of meters and control knobs never works quite so well as did the same apparatus in its early life, spread in wild confusion across a table top. Nor can it be denied that there exists an equally fallacious belief to the effect that the circuits and values of a successful low-powered transmitter will not provide an equivalent performance when high power is used. We had built low-powered transmitters which provided a "1929 performance" but there was too much of the radio amateur in our make-up to allow us to approach the application of the same ideas to high-powered work without considerable concern. There was, it seems, that inborn fear that the performance of our transmitters would drop as the power was raised. For a week or more, the Laboratory was filled with odors of burning bakelite, hard rubber and wood, and at times whiffs of smoke drifted lazily across the tables—but in the end our pulse had returned to normal, for we had found that even 250-watt self-excited transmitters can be made to behave in a 1929 manner with just the same treatment we had given the low-powered set.

The treatment, as we explained last month, consisted of installing High-C tuning circuits, making all conductors, condensers, resistors, transformers and chokes of ample proportions, and tuning with extreme care to keep the grid excitation at the most desirable value, the antenna coupling at the lowest practical point and the antenna detuned on the particular side of resonance which provided the cleanest signal.

The only serious problem, of course, was that involved in the use of the High-C circuits which we had found so effective
in the low-powered transmitters. Calcula-
tions showed us that we could expect tank
currents of the order of 18 amperes if we
employed the capacity-inductance ratios of
the low-powered sets, and much experi-
mental work preceded the construction of
the high-powered transmitter by using a
ful high-powered transmitter by using a
tank circuits in which the losses were low
enough to be justified without question by
the improvement in performance.

A TYPICAL TRANSMITTER

The final transmitter, built at the comple-
tion of the experimental work to provide a
typical example of the manner in which
the high-powered transmitter should be re-
modeled for 1929, is that illustrated in these
pages. We will first describe it in detail
and then proceed to a discussion of the man-
er in which the same principles could be
applied to transmitters of other types.

A UV-204-A tube was selected for use in
the "sample" transmitter since it is the
largest tube readily available to the amateur
and so is the tube most suited for use in
a 1929-type high-powered outfit. A great
many amateurs attempt to build a success-
ful high-powered transmitter by using a
UX-852 or similar tube running at four or
five times its rated power but there is not
the slightest question that this procedure
cannot be followed in any self-excited trans-
mitter if a 1929-type performance is to be
expected.

The circuit used is the tuned-grid tuned-
plate, selected on account of its mechanical
suitability for use with a long tube having
its grid terminal at one end and its plate at the other. Other cir-
cuits could have been used but with this particular tube they
would not have permitted the same simplicity of layout or di-
rectness of wiring.

TANK CONDENSERS

The variable condensers throughout are of standard types.
Many types of pie-plate, copper disk and copper tube condensers
for the tank circuits were built, and still more designed, but con-
siderations of compactness and simplicity invariably brought us
back to the use of the standard types connected in parallel to
the necessary capacity. We admit, however, that there is a
splendid field of endeavor in the evolution of cheap and effective
"home-brew" fixed or adjustable tank condensers to be added in
parallel with existing tuning condensers. The most important
requirements will be the use of heavy copper sheet for the plates,
and pyrex glass, high quality hard rubber or well dried wood
for the insulation; the use of heavily-soldered connections to
all plates, and the provision of some means of halving and quar-
tering the capacity so that it
may still be used on the highest frequency
bands. In both the grid and plate circuits of
this transmitter, a Cardwell Type 199 con-
denser is run in parallel with a Type 147B,
the former used for tuning adjustment, hav-
ing a maximum capacity of 500 µµfd., and
the latter used as an adjustable lumped ca-
pacity, contributing 440 µµfd. The two feed-
er or antenna condensers are of the Type
147B. "Double-spaced" condensers are all
that are necessary for the plate tank of a
tube supplied with 2000 volts when a High-
C circuit is used. Where plate voltages of the
order of 500-1000 are used the spacing used
in good receiver-type condensers is satisfac-
tory. In the grid circuit the voltages are
still lower but it was still found worth-while
to use "double-spacing" where the plate
voltage is of the order of 2000 volts.

INDUCTANCES OF UNUSUAL PROPORTIONS

The grid and antenna inductances are
wound with 3/4" copper tubing, this be-
ing of suitable size for the currents

FIG. 1. THE CIRCUIT OF THE TRANSMITTER
ILLUSTRATED

C1, C2—440-µµfd. variable antenna or feeder tuning con-
densers.
C3—440-µµfd. variable condensers connected across the
filament condenser used to provide adjustable "lumped"
capacity for the High-C circuits.
C4—330- or 250-µµfd. tuning condensers.
C5—100-µµfd. fixed by-pass condenser (5,000-volt rating).
C6—100-µµfd. fixed filament by-pass condenser (2,500
volt rating).
R1—100-ohm center tap resistors. A center-tapped filament
transformer can be used instead.
R2—Heavy duty 10,000-ohm grid leak. Leaks rated at 75
watts or less usually will heat appreciably and cause
frequency creeping.
R.F.C.—160 turns of 26 gauge D.C.C. wire on a 3/8" diameter
form.

This circuit was used in the transmitter under discussion in
preference to the Hartley or Colpitts merely because of
its particular adaptability to a tube having its grid terminal at
one end and its plate at the other. Any one of the many
satisfactory keying methods which have been described in
QST can be used.

COS SEPTEMBER, 1928
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flowing in the circuits in which they are connected. The plate coils, however, are of much heavier construction. Our first plate tank had an inductance of the same \( \frac{1}{4} \)" copper tubing as that for the grid and antenna coils, the temporary connections to the condensers being made with clips heavily soldered to cables of about the same diameter as the tubing. For inputs greater than these it is suggested that \( \frac{3}{4} \)" outside diameter tubing or, preferably, \( \frac{3}{8} \)" wide, heavy copper strip, be used for the plate coil and \( \frac{1}{8} \)" tubing or \( \frac{1}{2} \)" strip for the grid. In all cases the leads to the tank condensers should be of similar conductor to that used in the inductance and some heavy clamping device should be used for the connections. Clips simply will not serve the purpose.

For inputs greater than these it is suggested that \( \frac{1}{2} \)" outside diameter tubing or, preferably, \( \frac{3}{8} \)" wide, heavy copper strip, be used for the plate coil and \( \frac{1}{8} \)" tubing or \( \frac{1}{2} \)" strip for the grid. In all cases the leads to the tank condensers should be of similar conductor to that used in the inductance and some heavy clamping device should be used for the connections. Clips simply will not serve the purpose.

Further comment on the constructional details of the transmitter are hardly necessary for the minor points can well be gleaned from a study of the circuit diagram and the photographs. It can be said, however, that it is not suggested for one moment that the transmitter represents the acme of mechanical and electrical perfection. It is presented merely as an example of the simple modifications necessary to equip the amateur transmitter with High-C tanks, mechanically rigid construction and, as the outcome, the ability to produce signals of 1929 standard when tuned correctly.

REBUILDING EXISTING TRANSMITTERS

In quite the majority of present-day amateur transmitters, complete re-construction would not be necessary in order to modify them in accordance with the ideas set out
In a Hartley transmitter employing a UX-582, for instance, the only important changes might well be in the mounting of the tube so that its grid and plate leads are convenient to the plate tank, the addition of a second variable condenser in parallel with the existing plate condenser, and the provision of a new set of plate coils with suitable heavy mounting and connections on the condensers.

In a Colpitts transmitter the same process would apply, the particularly important point in this case being to remember that the "bridge condensers" and the condenser joining the two coils in the "split Colpitts" all must be considered as tank condensers and so must not only be proportioned to give the required total capacity across the coil but should be of a high grade, air dielectric type. Small mica dielectric condensers could not be used effectively in these roles.

Of course, in all probability, the alterations also would involve a general clean-up of wiring, a stiffening of the antenna coil and its mounting, and some re-ripping of the antenna to avoid appreciable vibration or swinging. Then, it may mean installation of a separate filament transformer to avoid filament-voltage fluctuations during keying or the use of a separate power outlet for the filament supply if a filament transformer is being used and fluctuations still occur.

Aside from these matters, the attainment of a 1929 signal with the self-excited circuit will most certainly mean the dumping of a.c. or "self-rectified" plate supply and the installation of some form of rectifier or a generator. At the moment, said to relate, the only truly practical rectifier for the UX-852 or UV-204-A is the mercury arc, but we are fortunate in being able to hint that it may not be long before this condition is effectively remedied. The filter system is still to be a problem but the improvement in the plate-voltage-vs.-frequency characteristic afforded by the use of High-C tanks will simplify the matter to a considerable degree. We dislike the idea of talking results and so leaving ourselves open to misunderstanding on the part of the more literal-minded readers, but in this connection we cannot refrain from mentioning that the transmitter illustrated on these pages, supplied from a mercury arc rectifier and equipped with a 2 µfd. condenser as its only filter, can produce a piercing "d.c." note on which modulation can be detected only by the hypercritical observer.

ADJUSTING FOR A 1929 PERFORMANCE

The tuning process for the high-powered transmitter is similar to that described last month for the low-powered set, the chief difference being in the observance of extreme care in avoiding contact with any...
metal part of the set. The operator can be killed suddenly and very effectively by coming into contact with the transmitter in the right (or wrong, if you wish) manner.

In the tuned-grid tuned-plate circuit it is well first to set the plate condensers at some estimated value with the grid tank condensers at zero. Then, with the antenna coil removed, the plate voltage (reduced to about 75% of the rating of the tube) can be applied, and the grid tank capacity increased slowly until the plate current dips and then rises to a value about 10% higher than the minimum. At this point the frequency should be checked, and if it is not within the band the process should be repeated until it is. At this stage the antenna coil can be coupled loosely and the antenna or feeder circuit tuned until maximum current is indicated. If the plate current at this point is still below the rating of the tube, when the voltage has been increased to normal, the grid tank capacity can be increased until it has climbed to the required value, at which time the antenna tuning should be readjusted. Each change in the constants of the grid circuit will mean changes in frequency and so continual checking with the frequency meter will be necessary. The antenna coupling can now be increased until maximum antenna current is obtained and immediately it should be reduced until the antenna current is about 85% of the maximum value. It is at this stage that it is so essential to check the signal with a monitor or "Growler" in order to observe on which side of resonance the antenna should be detuned in order to obtain the cleanest signal and in order to permit that final polishing of all adjustments which is to mean the difference between a good 1928 and a 1929 performance. The monitor will be indispensable also in deciding upon the connections to the antenna coil. With symmetrical current-feed antenna systems the difference in note with the leads to the antenna coil connected one way or the other usually will not be marked but in the as-

FIG. 2. ANTENNA-TUNING VS. FREQUENCY CURVES FOR THREE VALUES OF ANTENNA COUPLING

In addition to showing a performance similar to that of the low-powered transmitter described last month, these curves provide further indication of the splendid improvement in stability afforded by loose antenna coupling.

the grid and plate inductances for four frequency bands

For the 3500 kc. band, Ap and Ag are the coils used. Ap being 3 1/2" inside diameter and Ag 2 1/4". Bp and Bq serve for the 7000 kc. band. Cq and Cq for 14000 kc. and Dp. Dq for 28000 kc. With the exception of coil Ap the coils are all 2 1/2" inside diameter. The plate coils are of 5/8" outside diameter copper tubing, and the grid coils of 3/8" tubing. All of them were wound by hand on pieces of iron pipe. This procedure is possible, however, only when the tubing is of the "soft drawn" grade.

symmetrical antenna feed systems such as the "Zeppelin," the vertical current-feed antenna or the "antenna-counterpoise" arrangement, many adjustments can be obtained with which one particular connection must be observed. In the transmitter under discussion with the particular antenna used the shrill "d.c." note gives place to a heavily modulated signal just as soon as the feeder connections are reversed.

The more we tune transmitters the more convinced do we become that the amateur transmitter can be tuned about as success-
fully by watching the meters alone as an automobile can be driven in heavy traffic by exclusive observance of the ammeter and card size, 5½" wide x 3¼" high, may go thru the mails, in the United States and its possessions only, with only a 1-cent stamp affixed. When making up your QSL cards have them of the above dimensions (unless you use the government 1-cent card) and you will save 1c on each card. Private mailing cards of other sizes still take 2c each. Add this latest information to the rates already given on page 26 of the July, 1928, issue of QST and save yourself money.

8AA, on his new card, has replaced all the conventional dotted lines with the statement "Believe it or not! Your 'Pure d.c. Crystal control signals' pounded in here R9 on .......................... 19..." That's one more stunt that won't be novel any more.

Undesirous of climbing the high roof of a rickety barn to unlatch his old antenna, and anxious to make room for his new one, 1BZJ hit upon the idea of shooting it down with a "22" rifle. A single shot, it is said, sufficed.

YL—"And what's the furthest place you've ever reached with your radio?"
Ham—(Wondering whether she meant transmitting or receiving.) "Elucidate".
YL—(She must have been a bit dumb.) "Never heard of it."

YL—"And what's the furthest place you've ever reached with your radio?"
Ham—(Wondering whether she meant transmitting or receiving.) "Elucidate".
YL—(She must have been a bit dumb.) "Never heard of it."

6BWS has built a new 5 meter transmitter. The component parts comprise a filament meter, plate meter, grid meter, antenna meter and wavemeter. [We used that this month because we are to talk frequencies from now on.—Editor] Special Despatch to the Toronto Globe. (Extra special we'll say) Quebec—
"Hidden in a shabby street here has been found what is described as the most powerful radio set in America, the machine being in the possession of a 21 year-old Russian. With this set a Russian is said to have been in communication with European Capitals for the last two years. ———— The powerful radio is called a "Kolster Decremeter", and it is the last word in telegraphy and wireless telephony. With this machine, it is stated, Neina has been talking to Paris, Petrograd, Berlin and London every day for several years. What these messages are may lead to startling discoveries."

Why, yes. The "Kolster Decremeter" may yet be the cause of another World War.

Save Postage!

Since July 1 private mailing cards, if they conform to standard government post-
The UX-860
A Screen-Grid Power Tube
By Harold P. Westman, Technical Editor

The long line of radio tubes already available to the amateur and experimenter has recently had a new youngster of rather husky proportions ushered into its midst under the alphabetical-numerical cognomen of the UX-860. It being a “power” tube, there is no “CX” or Cunningham designation involved.

The UX-860 is a screen version of the 852. In cases where the 3.3 µfd. grid-to-plate capacity of the 852 causes trouble, the 860 may be substituted and its reduction of this capacity to a value of .05 µfd. should be very helpful. It is designed primarily for use as a radio frequency amplifier at frequencies greater than 3,000 kcs. The screen-grid does away with the necessity of neutralization although it by no means does away with the need for proper shielding of the external circuits.

While it may be used as an oscillator, it has no particular advantage over the 852 as such nor is it generally suitable for use as a modulator or audio frequency amplifier due to its high plate resistance.

This tube very much resembles the 852 in appearance. It is of the T type in which the plate and grid are supported on separate stems with their leads brought out through separate seals which insure low capacity and high insulation. The filament is supported on a third stem and its leads together with the lead from the screen grid are brought out through another seal. As in the 852, the filament leads terminate in a UX base, the screen-grid being connected to the grid terminal of this base.

A thoriated tungsten filament in the shape of a double helix is supported from a center rod and requires no springs. The plate is cylindrical with six fins or wings to dissipate heat. The screen is of close mesh and is interposed between the control grid and plate. It is as high as the tube and is supported by collars clamped to the filament and grid stems.

The filament should be operated at its rated voltage. Loss of emission may be occasioned by either overloading or underloading the filament. Loss of emission due to reduced filament voltage is due to too low a rate of diffusion of the active material to the surface of the filament. This is materially hastened by the application of abnormal plate voltage and high plate current.

As with the other tubes employing thoriated tungsten filaments, severe overload may cause a decrease in emission. Providing a large amount of gas has not been liberated, the emission may be restored by disconnecting the plate and screen-grid voltages and operating the filament at normal voltage for ten minutes or more. The time required for reactivation may be decreased by raising the filament voltage to 12 volts.

The maximum plate dissipation either as an amplifier or oscillator should never exceed 100 watts. This corresponds to a cherry red color of the plate. Looking at the plate with the filament lighted is apt to be misleading because of the reflection of the light from the filament. It is best to turn the power supply to the tube off and note the plate color.

The screen voltage may be obtained from a separate source or from the plate supply system. The use of a separate source is not only expensive but does not offer as much safety as does the second method. If the plate voltage is removed and the screen voltage maintained, the screen current will increase considerably and overload that element, destroying it perhaps. On the other hand, if the screen voltage is obtained from the plate supply system, any changes in plate voltage will also result in a change in screen voltage and the ratio of the two will remain about the same, thus eliminating this danger.

If a resistance of approximately 100,000 ohms be placed between the positive terminal of the plate supply and the screen, the voltage on the screen will be of a satisfactory value. When using this method of
supply, the filament circuit should not be opened with the plate voltage on or the full plate voltage will be applied to the screen needlessly stressing the seal, etcetera. In all cases, the impedance between the screen and filament must be kept low by means of by-pass condensers. At no time should the screen dissipation exceed 10 watts which as in the case of the plate is indicated by a cherry red coloring.

Under normal operation, a bias of approximately 200 volts should be applied to the control grid. When a leak is substituted for battery bias, its value should be about 10,000 ohms. The value of bias is not critical and variations to suit particular circuit arrangements may be made. Both grid and plate leads are in the form of two conductors which should be twisted together. If only one of these conductors is used, excessive heating at the seal may result.

Some characteristics of the tube are given herewith:

- Filament voltage: 10.
- Filament current: 2.25 amperes.

The following values are obtained with normal plate voltage (2000 volts) zero grid bias and normal screen voltage (500 volts):

- Plate current: 70 milliamperes.
- Plate resistance: 700,000 ohms.
- Mutual conductance: 1.35 milliamperes/volt.
- Amplification factor: 200.

Maximum plate current d.c. 100. mils.
Maximum plate dissipation 100. watts.
Maximum screen dissipation 10. watts.
Nominal screen voltage 500. volts.

The filament voltage current characteristics are the same as for the 852 and are not given here. This curve may be found on page 21 of the May, 1927 issue.

This tube should be of interest to those operating crystal controlled transmitters or other types of oscillator-amplifier circuits at the higher frequencies where feedback is so damaging.

As with all other power transmitting tubes excepting the 852, the 860 may only be obtained directly from the Engineering Products Division, Radio Corporation of America, 250 Broadway, New York City, New York. To save you the trouble of telling us that the 210 and 250 are obtainable through dealers, we should like to point out that these types are now considered as being primarily amplifier tubes for broadcast receivers and not transmitting tubes exclusively.

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**Correction**

An error was made in figure 1 in the article "Some More About the Family" by A. B. Chamberlain which appeared on page 29 of the July issue. The ordinates should be labelled "TU Loss" rather than "TU", thus indicating a loss of high frequency audio energy due to transmission over a bare circuit. This is compensated for by the equalizer which has opposite characteristics.

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**9XL Transmissions**

(Continued from Page 8)

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**DIVISION OF TIME**

3 minutes—QST QST QST nuXL.
3 minutes—5 second dashes broken every half minute to give station call letters.
1 minute—announcement of frequency in megacycles per second (8.75 megacycles is sent as “8r75 MC.”)

If you use these transmissions please send a note to the Experimenter's Section, A.R.R.L., 1711 Park St., Hartford, Conn. —H. P. W.
The Zeppelin

Facts and Figures for the Design of the Hertz Antenna with Two-Wire Voltage Feed

James J. Lamb*

The general principle of the two-wire feeder is as old as the theory of electric waves on wires. The Hertz antenna is as old as the theory of electric oscillations. Therefore this article is founded on ancient history, and anyone interested in digging deeper into the theory and mathematics of the thing may do so by looking up the chapter on electric waves on wires in Fleming's (edition of 1910), or in Pierce's "Electric Oscillations and Electric Waves." The latter, by the way, covers the theory of feeders beautifully.

There are two types of antenna feed in general use among amateurs today, one being what is called "voltage" and the other "current." The names have not as much to do with the feeders themselves, as with the point at which they are connected to the antenna. The voltage feed system is coupled in some manner to the antenna at a voltage antinode (usually at one end) while the current feed type is coupled in some manner to the antenna at a current antinode, usually the center or an odd quarter wave from one end. The feeder systems are themselves of two general types, the first complex in design and suitable for one fixed frequency, the second wonderfully adaptable to amateur use.

The first system is that in which the output impedance matches the impedance of the feeder system thereby preventing wave reflection and standing waves on the feeder wires. The second, is that in which the output terminals are open circuited, there being full reflection and consequently standing waves on the wires. The second, when used as a voltage feeder, is the familiar Zeppelin, and the one in which we are interested.

The conventional case of two parallel wires with their output ends open circuited and with a non-reflective source of high-frequency sinusoidal E.M.F. at the input end is shown in Figure 1. In the case of the two parallel wires used in amateur feed systems (the attenuation being negligible) we shall have maximum amplitude of current at G at a given frequency, (wavelength) when the length L of each of the wires is equivalent to an odd multiple of a quarter wavelength. The current at the ends of the wires will, of course, be zero, and the voltage amplitude a maximum. There will be a phase difference of 90 degrees between the voltage and current at any point on either wire, due to full reflection, and the current at a given point on either wire will be 180 degrees out of phase with current at a similar point on the other wire an equal distance from the source. The field about either wire will therefore cancel that of the other, and little or no electro-magnetic radiation will result.

If a wire equal in length to an even multiple of a quarter wavelength is now added to one side, as shown in Figure 2, the relation of forward to reflected waves remains the same as in the case of Figure 1, but the extension is a linear oscillator in free space, radiates electro-magnetic waves, and becomes an antenna. This is one way of explaining the theory of the two-wire volt-

* See Electrical World, Feb. 1928. The voltage is obtained from

FIG. 1. TWO PARALLEL WIRES WITH THEIR OUTPUT ENDS OPEN CIRCUITED AND INPUT SUPPLIED WITH A HIGH FREQUENCY SINUSOIDAL E.M.F. FROM A NON-REFLECTING SOURCE G. EACH WIRE IS AN ODD MULTIPLE OF ¼ WAVELENGTH LONG

2. Matching the Transmission Line to the Antenna, by Walter Van B. Roberts, QST, Jan. 1928. The voltage and current are practically in phase, there being just sufficient potential difference between the input and output terminals to offset the drop in the line. A neon tube run along the length of such a feeder system should glow with practically constant brilliancy at all points indicating almost constant voltage distribution.

3. When there is a full reflection from the output terminals, the voltage and current are in phase quadrature, or 90 degrees out of phase with each other. Standing waves on the wires accompany reflection and are indicated by points of maximum and minimum voltage and current. The distance between two points of maximum current or voltage is ¼ wavelength and the distance between a point of maximum current and one of maximum voltage is ¼ wavelength. A neon lamp run along the wire will glow with the greatest brilliancy at a voltage antinode and will show no glow at a voltage node.
age feed or Zeppelin antenna. Now that we have the theory, we can tackle the actual design.

There are three essential requirements in the dimensions of a successful “Zepp”, and these are:

1. The feeder system must be such that each wire is equivalent in length to an odd multiple of one quarter of the wavelength being used. In other words, the feeder (both wires as a unit) must be tuned to the fundamental or an odd multiple of the fundamental of the wavelength being used.

2. The antenna must have a length equivalent to an even multiple of one quarter wavelength.

3. The feeder system must be electrically symmetrical.

Since the antenna or radiator is first erected and the feeder system suspended from it, we will now take up its design and construction.

THE LENGTH OF THE ANTENNA

The length of the antenna or radiator for a given frequency will not be the same for all conditions. If it runs close to the

![FIG. 2. WIRE OF LENGTH EQUAL TO AN EVEN MULTIPLE OF 1/4 WAVELENGTH ADDED TO ONE SIDE OF THE SYSTEM](image)

ground, immediately over a tin roof, near a grounded gutter-pipe or lightning rod cable, its natural period (in terms of frequency) will be lower than that of the same antenna in the utopian state known as “free space”. The antenna will not have to be very far “above ground”, however, to become apparently quite free from the loading effect of capacity to ground and the length may therefore be calculated as for a radiator with zero inductive and capacitative loading in free space and later shortened as may be required. The lowest frequency at which an unloaded Hertz antenna may be operated is its fundamental. When so operated it is a “half wave”, or its length is equivalent to one half the wavelength at which it is operated. Therefore, the shortest antenna length we may have is a half wave of the longest wavelength we are to use. The antenna may, of course, be operated at frequencies which are harmonics of the fundamental frequency, or wavelengths which are 1/2, 1/4 or 1/6 of the fundamental wavelength. Let us suppose that we wish to design an antenna to operate on the four amateur bands of 3,500-, 7,000-, 14,000- and 28,000-kc. (80, 40, 20- and 10 meters). The shortest antenna which may be used is a 1/2-wave 80-meter radiator, although it could be made a 1/4-wave 160-meter radiator and operated as a 2/2-wave antenna on 80 meters. One meter is 3.28 feet, and the length of the 1/2-wave 80-meter antenna is therefore $\frac{1}{2} \times 3.28 \times 80$ or 131.2 feet. We make the antenna of this length to start with and later shorten it, if necessary, after giving it a check by the method to be described further on.

Having our radiator now prepared for suspension between heaven and earth, we are ready for the feeders.

DESIGN OF THE FEEDER SYSTEM

As stated before, the feeder system as a whole must be tuned to the fundamental or an odd multiple of the fundamental for the wavelength being used. In other words, the feeder system must be 1/2-wave, 3/2-wave, 5/2-wave etc. The feeder system might be so constructed as to have each feeder wire exactly equivalent to an odd multiple of 1/4-wave in length, allowance being made for the loading effect of the input inductance, but this would be a tedious process and would permit operation on one fixed frequency only. The amateur demands a system which is flexible in adjustment and which permits ready and rapid QSY from one band to another. The solution is, then, to have the system tunable, and moreover tunable in the station itself. This is provided in the two tuning arrangements shown in Figures 3 and 4. The series system is used when the natural wavelength of the feeder system including the antenna inductance is slightly above the fundamental or odd multiple of the fundamental of
the working wave. The parallel tuning arrangement is used when the natural wavelength of the feeder system including antenna inductance is above an even multiple of the working wave but less than an odd multiple. In other words, if the length of the feeder is such that the natural wave length of the feeder system is between $\frac{1}{2}$ and $2/2$ or between $3/2$ and $4/2$ wave etc., the series tuning arrangement is used. If this natural wavelength is between $2/2$ and $3/2$ or between $4/2$ and $5/2$ etc., the parallel arrangement is used. The series arrangement is used when it is possible to go down to the next odd $\frac{1}{2}$ and the parallel when it is desirable to go up to the next odd $\frac{1}{2}$. Figure 5 shows some convenient feeder lengths and the system of tuning most satisfactory for each of the amateur bands.

It is interesting to note that there are some particular lengths which are such that it is impossible to get down to the next odd $\frac{1}{2}$ wave by series tuning and just as impossible to go up by parallel tuning. Care should be taken in putting up the feeders not to hit upon such a length. This situation results when the feeders are of the order of 25 feet in length and it is desired to work on 20 meters. The jump to $\frac{3}{2}$ wave is too much for series tuning. To go to $\frac{2}{2}$ wave puts more than $\frac{1}{2}$ wave in the antenna tank circuit when the parallel arrangement is used, and very little energy transfer from the oscillator output to the feeder input is possible. Increasing the feeder length to 30 feet, however, permits parallel tuning on the 20-meter band while series tuning is used on the 40 meter band.

The lengths specified in the table shown in Figure 5 need not be exactly followed, a variation of a few feet one way or the other being permissible, particularly on the longer feeders.

There is one salient requirement in the feeder construction. It must be symmetrical. Each wire must be exactly the same length as the other. This is particularly important when the system is to be operated on the higher frequencies where a foot is a considerable part of a wavelength, and an apparent slight degree of asymmety would result in a comparatively great asymmetrical voltage and current distribution, causing a loss of a considerable amount of the non-radiating properties desired in the feeders.

The distance by which the wires should be separated is not critical in value, although there is an optimum value. They must be close enough together to give effective cancellation of their respective fields and far enough apart so that minute vibration with respect to each other will not cause proportionate variation in the interwire electro-static capacity of sufficient magnitude to cause, in turn, appreciable variation in the feeder tuning and consequent wobulation of frequency. A value of separation which seems to meet these requirements satisfactorily is 10 to 12 inches.

Since, in most cases, the feeder system is suspended from one end of the antenna itself, all unnecessary weight should be eliminated. This means that the spreaders must be of the lightest obtainable material suitable for the job, and practically puts glass rods, towel bars and the like out of the question. Wooden spreaders in the form of $\frac{1}{4}$-inch dowels boiled in paraffin are quite satisfactory, or ready-treated pieces of "printer's furniture", which may be obtained in $\frac{1}{8}$" by $\frac{1}{8}$" by 3 foot strips from a printers' supply or job printing establishment, may be used. Spacers should be placed about every five feet and rigidly connected to the feeder wires.

The feeders should be made up of wire of the same gauge as that of the antenna wire, because the current at the antinodes in the feeders will be of the same order of value as at the current antinodes in the antenna. Number 12 enameled solid cop-
per wire is quite satisfactory both on this account and also because it possesses sufficient rigidity to prevent its whipping about in the wind as lighter wire would have a tendency to. If possible, the feeders should be supported on the side of the building, ridge-pole or mast at any convenient point by stand-off insulators, as this permits stretching the wires taut and also removes a proportionate amount of the load from the antenna, ropes and guys.

**TUNING THE FEEDER SYSTEM**

Our radiator now swings in the aforesaid free space. The feeder system drops in a more or less graceful catenary to the lead-in bushing and thence to the antenna inductance with its associated tuning device. The transmitter is adjusted to the frequency which we intend to use and is "rarrin to go". But before we can get the desired amount of energy from the output circuit of the transmitter to the antenna, the feeder system must be tuned to do the job.

Take another look at the table of Figure 5, and note the tuning arrangement recommended for the length of feeder we are using at the frequency on which we are to work. Suppose it is the parallel type. Set the feeder tuning condenser at maximum capacity, (250- or 500-ufd). Turn on the filament and plate supply to the transmitter and step on the key. Swing the tuning condenser from maximum down until the antenna ammeter shows signs of life and the plate mills climb up to a satisfactory value. If the input is not sufficient at the point of maximum antenna current, (resonance) tighten the coupling between the feeder input and transmitter output coils, and repeat the tuning process. The feeder tuning condenser should not be so adjusted as to give maximum antenna current and plate input, but should be set at a point off resonance where the antenna current is about 55% of the maximum obtainable. This will give the stable operation, steady frequency and general all-around operating characteristics demanded of the antenna system for 1929 conditions.

If the series tuning arrangement is the one required, the process is the same, both tuning condensers being adjusted from maximum down simultaneously and kept "in step". The frequency should now be checked with a meter, and a slight readjustment made all around if the tuning of the feeder system has unduly upset the adjustment of the transmitter. The two feeder r.f ammeters should now indicate approximately equal values of current. If the difference in the two readings is greater than about 10 percent, the length of our radiator is probably too great, and a process of pruning is in order.

**CHECKING THE LENGTH OF THE ANTENNA**

A short review of the voltage and current distribution in the feeders and antenna under the ideal and abnormal conditions may be in order. Figure 6 illustrates A, the voltage distribution when the length of the antenna is correct for the frequency at which we wish to operate; and B, the voltage distribution when the length of the antenna is too great for the frequency at which we wish to operate. There will always be voltage antinodes (loops) at V, and V₂ of both A and B, as these are the extreme ends of the whole system. This will always be true when there is a state of oscillation. A voltage antinode is also to be desired at a point directly opposite V₁, and this we have at V₃ in A. In B, however, the antenna is too long for the fre-

![FIG. 6. A—Voltage distribution when the length of the antenna is proper for the frequency at which it is being operated. B—Voltage distribution when the length of the antenna is too great for the frequency at which it is being operated by the amount X. Voltages antinodes. (Loops), are indicated by V, current antinodes by C.](image-url)
AM not going to say that ham radio is the bunk, but when you buy a new fifty watt bottle after using a seven and a halffer for a long time and then only get one tenth amp less radiation it doesn't go over like a R 8 report in South Africa. Its all right for these big boys like 6AM and 6HM to throw the cow's husband about radiation don't count for nothing, but that kinda stuff just qsy's over my head. I am one of those kind a guys that try to watch the amp meter move until I almost see it going around in a circle. That no radiation is o.k., but me fer the big swing on the ammeter needle. Which all goes to prove that I was getting mighty disgusted when after buying a fifty I found to my pleasure that I was getting about one amp with a suction of 200 mills. I had only been getting an amp and two wid 80 mills. Boy I was sure disgusted and I don't mean maybe.

When I am sore at my set I usually get out of the shack and walk around. So at this particular occasion I betook myself in the general direction of 6CLT.

"Sa om," I qsoed, "what do you do fer a amp meter that won't budge?"

"What kind you got?" he came back.

"It is a Rollie Smyth but wire," I answers.

"Just set a candle under it," he sez, "and watch her budge. I'll go as far as to bet you get two tenths more."

"Aw. Cut the funny qrm. I just got a fifty and I get a tenth less than I got wid my seven and. I have tried every thing from cutting down the counterpoise to putting a couple thousand on the plate. I even put the R.F. chokes in backwards."

"Well," he comes back, "Budgel seems to get three amps out of his you better try——"

"Sh!" I breaks in, looking out of the window, "will you qso that neat pair of ground connections. We gazed with awe. "Sa, ain't that one hot mama. Here is where I am qrw right now."

I jumps up busts out of the door and continues on my way. The mean YL was about a half a block ahead of me and I aimed to keep that far behind until I found her qrd. About two blocks more and she speaks to a boy friend, and I'll be blessed if it isn't my old friend CBY. A hi does the trick and one minute more and I am qso the boy friend.

"Who in the world is that mama?" I sez. jerking my head in the general direction of the fast disappearing YL. I knew that CBY was hogtied so no danger from any qrm.

"That's Helen," he comes back, "Don't you know her? She lives down in your neighborhood."

"I don't," I returned, "but I sure craves a qsp. Hw abt it?"

"Sure thing," he sez, "I will be over to your house tomorrow when she goes by. Anything to help another ham."

"Gee your anxious," I sed, "do you know her too well or have I been qrming you pretty bad?"

"Neither," he sez, but I was suspicious. Maybe that fifty was making more noise than I thought it was. Maybe 6HM was right after all. Nevertheless he was over to the shack next afternoon, and after he had exhausted every means of getting more radiation without putting in a killowatt, we qsy's to the front porch and the YL comes by. Everything was working to sked so far.

As the YL comes by he puts out a nice eq.

"Hello, Helen," he sez. Miss Helen turns around and we become qso. "Sa," he continues, "I want you to meet my good friend Bill or Annie as he is commonly known."

"Hello, Annie," she sez with a voice that sounds like crystal control. "I am very glad to meet you."

"You not half as glad as I am," I says truthfully. Then an idea pounds in like a ton of bricks, fer the om is abt as slow as a bug wid all the weights off. "Aren't those books awful heavy?"

"Well," she comes back, "they aren't very light."

"Let me carry them for you," I sez, "I was just going down to the store. I just remembered that my ma had asked me to get a can of prunes the day before, and gone after them herself."

She looks me over but I don't crack a smile, and she hands them over.

"Sure sorry you have to go so soon," I sez to CBY and I begins to walk off wid Helen. But I notices a smile around his lips, and so I looked around when we had gone two or three steps and I see him laughing fit to kill. Right off I confirms my suspicions that something is not so good.

(Continued on Page 80)
Synchronism
By C. Francis Jenkins*

Many of those who are receiving our transmissions of radio-movies are having difficulty in rotating their disc in synchronism with the transmitter disc so I should like to make a suggestion.

Your disc is probably already mounted upon a motor shaft and if you have another motor it may be left there. If, however, you have only the one motor, it will be necessary to mount the disc on some other shaft making sure that the bearings are well supported and not loose.

Next, cut from the rubber inner tube of an old automobile tire, a disc about one-fourth the diameter of your scanning disc. For a 48-hole, 12-inch disc, a 3-inch rubber disc will be about right. Put this disc between a pair of 2-inch diameter flanges that are to be mounted on the motor shaft.

The motor should then be mounted on a board that can slide between guide strips on the platform that holds the scanning disc. The position of the motor should be such that in the ease of a 1725 r.p.m. machine to drive a disc at 900 r.p.m., the friction wheel should touch the disc at a point about three inches from the center. Now, by means of a screw adjustment, the position of the motor board may be shifted so the correct speed is obtained. As the friction disc approaches the center of the scanning disc, the speed of the scanning disc will increase.

It is not advisable to use more than two friction discs cut from the average thickness of inner tubes and in most cases, one thickness will be best. Although the disc will chatter a bit at starting, it will be found quite simple to obtain and hold synchronism after the disc is up to its running speed.

Don’t use a rheostat in the driving motor circuit to control its speed; let it run at the speed for which it was designed as this will result in greater constancy. Most any size of motor will do providing it is not too small; a 1/20th, 1/16th or 1/8th horsepower motor revolving at about 1725 r.p.m. will work well with scanning discs up to 12 or 15 inches in diameter.

Radio Set Tester

In this day when the average radio receiver is operated from a variety of sources, employs tubes that differ widely in their characteristics and circuit arrangements that are vastly more complex than one would have thought practical a few years ago, the lot of the trouble shooter or repair man is certainly not one that is envied by many. Upon him devolves the problem of keeping the ultimate consumer happy and content with his purchase, for even the best of sets fall heir to ills most of which are minor but many of which have possibilities of developing into problems of major importance. What is more valuable for the repair man than test equipment which will allow him to put a set through its paces in the shortest amount of time? The diagnosing of trouble should be but incidental to the correcting of it.

The instrument shown in the illustration is a versatile device that may be used to check almost all parts of any modern receiver without the use of a great deal of thought or time on the part of the operator. It is equipped to measure direct voltages as high as 600 or less than a volt, regardless of whether they are obtained from...
Remodeling the Traffic Tuner for 1929

Opening up the scale of the Autodyne not only for this year but for next year's conditions

By Harold P. Westman, Technical Editor.

It should perhaps be stated at the outset that the receiver to be described is not the result of the organized "Technical Development Program" that is being prosecuted by the League. It is merely my own opinions as to some receiver characteristics that should be desirable for operation primarily in 1929 but with a thought towards making the set satisfactory for the remainder of this year. When the transition occurs, a comparatively small amount of work will allow the tuning ranges to be modified to meet the newer conditions.

We are at present doing practically all of our communicating within three bands: the 3500-7000 and 14000-kc. bands in which there are a total of 3500 kilocycles. What is left of these in 1929 will encompass but 1200 kilocycles and it behooves us to use all the territory open to us. Our 1750-kc. band will contain 185 kilocycles and while transmission over large distances when employing low-powered transmitters is not as good there as it is in the 3500-kc. region, it should be very satisfactory for distances not in excess of 250 miles or so. Traffic networks, where the distance between stations is small, could be established there and the reduction in the amount of interference encountered should help considerably in getting traffic through. Any receiver suitable for 1929 should, then, be capable of covering the 1750-kc. band as well as the other three more popular ones.

Our new 28000-kc. band has offered some possibilities, in that communication over comparatively short distances has been established. We would be very foolish not to make extensive tests to determine just how effective these frequencies are for our purposes. This gives us five bands that must be covered if we are to make ready for 1929 conditions. While it would be nice to cover the 1750-kc. band, this does not seem to be thoroughly practical from a constructional point of view, and it would seem best to build a separate receiver (probably of the double-detection type) for this band.

The simplest method of constructing a receiver to cover all five bands would be to use a size of condenser that allowed that band to be covered which required the largest capacity range and let the other ranges fall where they may. However, there was described in the April, 1927, issue of QST, under the heading of "A Traffic Tuner," a receiver that spread each band over practically the entire tuning dial scale. After handling such a set one simply hates to go back to receivers which resemble a New York subway. The subway gives you lots of space between trains but precious little within them; so does the average set treat the amateur bands.

As the name implies, the "Traffic Tuner" was primarily devised for the benefit of the traffic handler who must be capable of making and keeping schedules even though conditions be poor. This requires a set that spreads the particular band in which operation is desirable over a large portion of the tuning dial so that tuning, even with a comparatively fast motion dial which allows the band to be searched quickly will not be abrupt and critical. In the second place, the regeneration control must not have too great an effect upon the tuning. Thirdly, it should be possible to log signals and assuming that the signal frequency has not been changed to be able to go back and pick them up without wasting too much time. Sensitivity and stability must, of course, not be sacrificed.

A receiver built with these points in mind might answer many of our 1929 troubles and if it didn't, it would at least give us a start towards meeting them. That in itself is well worthwhile.

The older tuner employed a conventional type of tuning condenser which goes from minimum to maximum capacitance with a rotation of 180 degrees. In this one, a National "equicycle" condenser which is rotated...
270 degrees to cover its range is used. A gain of 50% in dial space results.

The capacity change needed to cover the 1750-ke. band as indicated by the tables in the Handbook is several times that required to cover its range is used. A gain of 50% in dial space results.

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the circuit permanently while the larger section will be connected across it for the 1750-kc. band. A switch could be constructed for this change but would probably result in mechanical difficulties. To simplify matters, a piece of flexible wire was connected to the larger section stator plate and the clip on its end may be snapped onto the machine screw supporting the stator plate of the smaller section or onto the frame of the condenser thus grounding the larger section when it is not in use. It makes a workable and practical arrangement involving the use of no great amount of mechanical ability or equipment as might a more beautiful appearing switch. There is no need for its being operable from the front of the panel because it will need to be shifted only when it is desired to receive signal strength. What is more important, it helps on the signal noise ration. A large tuning condenser is used and the coil should be of such dimensions that the antenna circuit will tune over the 1750-kc. band. Harmonic tuning will be employed for the higher frequency bands and the coil will not have to be changed for them. No switching arrangement has been provided for disconnecting the tuning circuit other than the use of an extra binding post. If such is desired, it may be installed without a great deal of trouble. If a very long antenna is used, the tuning coil and condenser may be connected in series by connecting the coil across the two antenna binding posts.

The antenna coupling condenser consists of two small brass plates. One is somewhat larger than the other (it happened to be available and was not cut down) and the smaller is approximately \( \frac{1}{4} \) inch square and is soldered to a piece of heavy bus bent in the form of a "U", the sides of which pass under the head of a binding post. Spacing up to an inch and a quarter may be had. Coupling should be made loose and the two stage audio amplifier relied upon for obtaining good signal strength. The looser the coupling the less effect will the antenna tuning have upon the calibration of the tuning dial and the less need there will be for using the regeneration control. The coils are wound on Pilot forms, one of which is shown next to the tuning condenser. When using such small tuning capacities, one really begins to appreciate the tuning effect the tickler coil has upon the circuit. In the 14,000-and 28,000-kc. bands, it is possible to shift the tuning very materially by changing the number of tickler turns by one, this with tickler coils of No. 30 s.s.c. wire. The tickler seems to give the smallest effect on loading the secondary circuit and detuning it when the least number of turns is employed. The coils were wound about \( \frac{1}{4} \) of an inch below the filament end of the secondary winding and the turns reduced one at a time until the circuit would not oscillate over the entire range of the tuning condenser. After the minimum number of turns was obtained,
the winding was shifted away from the secondary until the loosest coupling was obtained without causing the regeneration control to become cranky and irregular. The result is a smooth control of regeneration with very slight detuning effect. The use of a large coil with looser coupling causes greater detuning.

The use of a 2000-μuf. by-pass condenser between the battery side of the tickler coil and filament helps materially in the problem of regeneration. A small condenser in this position makes it necessary to increase the size of the tickler coil with its accompanying troubles. As the size of the by-pass condenser is increased, it tends to bypass more of the higher audio frequencies because it is in shunt of the primary of the audio transformer. While this may be damaging to quality in a broadcast receiver, it can be considered as an assistance in a set for receiving telegraph signals in that it tends to reduce the hissy background. It has little or no effect upon signals in the lower audio range to which they are usually heterodyned.

Dry cell tubes of the '99 type are used. Since they have been equipped with long terminal prongs that make decent contact, they are not half so troublesome and are first rate as oscillating detectors for high frequency work. Fringe howl has been cured as usual by shunting a .1 or .25 meg leak across the secondary of the first audio transformer. The transformers are designed for music and so we are not discriminating against a large percentage of the signals on the air. Separate B leads are provided for the two audio amplifying tubes so that on nights when the static is very bad, the plate voltage to the first amplifier tube may be dropped to a volt or two and thus by its limiting action, one to one ratio between the signal and static can be obtained. This is a stunt that has been mentioned before in QST and was recently suggested again by Paul G. Watson of West Chester, Pa. The phone cords do not come to the panel at all and, therefore, won't always be getting in the way.

Coil sizes are as follows:

The 6879-8000-kc. and the 11760-13640-kc. ranges are obtained with the shunt capacity in the circuit while the other ranges with the same coils are obtained without the shunt condenser. The value of this condenser is determined by shunting it across the tuning condenser and increasing its capacity until when with the tuning condenser at about 10 degrees, the frequency is slightly below that obtained when there is no shunt and the tuning condenser is set at 150 degrees. It would, perhaps, better be adjusted with the 14000-kc. coil which band is covered without the shunt capacitance in the circuit.

The secondary coils are wound with No. 213 d. c. c. wire excepting in the case of the 1750-kc. coil which is wound with No. 16 d. c. which is used for the tickler coils. The ticklers are close wound and are spaced about \( \frac{1}{8} \)" from the filament end of the secondary windings. The 1750- and 3500-kc. coils are close wound while the spacing between turns of the 7000- and 14000-kc. coils is the diameter of the wire used. In the case of the 28000-kc. coil, it was found necessary to wind the secondary coil with about \( \frac{1}{8} \)" spacing between turns and then wind the tickler coil between the turns. If the tickler were wound below the secondary in the usual fashion, it would probably call for at least two or three more turns which would require that the number of secondary turns be reduced still further.

Fig. 2. gives a typical tuning curve. It happens to he for the 3500-kc. hand but is similar for the other range. The thing to be pointed out is that the number of divisions of dial space to cover a band

(Continued on Page 68)
WASHINGTON DEVELOPMENTS

Commercial Assignments in Our Bands; Amateur Calls Changed; Amateur Extra First Class Operator's License Restored.

We have previously mentioned in OST that 21 channels between 7300 and 8000 kc. (part of our present "40-meter" band) and 27 channels between 14000 and 14400 kc. (in our present "20-meter" band) have been assigned to commercial interests by our Federal Radio Commission, because these will not be amateur frequencies after January first and because United States stations will not get the use of them if they do not start now. Construction permits have been issued for the use of many of these channels and it is now expected that many of the stations will be in operation before the end of the year. This applies particularly to the Radio Corporation group. R.C.A. channels on which operation prior to January 1st is likely are: 7400, 7415, 7520, 7715, 14800, 14830, 14920, 15040, 15430, 15460, 15490, 15970 and 16000 kc. As these stations one by one come on the air we shall find our operating territory gradually reduced, but by the same token the foreign commercial stations now operating in the ranges 7000-7300 and 14000-14400 kc. will be moving out, for they must be clear of our 1929 bands by the first of the year.

NEW AMATEUR CALLS

As anticipated in our August issue, page 35, the Radio Division of the Department of Commerce announces that, effective October 1, 1928, all amateur, experimental and training school stations are changed by prefixing the existing call with a letter to indicate nationality, as required by the Washington Convention. The prefix for stations in continental United States is "W", while for those in distant territories and possessions it is "K", to permit distinguishing them from continental calls of the same district. Quoting from the Radio Service Bulletin for June 30th:

While the requirements of the convention are not actually effective until January 1, 1929, it has been deemed advisable to change the call signals effective October 1, next, as the Division desires to show the new signals in the annual list of Amateur Radio Stations of the United States, edition June 30, 1928, rather than to change the calls effective January 1, 1929, and publish the new calls in the June 30, 1929, edition.

Therefore, beginning that date, all stations in the classes above named within the continental limits of the United States are hereby ordered to add to their call signals the letter "W", and those in Alaska, Hawaii, Porto Rico and the Virgin Islands should add the letter "K". These letters should precede the call signal; for example, station 4ABC, if within the continental limits of this country, becomes W4ABC and, if in Porto Rico, becomes K4ABC.

It is important to note that the prefixes "W" and "K" are not to be used before October first. On that date, however, their use commences with the old intermediate "de" and the abandonment of "nu".


Aside from the fact that Canada is going to use the letters "VE", we have no reliable information on the prefixes that other countries will use for their amateur calls. As it does not seem likely that we will have a complete list before the year is out, we have printed below the international table of allocation of call signals from the Washington Convention. Nations are obliged to select some letter or letters from their assignment to use as a prefix to amateur calls, but we can not tell at this date what they will be. Where a nation is given all combinations beginning with a given letter, as in the case of "W" for the United States, that single letter will suffice; but where a letter is partitioned amongst several countries, like "Z", two letters will be necessary. One cannot say to-day, for example, whether New Zealand amateurs will use the prefix "ZK", "ZL" or "ZM". This list, therefore, is of no aid in making calls but will be helpful in determining the identity of calls heard.

Chile ............................................. CAA-CEZ
Canada .......................................... CEA-CNZ
Cuba .............................................. CIA-CMZ
 Morocco ......................................... CNA-CNZ
Bolivia ............................................ CPA-CPZ
Portuguese colonies .......................... CRA-CQZ
Portugal ........................................... CSA-CUZ
Roumania ........................................ CVA-CVZ
Uruguay ........................................... CVB-CVZ
Puerto Rico ...................................... CVA-CXZ

germany ......................................... CZA-CZZ
Spain .............................................. EAA-EBZ

Irish Free State .................................. EIA-ELZ
Liberia ........................................... EIA-ELZ

Estonias ......................................... ESA-ESZ
Ethiopia .......................................... ETA-ETZ

France and colonies and protectorates .......
Great Britain ................................... G

Hungary ......................................... HAA-HAZ
Switzerland ...................................... HBA-HBZ

Sweden .......................................... HCA-HCZ

Ecuador .......................................... HRA-HNZ

Republic of Haiti .............................. HRA-HNZ
Dominican Republic ........................... HRA-HNZ

Republic of Colombia ........................ HNJ-HKZ

Republic of Honduras ........................ HRA-HNZ
Bolivia .......................................... HSA-HSZ
Italy and colonies ......................

Japan ............................................. J

United States of America ..................... K

Norway ............................................. N

Argentina Republic ............................ N

LOA-LVZ
Attention is here called to the kind restoration, by the Radio Division, of the Extra First Class Amateur Operator License. All Supervisors of Radio are now prepared to issue this license. For further particulars our editorial this month should be consulted.

TELEVISION FREQUENCIES

It is expected that a generation order will issue from the Federal Radio Commission in the very near future, authorizing amateurs to experiment with picture transmission and television transmission within the frequency bands 1715-2000 kc. and 59,000-60,000 kc. (the “160-meter” and “5-meter” bands) but within these two bands only. This has no reference to the frequencies used by broadcasting and experimental stations for popular consumption, but refers only to transmissions by amateurs themselves.

THE GOVERNMENT CALL BOOK

Amateurs are not adequately supporting the very splendid call book, List of Amateur Stations of the United States, published annually by the government for the modest sum of twenty-five cents. Only about 6,000 copies are sold annually. With 17,000 amateurs in this country there should be bigger support. It costs the Radio Division over $3,000 of their appropriation to have this list made available for popular sale, and unless there is more evidence that the list is in demand the Division may discontinue its publication.

The book will appear in September or October and will be complete to June 30th. It is accurate, and it deserves our support. The Radio Division having paid the entire cost of composition, the 25c charge represents only the cost of paper and handling. Orders should be addressed to the Superintendent of Documents, Government Printing Office, Washington, and remember that stamps aren’t accepted. Last year some purchasers were erroneously advised that the supply was exhausted and their money was returned, but this year we are assured of an ample supply.

CHANGES IN ALABAMA

On July 1st the Radio Division, for administrative convenience, transferred the state of Alabama from the Fifth District to the Fourth District, under Major Van Nostrand at Atlanta. This necessitated the changing of Alabama amateur calls from 6s to 4s. Applications were sent all amateurs early in June and 4th-district licenses, dated July 1, were issued as fast as applications came in, so that those who responded promptly will be correctly listed in the June-30th issue of the government call book. In many cases the same combinations of call letters were given the stations; in other cases two- or three-letter calls were given them according to what they had while in the Fifth District. Major Van Nostrand kindly supplies us with the following list of Fourth District calls in Alabama to July 9th:

<table>
<thead>
<tr>
<th>Call Letters</th>
<th>City, State</th>
</tr>
</thead>
<tbody>
<tr>
<td>W4GP</td>
<td>John Meenan</td>
</tr>
<tr>
<td>W4AHN</td>
<td>Paul Brake</td>
</tr>
<tr>
<td>W4AHO</td>
<td>Victor V. Storv</td>
</tr>
<tr>
<td>W4AIN</td>
<td>John L. Cauthen</td>
</tr>
<tr>
<td>W4JB</td>
<td>Cecil L. Thomas</td>
</tr>
<tr>
<td>W4AHJ</td>
<td>Basil Payne</td>
</tr>
<tr>
<td>W4AHT</td>
<td>Harry D. Carl, jr.</td>
</tr>
<tr>
<td>W4AHW</td>
<td>Francis M. Greene</td>
</tr>
<tr>
<td>W4AHX</td>
<td>Elmer McCurdy Prather</td>
</tr>
</tbody>
</table>
SUPERVISOR KOLSTER COMMENDS US

In the annual report of the Supervisor, First District, to the Radio Division, Supervisor of Radio Kolster comments as follows under the subject of "Interference":

"I wish to bring to the attention of the Division the splendid cooperation extended to this office by the amateurs who volunteered their services in connection with this investigation work."

We're proud of that.

CAPTAIN HOOPER NOW D. N. G.

Captain S. C. Hooper, in charge of the radio section, Bureau of Engineering, U. S. Navy, and lately assigned as Technical Advisor to the Federal Radio Commission, has been appointed Director of Naval Communications at Washington, relieving Capt. Thos. T. Craven, who has been promoted to Rear Admiral and transferred, we believe, to sea duty. Like Admiral Craven before him, Capt. Hooper is a splendid friend of this department. He has known us longer than any of his predecessors in that office. Although known to amateurs as one of the joint revisors of the well-known Robinson's Manual, he must be best known as one of our most helpful friends at the Washington international conference—see January QST. Our congratulations and best wishes to both officers!

—K. B. W.

If you substitute for the crystal a wave-meter or any tuned circuit, tuned to the same wavelength as the crystal, during the "tuning up" process, you will not be so apt to have a crystal "transmitter" and a broken crystal when it comes time to work the set. After all the preliminary adjustments have been made, the crystal can be put back in the circuit.—30KL

A description of their line of uniform-size meters for transmitters, and some dope on the uses of various meters, is in the Weston Electrical Instrument Corp. new circular J. Better get one.
THE members of the Experimenters' Section, together with the rest of the amateur fraternity, are faced with the big problem of meeting the more or less drastic change in operating conditions which the inauguration of the provisions of the International Radio Conference of 1927 will bring upon us January first of next year. We have never been licked by frequency restrictions before, and we are not going to be licked this time. It is quite obviously not only expedient but also necessary that the body of experimenting amateurs concentrate their activities on the technical phase of preparing to cope with the not far away situation, and that the Experimenters' Section as the organized body of these experimenting amateurs tackle those technical problems bearing most directly on the approaching situation.

CONCENTRATING ON PROBLEMS TO MEET 1929 CONDITIONS

With this viewpoint in mind the list of X Section problems has been somewhat modified. While most of the old problems have been retained, the scope of several has been enlarged and several new problems have been added. Four problems have, for self-evident reasons, been eliminated. The present list of problems is as follows:

THE ANTENNA CIRCUIT

A10-Antennas and feeder systems.
A12-Loop transmission and reception.
A13-Underground antennas.

RECEPTION

R12-Radio frequency amplifiers for amateur bands.
R13-Methods of obtaining audio frequency selectivity.

TRANSMISSION

T25-Radio frequency chokes for transmitters.
T26-Keying methods.
T27-Transmission and reception on 28,000 Kc. (10 meter) band including antenna systems.
T30-Transmission and reception on frequencies above 56,000 Kc., (wavelengths below 5.357 meters).
T33-Constant frequency transmitters.

Glancing over the list, it is seen that A10 has been enlarged to specifically include feeder systems, while A12 and A13 are as before. Receiving problem R12, while specifically mentioning radio frequency amplifiers, actually encompasses every type of receiver including the superheterodyne. R13 is a new addition, and one which is undoubtedly to prove of great value in adapting receivers to 1929 conditions.

The transmitting problems T25 and T26 are unchanged, while old problem T27, having outlived its usefulness, has been replaced by new problem T27 made necessary by opening of the 28,000 kc. band. T28, portable Transmitters, has proven more the question of mechanical design in adapting a low power transmitter for portable use than a real experimental problem, and has therefore been eliminated. T30 and T31 have been combined as T30, while T32 has been enlarged to include all constant frequency transmitters as T33. General problems G12 and G13 are so obviously general in their nature and remote from the big problem before the amateur at this time that they have been eliminated.

Due to the wide scope of each problem and the desirability of having each experimenter concentrate to the greatest possible extent on the problems he may select, not more than TWO problems are to be chosen from the list by each member.

If at some future time, however, the experimenter should decide to substitute a different problem for one first chosen, he may do so by writing Headquarters, advising the change.

Experimenters at present enrolled for problems which have been discontinued on the new list should not drop their activities on these problems, but should continue to a conclusion and report on these problems as usual.

Outlines suggesting a method or methods of attack on the problems as well as a list of references of material are being prepared for each problem and will be sent to members enrolled for the respective problems as soon as the preparation is completed.

There is work to be done by every experimenting amateur now as never before, and new members for the Experimenters' Section are needed and wanted. All desiring to be enrolled should do so at once—just address the Experimenters' Section, American Radio Relay League, 1711 Park St., Hartford, Conn., and state that you wish to join the X Section.

-J. J. L.
Mica Condensers For High Frequency
By Arthur M. Trogner*

A recent article in QST gave some explanation of the necessity for symmetrical arrangement of condenser units when used in parallel in high frequency transmitting circuits. This is no new conception or principle, but, like a lot of other fundamental rules it is of such small moment in intermediate and low frequency circuits that it can usually be neglected there. In the high frequency field the effects of a neglect of this principle of symmetry will not be pleasant unless your pocket-book is well lined and you delight in making business for the small condenser makers.

What is meant by this symmetry can best be explained by first showing what not to do and why. Fig. 1 shows several common methods of connecting small fixed condenser units in parallel when greater current carrying ability, greater capacity, or both are desired. It is obvious that the paths from “A” to “B” in 1 (a) are not the same length through both condensers. From your own work with high frequencies you know what an appreciable difference in inductive reactance such small differences in physical circuit length may mean. This difference in inductive reactance will force most of the current to flow through the lower reactance path and very probably burn out that condenser. In the figures the different thicknesses of the dotted lines indicate (very approximately only) the proportion of the total current which will flow through each condenser in the various arrangements. If you are counting on using nearly the full current carrying capacity of each condenser in the combination, it is easy to see that burnt-out condensers will be the result. Adding more condensers in parallel such as 1 (b) and 1 (c) even though the physical lengths of the separate paths may be the same will not cure the trouble to any appreciable degree since the outside condensers will still carry most of the current for the same reason that high frequency currents are crowded to the surface of a conductor on which they are traveling. The inside condensers, or the inside of the wire, are paths of higher inductive reactance than the outside and radio frequency currents always travel in the path of least inductance even though this results in higher circuit resistance. Another example of this is shown in Fig. 2 which shows roughly the character of the current distribution in the conductor of a coil carrying high frequency current. The current is crowded to the inside surface of the wires since the outer surface of the turns, being cut by more lines of force, has a higher inductive reactance. This will be easy to see if you remember that the inner surfaces are cut by the flux which is inside the coil, whereas the outer surfaces are cut by this same flux plus the flux which distributes itself between the inner and outside surfaces of the wire. (See Morecroft, Principles of Radio Communication, page 125 first edition or page 156, second edition.)

This is one reason why coils wound with flat copper strip are so effective for high frequency work; there is not a lot of useless copper on the outside of each turn to cause eddy current losses.

This leads us to the right way to connect condensers in parallel. Put each condenser unit in a path of equal inductance. This is shown in Fig. 3 for various combinations. We have tried this out and know that it is worthwhile every time. With such arrangements, each condenser will carry its share of the load. Of course, each condenser in any parallel combination should be at least of the same rated capacity otherwise the difference in capacitive reactance thus formed will cause more current to flow through the larger capacities and might overload them. It might be well to point out here that the usual difficulty with condensers at these high frequencies is not voltage breakdown but heating and failure of the dielectric.

In Fig. 4 is shown detail dimensions of standard parts which have been found very useful here at the Laboratory. These parts provide for 4 units in parallel and by using the ring fittings shown, such parallel units can be readily arranged with 2 or more sections in series where needed to take care of high plate voltages, and the like. Fitting of similar construction are employed to mount six condensers in parallel.

It might be well to add a few words about choosing the proper kind of condenser units to use. One of the benefits to "Hamdom" from the coming of the BCL is the improvement in many radio parts available on the market. Among these are greatly improved small mica condensers. Originally intended mainly for use in receivers, it has been found that the better types, constructed of the best materials to rigid standards, are just the thing for use in high frequency transmitters. Notice that I did not say that all small mica condensers are good for transmitter work.
There are many makes of condensers on the market which are all right for use in receivers, but which will not stand up under the severe loads found in transmitters. The difficulty with most condensers of this type is that their internal losses are too high. Often this is true only when the condenser is passing appreciable currents which accounts for the fact that such condensers may be considered low-loss units for receivers and yet fail in transmitter use.

A suggested set of rough specifications is given below. The units should be entirely enclosed to prevent accumulation of dust and moisture across and between the edges of the mica sheets. A complete water-tight enclosure is to be preferred since only a slight amount of moisture may cause a rapid rise in losses. Condensers should be capable of carrying the currents specified in the table below without exceeding an ultimate temperature rise of 10° C above surrounding temperature.

<table>
<thead>
<tr>
<th>Capacity</th>
<th>R. F. amps. at 6000 Kcs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>.0002 to .0003 mfd.</td>
<td>3 amps.</td>
</tr>
<tr>
<td>.0006 to .0009 mfd.</td>
<td>4 amps.</td>
</tr>
<tr>
<td>.001 mfd. and larger</td>
<td>5 amps.</td>
</tr>
</tbody>
</table>

ELECTION NOTICES

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

1. You are hereby notified that an election for an A.R.R.L. Director, for the term 1929-1930, is about to be held in each of the above Divisions, in accordance with the Constitution. Your attention is invited to Sec. 1 of Article IV of the Constitution, providing for the government of A.R.R.L. affairs by a Board of Directors; Sec. 2 of Article IV, defining their eligibility; and By-Laws, 14, 15, 16 and 17, providing for their nomination and election.

2. The election will take place during the month of November, 1928, on ballots which will be mailed from Headquarters in the first week of that month. The ballots for each Division will list the names of all eligible candidates nominated for the position by A.R.R.L. members residing in that Division.

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

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

Gentlemen:
We, the undersigned members of the A.R.R.L. residing in the ............... Division, hereby nominate ............... of ............... as a candidate for Director from this Division for 1929-1930.

(Signatures)

The signers must be League members in good standing. The nominee must be a League member in good standing and must be without commercial radio connections. His complete name and address should be given. All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the first day of November, 1928. There is no limit on the number of petitions that may be filed, but no member shall append his signature to more than one such petition.

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

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

For the Board of Directors:

K. B. WARNER, Secretary.
Hartford, Conn., 1 September, 1928.

Reports have been circulating in amateur radio that the UV-203-A 50-watt tube is no longer available. The rumor is untrue. The tube is still available, but must be ordered direct from the R.C.A. in New York. Only the UX-852 and the UX-210 are available from dealers. All the other transmitting tubes are sold under a sales agreement through the Engineering Products Division, Radio Corporation of America, 233 Broadway, New York. Requests for information on, and orders for all transmitting and power rectifying tubes other than the 852 and the 210 should be addressed to that division.
As this report is being written, a number of replies have come in from Presidents of National Sections regarding the vote on the proposed new Constitution. It appears, so far, that the objections cited to the first proposal have been satisfactorily taken care of in the second proposal; we hope and believe that the new Constitution can be reported on as being adopted, in the next issue of QST. In addition to the QST notice, of course, more detailed written reports will be mailed promptly to all Section officers.

The editor of this department again wishes to urge upon the presidents and secretaries of all National Sections that they send in regularly each month some kind of a report for their respective sections. During the Summer it was to be expected that reports would fall off somewhat, but with the Fall approaching, there should begin a greater interest in amateur radio. See to it that your country is represented in this section of the magazine each month by sending in a short report to reach Union Headquarters not later than the 25th of each month.

Information is particularly requested from foreign countries regarding the attitude of their governments toward the new amateur wavebands. We want to know as soon as possible how much of these bands is going to be made available to you, what powers will be allowed, intermediates designated, etc. Please advise this office promptly when such information becomes definitely known.

ACTIVITY IN THE AZORES

In a letter to the I.A.R.U. editor, Mr. M. S. Killen, Hon. Sec'y, of the Western Union Radio Club, Horta, Fayal, Azores, states:

"Our club station, ep3MK, works on 45 meters, 80 watts input to a Hartley oscillator. Our club has just commenced working, but there is much interest, and we have already made contact with nu2UN and nu2NV. We want to let all NT stations know that we are anxious to QSO them."

BELGIUM

According to a letter from Mr. Paul de Neck, President of the Reseau Belge (Belgian I.A.R.U. Section) there has not been so much activity for the beginning of the summer due to the influx of a great many new members, all young in the noble art of transmitting, and a period of motoring, football, etc., on the part of the old-timers. His report, which follows, shows an encouraging amount of amateur work, however:

"eb4AU recently worked a Japanese unlicensed station on 20 meters, making the first EB-AJ contact. He also worked a Canadian ship anchored in Papeete harbor (Tahiti) and reports a QSO with VPG, a British station at Accra, on the Gold Coast of Africa.

"eb4FT, on regular schedule, worked a French ship bound for the West African coast practically every night up to the arrival of the ship at Port Gentil, in the Gabon, its port of destination."

"eb4AR is particularly interested in going after ships, and works lots of them.

"eb4OU, on 45 meters, puts out phone over the whole of Europe, with 100% readability, and recently received a report from Siberia commenting on the excellence of his phone quality. He is using a Belgian ham circuit, called the 'circuit Van Gasse', and with 45 watts input is one of the best phones in Europe.

"eb4FT has just informed us that he worked a new official short-wave station skVPC, on 32 meters. The QRA: Port Stanley, Falkland Islands.

—Paul de Neck, President, Reseau Belge."

CHILE

nu5APG, K. M. Ehret, at Oklahoma City, reports a recent QSO with that well-known Chilean station sc2AS, in which the latter stated that he was starting a new business further south and would definitely be off the air with the old set for at least two years, there being no electricity available at the new location. 2AS stated, however, (Continued on Page 62)
Luis Greco Lorena, Calle Habana 7A, alta, Santiago de Cuba, Cuba

(Heard during June)

I saw an amazing land and left it later. I saw the lighthouse standing tall on the beach, but the weather was not suitable for further exploration.

(40 meters)

(Continued on Page 2)

(40 meters)

(Continued on Page 2)
For Next Year

136 High St.,
Exeter, N. H.

Editor, QST:

What is to be done about it? Must the name of QST be changed after January 1st next? It is to be noted that "QST" is not included in the list of "Q" signals adopted by the Washington Convention and apparently "CC!" is to take its place (Article 9 bis, Par. 3). Won't the CQ hounds laugh if our magazine must be called "CQ"?

Seriously, though, I hope that an article will soon be forthcoming dealing with the changes in operating procedure which must be made in accordance with the Convention. Much has been said about the new wavelengths, but very little about the other ways in which amateur operation will be affected. Of course most of the regulations apply to commercial work, but it would seem that, for the sake of uniformity, the amateurs should conform to them as far as possible.

For example, I don't suppose that the amateurs are bound to use the new set of audibility signals ("R" signals), running from 1 to 5, but it seems to me that they should do so, especially as I think that the new ones are better than the present ones running up to 9.

The new list of "Q" signals certainly looks different from the old one. It will take some time to get used to QRZ meaning "You are being called by"; QRV "Send a series of V's"; QSR "The distress call received from—has been attended to by—"; etc. It is amusing to note, among the numerous miscellaneous abbreviations which have been authorized, that "OK" is officially recognized, meaning, "We are in agreement."

Probably the owners of amateur phones will have little occasion to send out SOS's, although perhaps some of them ought to do so, but they may wonder why the official radiophone distress call is "Mayday," until it is understood that this stands for the French "m'aider".

I am wondering if the amateurs will adopt "CM" for Yes and "NM" for No, or if such expressions as "Yep" will continue to hold their own. Do you think there would be any advantage in trying to establish a set of abbreviations especially suited to amateur use, just as the commercials have their "Z" signals? These might be special "Q's", although there would be a disadvantage in mixing the official with the unofficial. We already have "73," so how about extending this plan? Thus, for example "71", might mean "Please send card" etc ad infinitum. A rather lengthy list might serve in emergencies, as for instance, when operators do not speak each other's language, but I am not enough of a DX man to speak with authority on such matters.

I am glad to see that national prefixes, rather than intermediates, are to be used hereafter. I have never cared for the intermediate plan and I guess we have all had the experience of listening to a long string of calls, only to find that the all-important intermediate was given carelessly or was lost in QRM or QSS. The prefixes ought to go far towards making station identification easier.

Into what class do amateur stations fall? They are "fixed" in that they are "permanently located and communicating with one or more stations similarly located," but in most ways their operation (except when working on schedule) seems to be more of the nature of that of mobile stations, as referred to in the Convention. Probably this is a matter of no importance, however.

I am sure that an article in QST on some of the points mentioned would be of interest to many of us.

—H. S. Shaw, JRZ.

The reader is referred to the Editorial pages of this issue.—Editor.

The “Splatter System”

[In which Dr. Hulburt, of Taylor and Hulburt fame, comments on the possibilities or impossibilities of the “Warner Splatter System.”—Editor.]

Naval Research Laboratory,
Anacostia, D. C.

Editor, QST:

In QST for July 1928, page 7, I read your captivating suggestion of the “Warner Splatter System” for the use of the 30 megacycle (10 meter) waves. This system, based on Meismer’s 80-degree angle long distance experiment, contemplates directing these waves more or less vertically upward with the idea that they be splashed down from the skyward regions. From the descriptions which I have read about the overhead regions I wonder whether the wire-
Millions of dollars are invested in radio chargers, eliminators, etc., which would be lost if it were not possible to replace the rectifying units when their life has been exhausted. All Elkron Rectifiers are replaceable.

**HOW TO TELL IF YOUR RECTIFIER NEEDS REPLACING?**

If your trickle charger no longer keeps your storage battery up the way it did when it was new, you need a new rectifier.

If your set has not the same pep as it did when you installed your "A" Eliminator, you need a new rectifier.

**Do not void the Manufacturers' Guarantee on your Balkite Power Units**

The Elkron Replacement Units and those made by the Fansteel Products Company containing an Elkron Rectifier, are the only ones authorized for replacement of the acid jars in Balkite Power Units.

See your dealer today—there are thousands of hours of good reception left in your power units as soon as you have replaced your rectifier or acid jar with a new dry Elkron.

**ELKON, INC.**

Port Chester, N.Y.

Division P. R. Mallory & Co., Inc.
We've had hundreds tell us that they knew radio backwards and forwards. Yet they enrolled in our courses. And a few weeks after they started to learn radio the RIGHT way these same men told us that they never realized how much they had been missing right along.

Maybe you too have sufficient radio knowledge to build a few radio circuits. That isn't enough to make a real commercial success. What you really need is a course that takes you from the first elements of radio right through the most complex stages and gives you the practical knowledge you need for commercial work.

**RADIO INSTITUTE SPONSORED BY RCA, G-E AND WESTINGHOUSE**

The Radio Institute of America is the world's oldest radio school, giving the finest and most comprehensive instruction obtainable. Our graduates are making real money—we'll send you copies of some of the letters they write us about their successes.

**STUDY AT HOME**

Another feature of this course is that you can study at home—when you please and as long as you please. No need to give up your present employment. No time lost traveling back and forth to classes. Our new booklet tells how others—just like yourself—have won success in radio, and how you too can make this profession of fascinating brain-work your life career. You owe it to yourself to read this book through. If you will clip and mail the coupon, we'll send the book to you.

---

Get into the COMMERCIAL RADIO FIELD where the MONEY IS

---

less waves will act as the system has suggested. To have any considerable splashing, or scattering, of the wave would require electron coagulations of rather high density—ten million or so per cubic centimeter (or a million, million ions)—whereas the usual electronic densities are probably a hundred times less. It is difficult to see any way in which such coagulations could occur under normal conditions, although they might possibly exist under unusual circumstances, as during wind storms in the high atmosphere, aurora displays, etc. On the whole, one cannot be quite certain yet of the meaning of Messner's experiment.

There is, however, a scattering of the 10-meter waves which unquestionably does exist—a scattering from the waves of the sea. Sea water has a very high refractive index for these waves (twice as high as the index of a diamond for light) and consequently is a very perfect reflector. It is like molten silver for light waves. If an observer had an eye sensitive to 10 meter waves and were situated aloft over a patch of the sea on which were falling a sheaf of the waves, he would see the water waves and ripples shimmering and scintillating very brilliantly in all directions with the 10-meter illumination. The same thing, perhaps to a lesser extent, would be expected to be true of the facets and inequalities of the land. This type of scattering may be of importance in the 10-meter communication channels, such as filling in the skip zones, indicating storms at sea and the like.

—E. O. Hulburt.

**Danger**

[The following letter from S. C. M. Sears, to an amateur in Los Angeles, is published to bring this subject to the attention of the membership, so that all members may be warned against accepting such offers. The Los Angeles amateur stated that there would be "something in it for the stations doing this work." Amateurs cannot accept compensation for their services in handling messages. See the article by Mr. Segal on page 13 of July QST.—Editor.]

LaJolla, Calif.,
May 27, 1928.

Dear OM:

I am in receipt of your letter of the 25th with reference to lining up some San Diego amateur station to handle orders between the .......... Company, where you are employed, and the .......... Company of San Diego.

I am sorry, indeed, that I cannot do as you request. To handle such business, the stations involved would have to operate under a limited commercial license; such work not being permitted under an amateur license. Recently some of our stations have had to decline similar messages from other sources, as they do not care to jeopardize their licenses,

---

Say You Saw It In QST—It Identifies You and Helps QST
Here is the wonderful Receiver you have dreamed of owning—a Receiver with the celebrated Stromberg-Carlson tone, at a price within the reach of everyone.

Not only the tone but its extreme sensitivity—its keen selectivity—its splendid workmanship tell you at once it is a Stromberg-Carlson.

This Receiver has a handy jack to facilitate playing records electrically through the wonderful audio system of the Receiver; thus making it possible to convert any standard phonograph into a high quality modern electrical reproducing instrument.

The beautiful cabinet sets a new standard in radio. It is low, artistically designed, with two-toned Walnut panels and top of matched Walnut butts. A slide which may be used as a writing table acts as a cover to close the front.


The Stromberg-Carlson Sextette Friday Evenings at ten o’clock Eastern Daylight Time through the NBC and 22 Associated Stations

Stromberg-Carlson

Makers of Voice Transmission and Voice Reception Apparatus for More Than 30 Years

Say You Saw It In Q S T — It Identifies You and Helps Q S T
Push-pull Transformers with impedances to match power tubes and dynamic speakers . . .

Type "BX" Input Transformer has extremely high primary inductance. Secondary accurately divided. Price each, $6.50

Type "GX-210" Output Transformer. Especially designed for push-pull amplifier using UX-210 or CX-310 tubes. Secondary connects directly to moving coil of dynamic speaker. Price each, $6.50

Type "HX-171" Output Transformer. Same as above except impedance matches UX-171, CX-371, or UX-250, CX-350 tubes. Price each, $6.50

I trust that you will understand my reasons for taking this stand, and hope that you will be able to effect some other arrangement that will prove satisfactory. The Boulevard Express Company maintain stations in Los Angeles and San Diego and might be in a position to help you out on this.

Yours very truly,
G. A. Sears, Section Communications Chisholm 1926

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Free circular giving audio hook-up and complete information on request.

Why YL'S Become Amateurs

"Round Hills,"
So. Dartmouth, Mass.

Editor, QST:

I have been wondering if you and the other "hams" wouldn't be interested in hearing from a YL operator—since they seem to be rather scarce—and perhaps hearing how a YL became a "ham".

My husband, being the Radio Engineer for "The Round Hills Radio Corporation," had a transmitter and seemed to have such a lot of fun staying up all night operating it, that I began to think that I was missing a lot. So that—and the fact that I was afraid of becoming a "radio widow"—caused me to learn the code and become the YL operator at Station 1BHS.

I am not saying much about how the amateurs, whom I QSO'ed, had to suffer when I started (and I'm not so good yet) but I will say they were all perfectly great about sending slowly and repeating possibly a dozen times, and I would like to take this opportunity to thank them.

I wish some more YL's would get the "bug". I have attended two conventions: one in Boston and one in New York and only met two other YL operators. In Boston I was rather backward, but in New York I entered the contests with the rest and came back to Round Hills with four tubes and an aluminum shield.

--Helen Davis, YL at 1BHS.

In Appreciation


Editor, QST:

Having just finished reading the excellent article by Mr. Boyden Sparkes in the Saturday Evening Post for July 21st, entitled "Some Attic Adventures," in which Mr. Sparkes has so ably caught the spirit of amateur radio and placed it before the public, it comes to me that we could show our appreciation of this in some way, such as by letters or station cards. The writer can recall no comprehensive article on this subject ever having been printed in the more popular non-radio magazines, and it seems that Mr. Sparkes is due a sincere vote of thanks from each of us. Many of our difficulties can be traced to lack of informa-
MONTHS, sometimes years, are spent in preparing for Polar Expeditions. Every item of equipment from ship to footgear is considered, tested, viewed from every conceivable angle before being accepted as worthy to share responsibility for the safety of an expedition and its participants. No factor that human ingenuity can devise, making for success and security, is overlooked.

DEPENDABILITY in materials and equipment is of paramount importance in these, as in other ventures, where man is dependent upon things of his creation for his very life.

VAST and silent spaces, the Polar Regions. Vast, but to the listening ear not silent when vibrant with the all pervading voice of Radio.

BYRD, DYOTT, MACMILLAN, STOLL-McCRACKEN, are some of the names identified with expeditions placing their confidence in CARDWELL CONDENSERS for the equipment needed to keep them in touch with civilization, and possible succor when in desperate need of it.

WHO will say that the equipment selected for ventures like these is not DELIBERATELY and WISELY CHOSEN?

Literature upon request

The Allen D. Cardwell Manufacturing Corp.
81 Prospect Street, Brooklyn, N.Y.

"The Standard of Comparison"
No Grid Leak Interference

with the
Bradleyunit-B Resistor

BRADLEYUNIT-B solid-molded resistors eliminate the noise and interference in radio circuits caused by inferior grid leaks. Oscillograph tests show the Bradleyunit-B to be remarkably quiet in operation.

The Bradleyunit-B Fixed Resistor is made of a special, uniform mixture, baked and solid-molded at high pressure. This creates a solid, uniform unit, providing a constant resistance regardless of voltage used.

Radio manufacturers are assured of an accurately calibrated resistor which will retain its initial rating indefinitely.

For Radio Manufacturers

These remarkable solid-molded resistors are practically unaffected by moisture, although not depending on a glass enclosure for protection.

The Bradleyunit-B is furnished with or without tinned leads for soldering. Made in values from 500 ohms to 10 megohms.

Tapped Bradleyunit Resistors are also furnished to meet your specifications.

Allen-Bradley Co., 277 Greenfield Ave.
Milwaukee, Wis.

Allen-Bradley Resistors

--Emry C. Stuedle, 6NW, KGEP, 5508 South Cimarron, Los Angeles, Calif.

“es” and “&”

4338 W. Fort St.,
Detroit, Michigan.

Editor, QST:

Many of the fellows, in their correspondence and on QSL cards, write the abbreviated “and” “es” instead of “&”. No doubt this is due to the general, run of amateurs being unaware that “. . .” is the character for “&” in the American Morse code.

—J. O. Ellison, SCOW-SAGR.

“Propaganda Cards”

66 Ingram Road,
Thornton Heath,
Surrey, England.

Editor, QST:

Probably many American hams have by now received a card from a British station which bears at the head an inscription which can only be read as a direct insult to the R. S. G. B.

Although, so far as we have been able to find out, the operator’s only objection to the R. S. G. B. is that it does not give the same value for the money as the A. R. R. L., he does not join up and lend a hand with improving things, but tries his hardest to discourage other intending members from joining.

QST readers will realize that the T. & R. Bulletin, with its minute circulation as compared with QST, is neither so large nor so prolific in advertisements, but that it will grow if the R. S. G. B. is given support by the British hams, and not if they all cry off and do nothing whatever to support it.

Luckily there are not many such “hams” in Great Britain, but the existence of one or two is enough to cause anxiety to those who are looking forward to a British version of the A. R. R. L. as the ultimate outcome of the R. S. G. B., with a proportionate large membership.

We hope that stations seeing these propaganda cards will not treat them seriously, and will realize that they only express the sentiments of a very few unhappiest who have lost interest because they have been content to watch the work of others instead of doing their own bit.

America's Most Sensational
D.X. Receiver

Remarkable Federal Feats

A Federal F II at Buffalo, N.Y., has a record of verified reception from JOAK, Tokyo, Japan, 2LO, London, England, CWX, Havana, Cuba, and practically every distant station in this country.

In planning the F II, Federal had but one goal — to produce, regardless of cost, the most sensationally performing radio receiver that skilled engineers could devise. Delicate hair-line tuning, together with an almost unbelievable distance range, attests to their success.

Antenna and ground operation with four stages of tuned radio frequency coupled with detector, and two stages of amplification will bring in even the weakest of radio impulses picked up by the antenna. Each unit of the set including the individual tubes, is completely shielded. The chassis is of sturdy all-metal construction — the cabinet of genuine mahogany.

This set may be had either for battery or for light socket operation with Federal's power-tube coupler which greatly enhances tonal quality and the efficiency of the set.

Prices, without tubes, for battery operation, $250; for light socket operation, 60 cycle, $360; 25 cycle, $380. (Slightly higher west of Rockies.)

The designated Federal retailer in your community will gladly demonstrate this phenomenal receiver, or you may write direct for complete specifications.

FEDERAL RADIO CORPORATION, BUFFALO, N.Y.
OPERATING BROADCAST STATION WGR AT BUFFALO
Federal Ortho-sonic Radio, Ltd., Bridgeburg, Ont.

Federal Radio

Licensed under patents owned and/or controlled by Radio Corporation of America, and in Canada by Canadian Radio Patents, Ltd.

*Federal's fundamental exclusive development making possible Ortho-sonic reproduction is patented under U.S. Letters Patent No. 1,499,490

Say You Saw It In Q S T — It Identifies You and Helps Q S T

59
Radio Broadcast announces a Series of Articles by Mr. Robert S. Kruse

RADIO BROADCAST wishes to announce that Mr. Robert S. Kruse, formerly Technical Editor of QST, will be a regular contributor to Radio Broadcast.

MR. KRUSE'S first article entitled "What About the 5-Meter Band?" appeared in the August issue. His second article entitled "Practical Work on 5-Meters" will appear in the September issue. Other articles on short-wave experiments, experiences and apparatus, written by Mr. Kruse will appear in future issues.

READERS OF QST can follow Mr. Kruse's experimental findings in the short-wave field by reading Radio Broadcast each month. Send one dollar NOW for the next four issues of Radio Broadcast containing articles by Mr. Kruse. This offer gives you the magazine at 25c per copy instead of 35c.

Radio Broadcast, Garden City, N. Y.

Award of Honor

Anvik, Alaska, May 14, 1928.

Mr. Kenneth B. Warner:

It has been noted here, in Alaska, that while many bouquets were handed you after the Conference in Washington, and a few bricks were thrown, none of those substantial rewards were tendered you which are ordinarily so gratifying to the recipient and which testify to posterity of the gratitude of his contemporaries. It is, therefore, with great pleasure that I have to inform you, that the Bunkodyne, which you will find enclosed, has been awarded to you.

The Bunkodyne, as you are probably aware, is to the A.R.R.L. amateur what the Carnegie Peace Prize is to the prize fighter and the Pulitzer Medal is to the pacifist, the ne plus ultra of recognition.

The latest award was made to Mr. Everett Lasher, of 7ADY, Latouche, Alaska, who makes a specialty of routing his "nu" correspondence via England. Mr. Lasher has constructed his transmitter in such a way that it can be used as a long distance pulmotor. He recently revived a s who lost consciousness during a CQ endurance test. Mr. Lasher's want of judgment was overlooked in view of the humanitarian impulse which led him to do what would otherwise have been reprehensible.

At the time that the award was made, I made the mistake of informing him that it was the 547th award that had been made during the present year. On looking up the record, I find that in point of fact, it was the second award that has been made since the foundation, in 1923. The first award was made to Mr. Charles A. Service, Jr., for being good looking. No other names were considered at the time. Your name, therefore, in point of time is the third on the list; but in point of honor, as one who loves his fellow ham, it leads all the rest. Please accept my congratulations.

The Bunkodyne, as you probably know, is a perfect substitute for the rubber hands and shawl straps which are principally responsible for the decline in morals which is characteristic of the present generation. It consists, essentially, of a grid, an inductance and a condenser. The condenser, which is the tightening or binding element, is in the form of a loop which is passed through...
Radio Operators!

Are you prepared to use the new International "Q" signals which go into effect January 1, 1929? Do you know the correct procedure for obtaining a radio compass bearing as prescribed by the terms of the International Radio Telegraphic Convention, effective January 1, 1929?—the right procedure when distress communications are ended and silence is no longer necessary?—what to do when you hear from a radiotelephone station the spoken expression Mayday?

These Questions and Thousands More Are Answered In

THE RADIO MANUAL

A Complete Handbook of Principles, Methods, Apparatus for Students, Amateur and Commercial Operators, Inspectors

By G. E. STERLING, Radio Inspector and Examining Officer, Radio Division, U. S. Dept. of Commerce.

Edited by ROBERT S. KRUSE, for five years Technical Editor of QST.

Complete Preparation for Government License. 16 Chapters Covering

1. Elementary Electricity and Magnetism
2. Motors and Generators
3. Storage Batteries and Charging Circuits
4. Theory and Application of the Vacuum Tube
5. Fundamental Circuits Employed in Vacuum Tube Transmitters
6. Modulating Systems Employed in Radio Broadcasting
7. Wave-Meters, Piezo-Electric Oscillators, Wave Traps and Field Strength Measuring Apparatus
8. Marine Vacuum Tube Transmitters including detailed description of Model ET-3628
9. Radio Broadcasting Equipment including, for the first time in any text book, the complete equipment of Western Electric 2 Kilowatt broadcasting Transmitter used in over 75% of American broadcasting stations,
10. Arc Transmitters including description of Federal Marine 3 Kilowatt Arc Transmitter Type AM 4151: also models "K" and "Q"
11. Spark Transmitters including description of Navy Standard 2 Kilowatt Transmitter
12. Commercial Radio Receivers and Associated Apparatus
13. Marine and Aircraft Radio Equipment and Direction Finders
14. The Development of Amateur Short Wave Apparatus. Complete details of construction, operation and licenses
15. Radio Laws and Regulations of the U.S. and International Radio Telegraph Convention. Quotations of all important sections
16. Handling and Abstracting Traffic

Examine It Free Special Price Now

"The Radio Manual" is now on the press and will be ready shortly. Over 900 pages bound in flexible Fabrikoid. Regular price after publication will be $6.00. Orders received now will be accepted at the special advance price of $4.95. Send no money now. Examine the book first. Pay or return in ten days.

Order On This Coupon

D. VAN NOSTRAND CO., INC. 8 Warren St., N. Y.
Send me as soon as published THE RADIO MANUAL for examination. Within ten days after receipt I will either return the volume or send you $4.95.—The special advance price.

Name ...........................................
St. and Number ................................
City and State ..........................

Say You Saw It In QST — It Identifies You and Helps QST
Don't Start the Season Blindly—

Radio over-hauling time is here! That means carefully going over last season's equipment—checking up every part of the set to make certain nothing will fail of proper performance. Particularly, you should check the calibration of your instruments. Much can happen to them unless they were scientifically designed and constructed in the beginning.

Doubtless you will need to make some replacements and we suggest that you give serious consideration to the instruments you select. Radio instruments vary widely in their design characteristics and in their ability to withstand the excessive strains and surges incident to the operation of your set.

Weston Thermo Milliammeters

For example, we call your attention to the following characteristics of Weston Thermo Milliammeters—Model 425:

- They give definite assurance of your output, and accurate readings after hours of constant service.
- Extra large over-loads will not burn out these meters.
- Model 425 is ideal for short wave transmission, as it has a very low internal electrostatic capacity. For this reason it gives the true value of the current in the circuit, and does not disturb the constants of your transmitter.
- Model 425 is also made as radiation ammeters in ranges from 1 to 20 amperes, having a safe over-load capacity of 50%.

Write for the new radio circular "J" just off the press.

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

WESTON RADIO INSTRUMENTS

one of the two holes which form the grid, the other being reserved to receive the condenser in the event of the first hole being worn out. The grid is located in the middle of the inductance. The inductance and grid may be purchased from any mail order house or any dealer in second hand buttonholes. The condenser consists of a string of any desirable length, having a resistance one inch more or less, from each end. The ends beyond the resistance are the filaments. One of these, F, is longer than the other, f. In operation, the letters, papers, million-dollar bills, etc. which it is desired to keep together having been placed in the loop of the condenser, the filament F is pulled steadily and firmly until the desired degree of compression has been attained. It will be found that it will release this compression, if it is desired to extract one or more of the papers or the bills. A gentle pull will effect this.

The Bunkodyne is a patented device. The award carries with it the privilege of manufacture and sale; subject, of course, to prosecution by the holders of the patent rights. It is not known who they are; but it can, doubtless, be found out by experiment.

In making the Bunkodyne award, it is customary to send with it case remittance of $342,671.00, or as much of this amount as may be available from the interest accumulations on the original foundation investment of $0.02; but in this instance, out of a delicate regard for your feelings, this feature is omitted.

Trusting that you will find great enjoyment in the use of the Bunkodyne and in the exercise of the privileges which accompany the award,

I am sincerely yours,

John W. Chapman, E.A.T.E.

P. S. Having discharged the responsible duties which have devolved upon me, I want to say that it would be a good thing for your critics to ponder upon what would have happened to us if you had not taken part in the conference at Washington.

I. A. R. U. News

(Continued from Page 30)

that he would try to set up a transmitter with a 201A tube and a dry-cell plate supply.

We are sorry to see the old 2AS go off the air, but hope that some satisfactory QSO’s are established with the baby set in the new location. Let us hear from you by mail, at least, OM.

CHINA

Father E. Gherzi, S.J., in charge of the weather and seismic services at the Meteorological Observatory at Zi-ka-wa, near Shanghai, and already familiar to QST readers from his article on fading in the June issue, writes as follows:

Say You Saw It In QST—It Identifies You and Helps QST
A NEW NOTE IN AUDIO AMPLIFICATION

THORDARSON R-300 AUDIO TRANSFORMER

SUPREME in musical performance, the new Thordarson R-300 Audio Transformer brings a greater realism to radio reproduction. Introducing a new core material, "DX-Metal" (a product of the Thordarson Laboratory), the amplification range has been extended still further into the lower register, so that even the deepest tones now may be reproduced with amazing fidelity.

The amplification curve of this transformer is practically a straight line from 30 cycles to 8,000 cycles. A high frequency cut-off is provided at 8,000 cycles to confine the amplification to useful frequencies only, and to eliminate undesirable scratch that may reach the audio transformer.

When you hear the R-300 you will appreciate the popularity of Thordarson transformers among the leading receiving set manufacturers. The R-300 retails for $8.00.

THORDARSON ELECTRIC MANUFACTURING CO.

Power Supply Transformers

These transformers supply full wave rectifiers using two UX-281 tubes, for power amplifiers using either 210 or 250 types power amplifying tubes as follows: T-2099 for two 210 power tubes, $20.00; T-2900 for single 250 power tube, $30.00; T-2950 for two 250 tubes, $39.50.

Double Choke Units

Consist of two 30 henry chokes in one case. T-2099 for use with power supply transformer T-2009, $14; T-2909 for use with transformer T-2000, $16; T-3100 for use with transformer T-2950, $18.

Power Compacts

A very efficient and compact form of power supply unit. Power transformer and filter chokes all in one case. Type R-171 for Raytheon rectifier and 171 type power tube, $15.00; Type R-210 for UX-281 rectifier and 210 power tube, $20.00; Type R-280 for UX-280 rectifier and 171 type power tube, $17.00.

Speaker Coupling Transformers

A complete line of transformers to couple either single or push-pull 171, 210 or 250 power tubes into either high impedance or dynamic speakers. Prices from $0.00 to $12.00.

Screen Grid Audio Coupler

The Thordarson Z-Coupler T-2900 is a special impedance unit designed to couple a screen grid tube in the audio amplifier into a power tube. Produces excellent base note reproduction and amplification vastly in excess of ordinary systems. Price, $12.00.

THORDARSON ELECTRIC MFG. CO.
500 W. Huron St., Chicago, Ill.

Gentlemen: Please send me your constructional booklets on your power amplifiers. I am especially interested in amplifiers using.................. tubes.

Name.....................................................................................
Street and No. ........................................................................
City.................................................................................
State..............................................................................
"I think amateurs everywhere might be interested in knowing that I am sending every day at 0145, 0945, and 1215 GCT, on 23 meters, a weather bulletin giving meteorological observations from many stations in the Far East. As this sending is always done with the same power—220 watts—at a very exact hour, I would be indeed grateful to all hams who could try to listen in. The transmissions last about 15 minutes.

"I am sure that various official weather bureaus, for instance, along the Pacific Coast, would be glad to get these observations, and it would be another feather in the cap of the amateur if through this channel a scientific link could be established between the observatories on each side of the Pacific Ocean.

"The station is always operated by myself, QRH 23 meters, under the call ae8ZW. The note is fairly distinctive, being 500 cycles.”

ENGLAND

May: "Most work during May has been done on 23 meters but conditions do not seem to have been as good as usual; at any rate, in the latter half of the month. 5ML's best QSO's were with the sixth and seventh US districts and the third, fourth and fifth Canadian and with OA, SC, SB, AI and FK2MS. Lately he has been listening on ten meters without hearing much so far. 2XV had consistent contact with the sixth and seventh with 75 watts until the middle of the month, when he too found conditions fall off. OA and OZ were also worked on 23, and a number of these boys seem to have left their old pet 30 meters for the lower band. Some interesting QSO's were had with null and 2XV is looking forward to meeting him in person soon.

"5YK worked FK2MS and the usual sixes and sevens on 23; he has been trying phone on this wave, too, and also did some work with negative results on the 10-meter band. 5YX, who like 5YK is crystal controlled, worked two NU sevens and some fives on 80 meters during March and would like to know if any six heard him as he could not raise one. 5BQ is getting out F'B on 28 and wants schedules with the NU fourth and NC. What offers, gang?

"2CB and 2CX are working South America on 28, but 2CB cannot seem to get decent contact with the States. He is one of the 'mangle brigade' using a hand generator for power supply. 6QB has worked heaps of sixth and seventh district stations, getting R6 from both on 23 meters with low power. He also hooked OA and N4FB. 2NH ran a schedule with OA4AM for 29 days without a break! He is also investigating ten meters. 6BR works AS and SB on 45 meters as well as the U.S.A. 6PA has worked all over the States on 23 with a power unit of five watts. Good work, OM.

"6HP works OA on 23 but has difficulty with South America. 6CL has had some
Unless You Are Checking Out Jan. 1...

YOU WILL REQUIRE A FREQUENCY METER TO OPERATE WITHIN THE LAW!

"PRECISION work requires precision measuring equipment," says H. P. Maxim, Pres. A.R.R.L.

Old wavemeters will soon be useless. You can't operate with the new 7000-7300 Kc. band jammed into 5 or 10 divisions on the dial. Try to pick out 7275 Kc. on the dial of your present wavemeter. It can't be done! Kilocycles will supercede meters. QRH will be specified in frequency.

REL, anticipating the need of thousands of Amateurs, is producing the new frequency meters shown on this page, designed expressly for the new bands. Years of scientific research and engineering skill have made these meters superlative pieces of equipment, typical REL products.

WRITE for literature which completely describes the new meters and outlines the new operating requirements.

RADIO ENGINEERING LABORATORIES
100 Wilbur Avenue
Long Island City, New York
CUT down your operating cost—our rebuilt tubes accomplish this—their life is equal to new tubes and their performance will satisfy—send in your

We List and Price Repairs

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(10% Discount on lot of 6 tubes, from above list)

These tubes are rebuilt using same type filament as they had originally; also the operating characteristics are maintained the same.

We purchase burnt out tubes of the above types.

SOLVE your rectifier troubles once and for all.

RECTOBULBS

3000 Volts and 250 Mils. $15 ea.
Type 203 50 Watt Tube $20 ea.

No charge for crating if cash accompanies order.

Our work guaranteed against defects of material and workmanship.

National Radio Tube Co.
3420 18th St., San Francisco, Calif.

(A Ham Institution)

interesting NU contacts early in the month but like everyone else is finding things dud just now. 5HS is very QRV but will be QRV again soon.

"The Third Annual Convention of the R.S.G.B. is to take place on the 28th and 29th of September, and any American hams over here on these dates will be welcomed. Further details as to programme are not yet available, but it is sure to be wonderful for everyone."

—K. E. Brian Jay, eg2HJ.

"June: The general impression this month is that the pet 23-metre band has been bad—at any rate, compared with previous months. It would seem by comparison with last year that this state of affairs will last until about next February, as far as super-DX is concerned.

"5YK worked NU fourth on phone and got R4 with 60 watts crystal. He could not raise either the sixth district or the Antipodes, both of which were weak. He is working on a ten-metre crystal set, employing a new principle. This station will be ready to go on 10.15 metres as soon as the license arrives.

"5YX has done nothing, being QRW with exams. 5BY has been going strong, however. 2XV found conditions rather poor, but in spite of this worked su2BT, sb2AJ, sb2AX and a few NU stations; also 022R on 32 metres, the others being on 23. Frequent QSO's were had with NUIII to make various arrangements about his visit to England. 2XV will shortly be on the 8-to 10-metre band and reports will be welcome; the word TEN will be sent after each transmission to show it is not a harmonic. Operations will probably commence early in August.

"Other hams busy on ten metres are 2NH and 6QB, who also are to be found on 23 and 90. 2CX worked SB and SC, so is now WAC. Very FB OM. 2AX worked lots of NU's and SC and NU on 23. 6WN cannot raise NU, so would welcome reports on his signals if any one hears them. 6CL on 23 was called by an NU four, but did not hear him. 6PA says NU is only local when conditions are good. 2CB worked OA, SC and NU first, on 23, but has difficulties with the States; 2CB worked OA, SC and NU first, on 23, but has difficulties with the States; he, too, would like reports.

"6RB worked the world on 23 in May, but has not had any luck in June.

"Many hams are rebuilding and getting set for next year, and 5YK's standard frequency transmissions are being found of the greatest value. 6QB with his standard R.S.G.B. wavemeter is pretty busy, too. Most of the British members are now preparing for the new Washington wavelengths, which may become effective any day now.

—K. E. Brian Jay, eg2HJ.

FRANCE

From a letter sent in by our old friend Leon Deloy, one of the past presidents of
"ROUND THE WORLD" Four

Just What the Name Implies!

The trimmest short wave set ever—that’s the verdict everywhere on the new 730 S-M “Round-the-World” Four. It does everything you expect of a short-wave receiver—everything, even, that you expect of an S.M receiver. The Radio Broadcast Laboratory, in initial tests of the 730, received English SSW daily on the speaker, during afternoon hours. 9BBW, receiving on the “Round-the-World” Four, worked in one evening stations in Germany, France, England and Italy. Low-power amateur coils; stations over the U.S. and Canada are received regularly on the 730. And for television work, it’s ideal.

The “Round-the-World” Four is a complete four-tube regenerative, non-radiating short wave receiver kit with aluminum shielding cabinet. It has one screen grid r.f. stage, a regenerative, non-radiating detector, and two high-gain short wave coils, coil socket, and three r.f. chokes, with full instructions for building a one, two, three or four tube short wave set. It costs but $16.50 complete.

And it beats anything for getting out into the short-wave “Thrill Band.” Choose the kit you prefer—and “step out!”

720 Screen Grid Six

The Year’s Biggest Value

This is the set that S-M gets squarely behind and tells you it’s the biggest value in broadcast-band receivers to be found today. A man-sized recommendation.

Successor to the famous Shielded Grid Six that took the country by storm, the 720 is the kind of a set you can build in an evening, on its pierced metal chassis. When it’s finished and you put it on the air—then the real surprise begins.

Distant stations will come in, one after another, with local volume, and positive 10 kc. selectivity. As to tone, the 720’s superiority is insured by the new 255 and 256 audios, as described at the right.

Look at the 720’s features as you see them in the picture, and remember that S-M backs it to the limit—assures you that you can’t get more actual radio elsewhere at twice the cost. Then note the prices: Custom-built complete in a beautiful two-tone brown metal shielding cabinet, $102.00. Complete kit only $72.50, with the same cabinet $9.25 additional.

Better order now—such values spell scarcity!

Are you receiving the “The Radiobuilder” regularly? Every month it gives you all the earliest S-M news, operating hints and kinks. To S-M Authorized Service Stations, it comes free of charge, with all new construction Data Sheets. If you build professionally, write us about the Service Station franchises.

SILVER-MARSHALL, Inc., 858 W. JACKSON BLVD. CHICAGO, ILL. U.S.A. 

Audio Transformers

Just Two Years in Advance

Radically new in principle, these transformers are the first to give freedom from the hysteretic distortion found in all other types. They combine decided advances in both tone and volume, as will be seen below. E is the two-stage curve for the large size transformers (S-M 225, 1st stage, and 226, 2nd stage, $9.00 each); D is that of the smaller ones (S-M 255 and 256, $6.00 each). Note the marked advantage over A, B, and C—all standard eight and ten dollar transformers under equal conditions.

And you can have this finer performance in any set at less than average transformer costs.

The S-M catalog describes all these products, as well as A and B Power Supplies, Power Amplifiers, Modulation Transformers, etc.

Silver-Marshall, Inc.
858 W. Jackson Blvd., Chicago, U.S.A.

Send your complete catalog, with sample copy of the Radiobuilder.

For enclosed 10c, send five sample S-M Data Sheets.

Name: __________________________
Address: ________________________
A detailed treatment of vacuum tube circuit theory

If you have not yet seen this book you will certainly want to examine it, as it furnishes you with a dependable, up-to-the-minute discussion of thermionic vacuum tube circuits...From elementary thermionic theory to the theory and design of small tube circuits, the book covers each phase of the subject of vacuum tube circuits with detailed thoroughness.

THEORY OF THERMIONIC VACUUM TUBE CIRCUITS

By LEO JAMES PETERS

Assistant Professor of Electrical Engineering, University of Wisconsin

229 pages. 269, 110 Illustrations. $3.00

The consistent aim throughout this valuable manual has been to furnish the reader with a firm grasp of fundamental theory and a familiarity with methods of attacking problems so that he can investigate systems and circuit arrangements other than those discussed in the book.

McGRAW-HILL FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc.,
870 Seventh Avenue,
New York, N. Y.

You may send me Peters’ Theory of Thermionic Vacuum Tube Circuits, $3.00, postage paid. I will either return the book, postage prepaid, in 10 days, or remit for it at that time.

Name

St. & No.

City

State

Name of Employer

Official Position

(Book sent on approval in the U.S. and Canada only)

Q.S.T. 8-1-28

Remodeling the Traffic Tower

(Continued from Page 22)

depends upon the position of the band on the dial. To cover 500 kcs, starting at 3500 kcs, requires a dial rotation of from 134 to 18 degrees or 116 degrees. Now, if we start at 3850 kcs, 147 degrees, we have to rotate the condenser only 71 degrees to get to 3850 kcs. Thus if we cut out coils so as to place the desired range at the lower dial readings, the maximum dial rotation will be obtained for a given band.

Of course, at the lower range of the condenser, any changes in circuit capacity will have a larger effect upon calibration than at the higher capacity settings. With this in view and the thought that the minimum capacity across the coil due to the tube socket, wiring, etc., may vary to some extent in other receivers, no effort was made to squeeze the last dial division out of the ranges. He who is so inclined may do this; others will perhaps be satisfied with the ranges as they are. At any rate, it requires but little effort to add or subtract one turn, more or less, and you can suit yourself.

Well! So far we have a pretty decent 1928 affair but it isn't much of a world-beater for the 1929 conditions. By doing some more adjusting and shifting, we can make it into just as good a 1929 set as it is a 1928 one.

The shunt adjustable condenser can be dropped because there will be but five bands in all—and the smaller section of the tuning condenser will be employed for tuning on the 1750- and 3000-kc. bands while the two sections in parallel will be used for the 1750-, 2500- and 3000-kc. bands. Of course, they will both have to be reduced in capacity.

GERMANY

A card from ek4HX, contains this interesting information:

"I beg you to put a few lines in QST about QSL's for EK. Many SU amateurs send cards direct, but that is dangerous for us, and the cards often do not reach their destination. All cards for EK stations should be sent via DFTV, Berlin W57. Probably SU OM's don't know that all EK stations with a '4' and only two letters in the call-sign are unlicensed."
Replace Your Old Radio!

New AC electric receivers replace old radio models

Crosley Radios
- Tune efficiently
- Each circuit is sharply sensitive and selective
- Each element is shielded from each other

Crosley Radios are selective
- Where stations are crowded together you will appreciate the selective qualities of Crosley radios. You listen to ONE station at a time.

Crosley Radios have volume
- The Crosley receiver is phenomenal for the slight amount of battery or AC current consumed. This volume may be increased tremendously without distortion.

Crosley Radios can be so light
- The volume control of Crosley sets is so positive that the operator may set any broadcast program down to faint and scarcely audible reception.

Crosley Radios at any kind of furniture
- Outside cases of Crosley are easily removed for installation into any type of suitable cabinet.

Crosley Radio prices do not include tubes.
Guaranteed to Stay Accurate

It is one thing to build a resistor that shows up well in a quick test, and decidedly another to give it a month's trial carrying the workaday load before testing it. The difference in accuracy can be (and often is) surprising.

Test Har-field Resistors for a month or a year. Day after day they carry the load they were built to carry, and maintain the accuracy your order specifies. For Harfield, Field, Inc. have built the accuracy into their resistors that enables them to honestly make their guarantee.

Harfield Resistors are made in two types of coating—the vitreous enamel or specially processed cement. They come in a wide range of values to suit every need, and large quantities of any type or size can be quickly supplied. Prices are low enough to demand consideration from every careful purchasing agent and individual.

Tell us about the resistor you want and we will gladly make up samples for you with prices.

HARFIELD, FIELD, INC.

SALES OFFICE
123 Greenfield St.
New York

FACTORY
215 Emmet St.
Newark, N. J.

The distance between the plates in the smaller section should be increased until the 7000-kc. band is covered by a dial rotation of somewhat over 100 degrees. The spacing will be roughly equivalent to the thickness of 20 QST pages. In the other section, we can no longer use the capacity obtained by a single stator plate between two rotors and must shift the stator so that it is exposed to but one rotor plate. In this respect it will be similar to the smaller section although the spacing between the two plates will be less (about 10 QST pages).

We then get the following coil sizes and ranges:

<table>
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<tr>
<th>Hand in hrs.</th>
<th>Coil Range</th>
<th>Set Ticker</th>
<th>Hand Condenser</th>
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<tr>
<td>1715-2200</td>
<td>1675-2055</td>
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<td>3500-4000</td>
<td>3275-4000</td>
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<td>7000-7300</td>
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<td>14000-14400</td>
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<td>27900-30000</td>
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The types of winding, size of wire, spacing of turns, etc., are the same for these coils as for the previously described ones. The same coils may be used with the necessary turns added or removed as the case may demand.

Radio Set Tester

batteries or socket power devices. The various ranges are 600, 300, 60, 8 and 8 volts and a resistance of 1,000 ohms per volt is had for all of them. Direct current ranges of 150 and 30 milliamperes are available for checking the plate current of the tubes as well as the output of various of the commonly used rectifiers.

For sets employing tubes similar to the UX-226 and UY-227, there is an a.c. voltmeter having ranges of 150, 8 and 4 volts. The four-volt range is used for checking the filament voltage for the tubes mentioned above, the eight-volt range will be convenient for ascertaining the voltage across the filaments of 171s, 210s and the various rectifier tubes now in use, while the highest range may be used to determine the line voltage which may vary considerably in some parts of the country.

It is possible to make measurements upon a tube under normal operating conditions employing for such tests the regular power supply to the set. It is also possible by means of a switch provided for that purpose to change the bias on the grid of a tube and by measurements of plate current to ascertain whether the tube is in good condition. A rotating switch is so arranged that measurements of the plate and filament voltage, plate current, bias, etcetera may be made in succession without moving any of the equipment excepting the switch.

A product of the Weston Electrical Instrument Corp. of Newark, N. J., this instrument is known as their Model 537, Radio Set Tester.

—H. P. W.
The Mershon Condenser gives a very large capacity in a very small space. It is self-healing in case of puncture, and is unaffected by changes in temperature, or by moisture.

Expert radio amateurs used the Mershon Condenser for more than six years in their transmitting equipment. Today the Mershon Condenser is being widely used over the whole country in connection with electrical radio sets, whether new AC tubes are used, or battery sets are attached to house current thru the use of Eliminators.

Send for Your Free Copy of This Book....

The AMRAD Corporation
Medford Hillside, Mass.

Please send a copy of your new book on the MERSHON CONDENSER, showing hook-ups and designs.

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Address _________________________________________

Say You Saw It In Q S T — It Identifies You and Helps Q S T
BUILD A DAVEN TELEVISION RECEIVER

The first complete kit furnished with either T-21 or T-21B or T-4 Motor, Hornblower, Daven Television Tube, 3 Complete Stages of Daven Television Amplifiers and Instructions for Building. Daven Television Receiver Complete, including Television Tube $100.00 Less Qualified Tubes.

DAVEN TELEVISION APPARATUS

Daven Television Scanning Plates Each $5.00
Tubes T-24 $17.00
Tubes T-34 $15.00
Tubes T-48 $10.00
Cables, Blue 2, 250 Types $1.00
Daven Tube, New Lamp 20 to 80 Milliamperes 100 Plate 540$1 each 12.00
Daven Tube Motor 25.00
Daven Rounding at 45 degree 5-16
and 5-16 inch Motors 1.00
Daven for Front Use 5.00
Daven Rheostat 3.00
Daven Tube, Photo Electric Cell 1/4
Inch Built-Up 20.00
Daven Tube, Photo Electric Cell 3 Inch Built-Up

Daven Television Counters

1st Stage No. 1225 D-1225x $1.75
2nd Stage No. 1225 D-1225x $1.75
3rd Stage No. 1225 D-1225x $1.75
x Gliders and parts for Grid and Plate resistors 2.15
x Super Plates in Plates and Glactors in Grid 4.65
Daven AC 10 to output tubes in series with Television Lamp 3.50
Daven AC 10 (for brighter Illumination) 9.00
Daven 20 HI Mutual Tubes for Amp. Switches 37.50
Daven Mu 6 Power Tube 3.50

THE DAVEN CORPORATION
AMPLIFICATION SPECIALISTS
170 Summit Street
Newark, N. J.

Send for WESTERN RADIO new 1929 Catalog

Dealers and Set Builders
THE NEW 1929 Catalog is crammed full of the FINEST, NEWEST, Nationally Known A.C. sets, consoles, cabinets, dynamic speakers, kits, PARTS, eliminators and accessories at LOWEST PRICES. Largest stock of radio parts. Prompt delivery.

Write for our FREE catalog WESTERN RADIO MFG. CO., 125W Lake St., Dept. O9, Chicago

The Big Friendly Radio House

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

THE AMATEUR’S BOOKSHELF

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.


Radio Telephony For Amateurs, by Stuart Ballantine. One of the most valuable books we know of for the amateur. Theory, construction, practice. Not particularly about telephony. Heartily recommended for every amateur. 296 pp., 5½ x8½ $2.00

Manual of Radio Telegraphy and Telephony, by Commander (now Admiral) S. S. Robison, U. S. N., published by the Naval Institute. “Ranks with the very best of all published radio matter. Not only worth its cost but is perhaps the best radio book that ever came to this desk.”—QST Book Review. 896 pp., 6¼ x10 $4.00

Experimental Radio, by Prof. R.R. Ramsey, Third Edition. A splendid manual for the student and experimenter describing in detail 117 experiments of particular value and interest to the amateur desiring a complete understanding of radio work. $2.75

Principles of Radio Communication, by Prof. J. H. Morecroft. An elaborate general textbook. 935 pp., 5¼ x9 $7.50


Practical Radio Telegraphy, by Nilson & Hornung. 380 pages, 223 illustrations. A text for prospective commercial radio operators $3.00

Wireless Pictures and Television, by T. Thorne Baker. 188 pages, 99 illustrations. Completely and clearly presents the whole subject $2.50

Thermionic Vacuum Tube, by H. J. Van der Bijl $5.00

Radio Frequency Measurements, by Moulin $10.00

Prepared Radio Measurements, by R. R. Batcher $2.00

Elements of Radio Communication, by Ellery W. Stone $3.00

Radio Simplifier, by Kendall & Koehler, revised by J. M. Clayton $1.00

Ideas For The Radio Experimenter’s Laboratory, by M. B. Sleeper $0.25

Prices include postage

Read 'em and learn!

AMERICAN RADIO RELAY LEAGUE, INC.
1711 Park Street Hartford, Conn.
Control Your Volume
A Complete Line of Volume Controls

TONATROL

Observe this caution in building your receiver. Make sure you can control the tone and balance by turning Tone and Volume knobs.

Tone controls are the highest development in volume controls and are designed in types to meet the special requirements of all A.C. and conventional battery circuits. Also interchangeable with diamond or power switch attached.

Electrologic controls are a full line of controls for all radio purposes. Write for free descriptive circulars.

Department T-9, 175 Varick St., New York City

S. S. DROMORE CASTLE, New York City to Cape Town, South Africa, via C.U.C.

Steamship Co., 20 Broadway, New York City.

Operator Clyde Townsend, care the Union-Castle Mail Steamship Co., 26 Broadway, New York City.

Sagorudny pr log 13

1st bit 1fom 10m 20mg 2t-2ad 2t-ay 2e-2aa 2e-1ldy 2f-ogm fe-1as f-x-xw 2x-xw 2x-xw 2x-xw 2x-xw 2x-xw 2x-xw

Electra tube carriers an immediate replacement guarantee if defective within one year.

Type 1302 2Mfd $2.50. Type 1304 4Mfd $3.00

For Sale at Your Dealers.

Tobe Deutschmann Company Canton, Mass.

Observe this caution in building your receiver. Make sure you can control the tone and balance by turning Tone and Volume knobs.

Tone controls are the highest development in volume controls and are designed in types to meet the special requirements of all A.C. and conventional battery circuits. Also interchangeable with diamond or power switch attached.

Electrologic controls are a full line of controls for all radio purposes. Write for free descriptive circulars.

Department T-9, 175 Varick St., New York City

S. S. DROMORE CASTLE, New York City to Cape Town, South Africa, via C.U.C.

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Sagorudny pr log 13

1st bit 1fom 10m 20mg 2t-2ad 2t-ay 2e-2aa 2e-1ldy 2f-ogm fe-1as f-x-xw 2x-xw 2x-xw 2x-xw 2x-xw 2x-xw 2x-xw 2x-xw

Electra tube carriers an immediate replacement guarantee if defective within one year.

Type 1302 2Mfd $2.50. Type 1304 4Mfd $3.00

For Sale at Your Dealers.

Tobe Deutschmann Company Canton, Mass.
Are YOU among the 35,000 who refer daily to a copy of the Radio Amateur’s Handbook for Guidance and Information?

If Not, get a copy NOW


These chapters each occupy from ten to forty pages—indicating that each subject is treated in a thorough manner. In addition there is an appendix containing a fund of useful data. Then there is an index, occupying six pages, by which the valuable information contained in the book is made available. Altogether the Book contains 256 pages of the most valuable radio information ever found between two covers.

The Radio Amateur’s Handbook starts at the beginning and tells what an amateur is, what the League is, what amateur radio is, how to become an amateur, how to learn the code, how to understand what you hear, how to get your licenses, how to build a simple station, how to build a better station, how to operate your station, how the A.R.R.L. works, how to handle traffic, how to conduct experiments and make measurements, and a multitude of other things too numerous to mention.

Anyone who is at all interested in the technical side of radio can ill afford to be without The Radio Amateur’s Handbook.

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If you haven’t a copy of The Radio Amateur’s Handbook you are missing the greatest value in radio today.

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AMERICAN RADIO RELAY LEAGUE, HARTFORD, CONN.

Dear Sirs:

Enclosed find my $_______ Please send me postpaid (any where in the world) my _________ copy of the Handbook.

Name ____________________________

Address __________________________

Say You Saw It in Q S T!—It Identifies You and Helps Q S T
The smoothest, easiest-working bug on the market. Not too fast, not too slow—but just right. Works where others can’t.

Janpaned Base $17 Nickel-Plated $19

Special Radio Bug
Equipped with Extra Large, Heavy, Specialy Constracted Contact Points for direct use without relay.

Janpaned Base $17 Nickel-Plated $19

Book Reviews

By Harold P. Westman, Technical Editor


This book is apparently intended for general public consumption in that it treats the subject in that fashion commonly referred to as "popular." It gives
The Jewell pattern No. 580 Radio Test Bench has been designed to provide interconnected, all the instruments necessary to completely check the circuits and general working condition of radio receiving sets and accessories.

The testing panel is steel, black enameled, with all markings engraved directly in the steel and filled with white. The panel carries seven instruments, as follows:
- 0-7.5 volts D.C.
- 0-75 volts D.C.
- 0-150-300-750 volts D.C.
- 4-4-8.16 volts A.C.
- 0-150-750 volts A.C., and 0-1.5-15 microfarads.

The panel is also supplied with binding posts, so that all instruments can be used individually and with switches to cover all ranges. It is also supplied with a plug and cord so that all circuits in a radio set can be tested along with the tube, which may be placed in a socket in the panel. A pair of outlets are arranged to be connected to the 110-volt, 60 cycle, A.C. line, so that line voltage may be read and a set plugged into the outlets. Line voltage is also used for measuring the capacity of condensers.

Our descriptive circular Form No. 2004 describes this Radio Test Bench in detail. Write for a copy.

Jewell Electrical Instrument Co.
1650 Walnut St., Chicago

"28 YEARS MAKING GOOD INSTRUMENTS"

NEW SUPER COILS

TYPE 17 - FOR 20-40-80 m. Receivers, coil-laid supported, space-ground with No. 15 gauge a. c. wire. plug-in, two coil unit type. Plug-in antenna coil. Extremely efficient, of low r.f. resistance, and small field. $4.75

TYPE 19 - Complete, with housing, 15-110 m. $6.75

TYPE 15 - Especially recommended for the Amateur, and Experimenter, same as type 19, except of single coil unit type. Range 15-820 m. Fine for low power transmitters, very flexible in the use. $6.75

Set of 3 coils and mounting $26.00

SRL TYPE 160 Range 15-110. 1% accuracy guaranteed. $15.00

Crystal grading a specialty—Consult SRL for your crystals, that Now—New full bulletins—Write for them

SEATTLE RADIO LABORATORY
"Builders of Good Radio Equipment"
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RADIO OPERATORS WANTED

THE EASTERN RADIO INSTITUTE can train you quickly and thoroughly because:

MODERN AND EFFICIENT METHODS

THOROUGH INSTRUCTION under staff of LICENSED COMMERCIAL OPERATORS

MODERN APPARATUS including SHORT WAVE TRANSMITTER

FIFTEEN years a RADIO SCHOOL

THE OLDEST, LARGEST and MOST SUCCESSFUL school in New England. RECOMMENDED BY THE A. R. R. L.

Day or Evening Classes Start Every Monday.

SPECIAL CODE CLASSES

Write for Illustrated Prospectus

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BOSTON, MASS.

Raytheon
Kino-Lamp

As Pioneers in TELEVISION

We invite correspondence from amateurs in regard to these new Raytheon Products, which are being used successfully in the Television broadcasting.

Kino-Lamp—the first Television Tube developed to work on all systems.

Foto-Cell—made in both hard vacuum and gas-filled extra sensitive types.

RAYTHEON MFG. CO.
Kendall Square Building
CAMBRIDGE, MASS.
Say You Saw it In QST — It Identifies You and Helps QST

Bible Dramas by William Ford Manley,

There is but slight or no convention in the minds of most between radio and the Bible. It might, therefore, not be amiss to say that the reason for this review is that this series of Bible Dramas is published by arrangement with the National Broadcasting Company and covers a dozen stories prepared in such a manner as to make them suitable for radio presentation as well as for church or theatrical use.

The material has been so prepared that each story is complete in itself and although written primarily for radio presentation, makes interesting reading. It seems almost foolish to speak further concerning these when it is possible to get a vastly better and more accurate impression by listening to one of the Bible Dramas as broadcast on Sunday nights over the N. B. C. Network of stations.


This book is not an advanced work on storage batteries but rather, a simplified version as the title suggests. It is apparently aimed at the garage man whose knowledge of electrical equipment and theory is meager and whose radio knowledge is a negative quantity. The author has drawn profusely upon the installation and operating instructions supplied by various storage battery manufacturers. It should have but little appeal to the radio man and perhaps the second sentence in this paragraph goes further towards describing the book than do all the rest.

Standard Time Conversion Chart.

Perhaps many remember the "Time Slide Rule" desribed on page 42 of the September, 1927 issue of QST. This chart is very similar, though in what more detail. The chart indicating geographical locations is divided up to show every 7.5 degrees and the names of the principal countries through which these meridians pass is given. The time is shown from midnight to noon to midnight with the hours running from 1 to 12 rather than from 1 to 24. This may cause some inconvenience but is easily corrected and so should not be very damaging. It is called, Miscellaneous Publication No. 84 and may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents. No stamps or uncertified checks are accepted.

Conversion chart. (Kilocycles to meters or vice-versa.)

At this time when we are endeavoring to think and speak in kilocycles rather than meters, it is of utmost importance that we have some means of making this conversion with the least amount of effort. The Radio Division of the Department of Commerce, under whose jurisdiction the amateur is, are using the factor of 300,000 kilocycles per second in their conversion and this value will accordingly be used by QST. The Radio Division has had charts prepared covering values of from 10 to 29,990 in steps of 10 (the units may be either meters or kilocycles) and these may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents each. No stamps or uncertified checks are accepted.
**Bradley Leak** 2.95
**absolutely noisless and stepless**. 2000 to 30,000 ohm resistance. List $5, special $2.95.

$4. Bradleystat No. B-210
Special .............................. 1.60

Signal Buzzer Set International Code on Board Baseboard $2.45
Belden braid 3/8 inch wide, ft. .06

- **Acme 500 w. plate transformer, 1800-1800 ohms** each side of centre tap $2.45
- **Acme B.L.-1 transformer, 250-510 each side of centre tap**; also 2 mfd., 1,000v D.C. working voltage $1.95
- **Acme C.W. 20 Henry choke**. $1.40; also other sizes at special prices.

- **Neon Glow Lamps**, made by General Electric Co., type C, standard base, 101 uses, as illustrated in QST May issue page 122 $1.75
- **Fleischheim Condensers**, all types 5% off list.
- **Fleischheim Condensers**, all types 5% off list.

**MAIL ORDERS FILLED SAME DAY** 10% Must Accompany All Orders

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**RADIO IN BRASIL**

When in Brasil, apply to M. BARROS & CIA for anything you need in connection with radio.

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70 sob. Rua S. José 70 sob.
Postal Box 89
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Telegraph address, Radioparte, Rio de Janeiro
Branch: Avenida S. João 4, S. Paulo, Brasil

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**DODGE RADIO SHORTCUT**

With Appendix and Hints for Better Key Work. Fixes Signals in mind to stick—Kills Restivation, Cultivates speed and good Fist—Produces Results. Now Hams raise speed to 25 per second in few evenings. Previous failures qualify and pass exam quickly. Beginners master code and pass in ten days.

**DODGE HIGH SPEED METHOD**

(Individual Speed Practice) Quickly puts 25 per second in 3-40 per class. Five Hams report made the gain in few evenings. One of them by 75 minutes total practice only.

**DODGE MORSE SHORTCUT**

Easily mastered by Radio Op. Kills tendency to mix up or confusion. Either code used as desired.

**REPORTS FROM USERS**

Tell the complete story—Mailed on request. Radio $3.50, High speed $2.50, Morse $2.50. Money order. Name C. O. D. Foreign add 50 cents. See our Hamad. G. K. DODGE. MAMARONECK, NEW YORK.

---

**Eighth Edition Just Off the Press**

Robison's Manual of Radio Telegraphy and Telephony

Completely Revised in June, 1928, and Up-to-Date.

Of the 6th edition of this book reviewed by QST it was said this is perhaps

"The Best Radio Book That Ever Came to This Desk"


U. S. Navy, now Director of Naval Communications.

780 pp. Price $4.00 postpaid. 6th edition sold for $8.00; 7th edition sold for $5.50

Address: Secretary-Treasurer, U.S. Naval Institute, Annapolis, Md., U.S.A.
Consulting Engineers

For Short Wave and Transmitting Apparatus

We can furnish you with any type of Radio Experimental Apparatus you might require.

Communicate with us for further information.

E G E R T
SALES COMPANY
179 Greenwich St., N. Y. City

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Short Wave Converter Unit

Complete

$22.50

Special

$22.50

Some of the best entertainment of the air is broadcast on the short waves by many powerful stations. There is no longer any reason why all should not receive these excellent programs from all over the world. The Dresner Short Wave Converter Unit is completely assembled. It efficiently covers a wave band of 15 to 550 meters, and makes reception easily obtainable for all. Offered at the special price of $22.50—complete ready to plug into your receiver in a few seconds. If your dealer cannot supply you SEND MONEY ORDER DIRECT and we will ship P. P. prepaid. GUARANTEED.

DRESNER RADIO MFG. CORP.
644 Southern Boulevard, New York City

---

Financial Statement

By order of the Board of Directors the following statement of the income and disbursements of the American Radio Relay League for the second quarter of 1928 is published for the information of the membership.

K. B. WARNER, Secretary.

STATEMENT OF REVENUE AND EXPENSES FOR THE THREE MONTHS ENDED JUNE 30, 1928.

<table>
<thead>
<tr>
<th>REVENUE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertising sales, QST</td>
<td>$14,100.09</td>
</tr>
<tr>
<td>Newdealer sales, QST</td>
<td>9,910.36</td>
</tr>
<tr>
<td>Handbook sales</td>
<td>3,464.26</td>
</tr>
<tr>
<td>Handbook advertising sales</td>
<td>1,305.00</td>
</tr>
<tr>
<td>Dues and subscriptions</td>
<td>7,694.40</td>
</tr>
<tr>
<td>Back numbers, etc.</td>
<td>809.29</td>
</tr>
<tr>
<td>Emblems</td>
<td>146.85</td>
</tr>
<tr>
<td>Interest earned</td>
<td>309.35</td>
</tr>
<tr>
<td>Cash discount earned</td>
<td>318.65</td>
</tr>
<tr>
<td><strong>Total Revenue</strong></td>
<td><strong>$39,182.26</strong></td>
</tr>
</tbody>
</table>

Deduct:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Returns and allowances</td>
<td>$4,309.27</td>
</tr>
<tr>
<td>Less portion charged to reserve for newsstand returns</td>
<td>1,306.51</td>
</tr>
<tr>
<td></td>
<td><strong>3,002.76</strong></td>
</tr>
<tr>
<td>Discount 2% for cash</td>
<td>272.74</td>
</tr>
<tr>
<td>Exchange and collection charges</td>
<td>16.45</td>
</tr>
<tr>
<td><strong>Net Revenue</strong></td>
<td><strong>35,890.31</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXPENSES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication expenses QST</td>
<td>11,124.47</td>
</tr>
<tr>
<td>Publication expenses, Handbook</td>
<td>1,521.99</td>
</tr>
<tr>
<td>Salaries</td>
<td>14,006.25</td>
</tr>
<tr>
<td>Forwarding expenses</td>
<td>595.24</td>
</tr>
<tr>
<td>Telegraph, telephone and postage</td>
<td>1,066.91</td>
</tr>
<tr>
<td>Office supplies and general expenses</td>
<td>1,860.93</td>
</tr>
<tr>
<td>Rent, light and heat</td>
<td>927.50</td>
</tr>
<tr>
<td>Traveling expenses</td>
<td>723.72</td>
</tr>
<tr>
<td>Depreciation of furniture and equipment</td>
<td>488.66</td>
</tr>
<tr>
<td>Bad debts written off</td>
<td>62.14</td>
</tr>
<tr>
<td>Communications Dept, field expenses</td>
<td>71.30</td>
</tr>
<tr>
<td><strong>Total Expenses</strong></td>
<td><strong>33,279.01</strong></td>
</tr>
</tbody>
</table>

**Net Gain from Operations** $2,611.30

---

Indiana Central Division Convention

Yes Sir! The Hoosier boys know how to run conventions and the Indianapolis Radio Club, who sponsored this year's affair which was held on July 28-29, more than kept up the reputation.

Beginning early Saturday morning delegates began arriving from different parts of the state and the register showed several from neighboring states. The forenoon was spent in getting acquainted and by the time the afternoon session was ready to open every one was on a friendly basis. Promptly at 2 o'clock, Director Darr called the convention to order and welcomed the guests. Then followed some really good informative addresses by F. R. Finehout, 9CLO, on crystal grinding and with practical demonstration. D. J. Angus, the SCM, 9CYQ, understands crystal circuits...
VITROHM Transmitting Grid Leaks and Rheostats now cover the entire line of transmitting tube circuits. The prices on these amateur products are reduced materially. Your dealer should stock Vitrohm Transmitting Products. If you have difficulty in obtaining them, write us direct.

<table>
<thead>
<tr>
<th>CATALOGUE NUMBER</th>
<th>PRODUCT</th>
<th>RESISTANCE</th>
<th>DISSIPATION</th>
<th>CURRENT</th>
<th>MAX. TUBE RATING</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>507-2</td>
<td>Grid Leak*</td>
<td>5000 ohms</td>
<td>44 watts</td>
<td>90 m.a.</td>
<td>100 watts</td>
<td>$2.00</td>
</tr>
<tr>
<td>507-3</td>
<td>Grid Leak*</td>
<td>5000 ohms</td>
<td>200 watts</td>
<td>200 m.a.</td>
<td>1000 watts</td>
<td>2.80</td>
</tr>
<tr>
<td>507-4</td>
<td>Grid Leak†</td>
<td>50,000 ohms</td>
<td>200 watts</td>
<td>60 m.a.</td>
<td>1000 watts</td>
<td>6.50</td>
</tr>
<tr>
<td>507-5</td>
<td>Grid Leak†</td>
<td>20,000 ohms</td>
<td>200 watts</td>
<td>100 m.a.</td>
<td>1000 watts</td>
<td>4.25</td>
</tr>
<tr>
<td>507-51</td>
<td>Grid Leak*</td>
<td>10,000 ohms</td>
<td>200 watts</td>
<td>135 m.a.</td>
<td>1000 watts</td>
<td>4.00</td>
</tr>
<tr>
<td>507-66</td>
<td>Grid Leak**</td>
<td>15,000 ohms</td>
<td>200 watts</td>
<td>120 m.a.</td>
<td>1000 watts</td>
<td>6.00</td>
</tr>
<tr>
<td>507-63</td>
<td>Rheostat†</td>
<td>50 ohms</td>
<td>50 watts</td>
<td>1 amp.</td>
<td></td>
<td>5.50</td>
</tr>
<tr>
<td>507-59</td>
<td>Rheostat†</td>
<td>20 ohms</td>
<td>80 watts</td>
<td>2 amp.</td>
<td></td>
<td>5.50</td>
</tr>
<tr>
<td>507-83</td>
<td>Rheostat†</td>
<td>12.5 ohms</td>
<td>60 watts</td>
<td>2.2 amp.</td>
<td></td>
<td>5.50</td>
</tr>
</tbody>
</table>

* Center-tapped
† De Forest P or R. C. A. 852 Tube
De Forest H Tube
** Steps at 5M—10M—15M for R. C. A. 852 or De Forest P Tube
†† For Primary Control
††† Filament and Primary Control

Ward Leonard Electric Company
37-41 South Street, Mount Vernon, N. Y.

RADIO SCHOOL
Earn $35 to $50 Per Week
The rapid expansion of RADIO has created many new positions on land and sea. Enroll now. New term begins September 10th in both day and evening class. Send for free catalogue.

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18 Bovlston Street, Boston
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although still in an experimental stage, has now advanced sufficiently to enable amateurs to build outfits that will give edifying results.
Write today for our price list of television apparatus.

Photo Electric Devices, Inc.
594 Fifth Avenue Brooklyn, N. Y.

QST OSCILLATING CRYSTALS
AMATEUR BANDS

WE WISH TO ANNOUNCE:

1st.—That now, our crystals are capable of being used with as high a power tube as the 50 watt size.
2nd.—That we do not claim to grind the CHEAPEST crystals, but we do claim to grind only the best which is the cheapest in the long run.
3rd.—That we will ship the closest frequency crystal we have to your desired frequency, and that the frequency of the crystal will be stated ACCURATE to BETTER THAN A TENTH of 1%.
4th.—That all crystals are absolutely guaranteed in regard to output and frequency, and immediate shipment can be made on crystals in the amateur bands. Prices for grinding POWER CRYSTALS to oscillate in the various amateur bands are as follows:

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
<th>Price</th>
</tr>
</thead>
</table>
| 1715 to 2000 Kilocycles | $15.00       | Note: The above prices are effective July 1st, 1928, to be in effect until November 1st, 1928. (Add $10.00 to these prices if crystal is to be mounted in an excellent dust-proof power mounting.)
| Broadcast Band| 40 to 10,000 Kilocycles | $45.00 mounted, $55.00 unmouted. Two day shipment and all crystals guaranteed.

Crystal Service—Will grind a crystal for you accurate to plus or minus 500 cycles of your assigned frequency for $45.00 unmouted, $55.00 mounted. Two day shipment and all crystals guaranteed.

We will be pleased to quote prices on your particular requirement.

SCIENTIFIC RADIO SERVICE, "The Crystal Specialists"
P. O. Box 86, Dept. ZA
Mount Rainier, Maryland

Say You Saw It In QST — It Identifies You and Helps QST
New Tone Brilliance
with a Potter Condenser Block
in your Power Amplifier. Rich,
natural bass tones that possess
a real thrill.

No. T2900
where two 250
Type Power Tube
is used
$20.00

No. T2950
where two 250
Type Power Tube
are used
$22.50

Highly Efficient—Long Life
The Choice of Leading Radio Engineers
Ask your dealer for full information
POTTER MFG. CO.
North Chicago, Illinois

Beginners! Students!
Beginners! Students!
The TELEPLEX Code Sender will make you proficient in code practice—both sending and receiving, in half the usual time. This is the only instrument that reproduces actual sending of expert operators. Sends messages, radiograms, etc., regular code traffic at any desired speed. Endorsed by the U.S. Navy and leading Technical and Telegraph Schools. Complete Set of Instruction Tapes (Wireless or Morse) for beginners and advanced students furnished with the Teleplex. Remember, only the Teleplex provides practice when, where and how you want it. Write for booklet RL.

Silent
Photograph Motor
Teleplex Co., 76 Cortlandt St., New York, N.Y.

and showed the gang what he could do with that small xtal-control portable set. H. F. Weakley of the Esterline-Angus Co. gave a good talk on Radio Instruments. C. E. Dutton of the A. T. & T. gave us a new angle on chain broadcasting and made us realize the advance which has been made in that particular field of radio. The most interesting lecture of the two-day sessions was that given by R. J. Kryter of the Presto-Lite-Battery Co. The subject of Rectifiers and Filters was handled in a masterly way. A. A. Hebert, Treasurer-Fieldman, from A.R.R.L. Headquarters, discussed the 1929 problems with which we amateurs will be faced, and told us what was being done by Headquarters to help relieve the situation.

Former Division Manager R. H. G. Mathews, Lt-Commander, U.S.N.R., brought a naval personnel with him, and enrolled 22 of the delegates present into the Naval Reserve. Matty is certainly a worker and if he continues the same pace he will have the best Unit in the service.

When we speak of Banquets we always think of those night affairs which are scheduled for 7 o’clock in the evening and let every one starve until 8 o’clock, but this banquet was another departure from the conventional—it was held in the afternoon; a real Sunday afternoon dinner.

There were so many nice things that took place that space prevents mentioning everything, but we will say that the good prizes donated by the manufacturers had to be won. The closing of the affair took place shortly after the dinner but not before OM Burns had had a chance to regale us with his entertainers—they were good too—and we now know he has an eye for pulchritude.

—A. A. H.

The New England Division Convention
Held at Augusta, Maine.

THE Maine A.R.R.L. Convention held at Augusta, July 13 and 14 was acclaimed by those who attended the biggest and best affair of the kind ever held in the Section. The Convention Committee secured the full cooperation of many state and local agencies in “putting it over”. Chairman L.A. Burleigh Jr. (1KE), Secretary Fred Best (1BIG) and Leslie Hall were responsible for the fine arrangements. For those who drove from all parts of New England and New York large banners and signs pointed the way to Ham Headquarters at the Augusta Y.M.C.A. and bid the delegates welcome.

The opening sessions were held in the Senate Chamber at the State Capitol. After the address of welcome by Mayor Mc-
Synchronous Motors for Television

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.

ELECTRIC SPECIALTY CO.
225 South St.  Trade "ESCO" Mark  Stamford, Conn.
New Data Book Now Ready

The new Frost-Radio 16 page Data Book, just off the press, is ready for mailing. It contains a great deal of valuable information regarding circuits but also technical data on rheostats, variable high resistances, filter condensers, etc. We have aimed to make this a complete authoritative manual of interest to every reader of QST. Write for your copy today, enclosing 10c to cover cost of postage. Also contains full information on the new Frost-Radio items for 1928.

HERBERT H. FROST, INC.
Main Office and Factory
Elkhart, Indiana

37 Barclay St. New York City

The Short Wave Set
That Backs Its Claim

TYPE "P" S.W. Receiver—portable—embodying all the latest developments in H.F. design. Compact, quality job—size 6 in. x 9 in. Can be used on permanent or portable installations. Equally fine results on either S.W. broadcasting or code reception. Finest grade material throughout, Vernier dials, latest type small diameter low-loss coils. 3 plug-in coils supplied, covering 15 to 115 meters. Uses standard UX 201A or 199 Tubes.

KIT $32.50

TYPE B.L. High grade S.W. Receiver for either S.W. Broadcasting or Code reception. Same as model "P", designed especially for permanent installation. Drum meter. Both of these receivers will give fine results, receiving American stations in foreign countries.

KIT $30.00

If you prefer to have these sets assembled, tested, and ready to operate, enclose $1.00 extra to cover cost of work.

LOW WAVE LABORATORIES
37 Barclay St. New York City
We manufacture complete line of transmitting apparatus

ENCLOSE STAMP FOR CATALOG

Lean, the traffic session was conducted by S.C.M. Best and the C.M. from A.R.R.L. Headquarters. Code contests were next held for groups of novices, amateurs, and commercials. The crowd adjourned to the “Y” for a buffet lunch. Stunt night in the “Y” gym was under the capable direction of Physical Director Mahan. Everyone got acquainted and had a good time. Prizes were awarded those who excelled in the different contests. From the “Y” the gang went to the Central Maine Power Co. Auditorium for a dance and jamboree under the auspices of the C.M.P. Co. Girls Club.

Saturday morning a sight-seeing tour was the chief feature of interest. In the afternoon the Technical Session was held in the C.M.P. Co. auditorium. L.C. Brown of IAQD demonstrated his ten-meter equipment in a very interesting way. L.B. Root of General Radio discoursed on crystal control. F.E. Handy exhibited a portable receiver and mentioned some of the considerations in its design. The 125 delegates assembled at the Augusta House for the big banquet which was broadcast through WCSH of Portland. "The Song of the Short-wave Ham" written by IHE featuring T.O.M., the Wouff Hong and Retty-switch was sung, broadcast, and placed on sale following the convention. A silver cup donated by W.J. Lee, 1BCY-4XE-NRRG, as a Naval Reserve award for the individual amateur and reservist in Maine, N.H., Vt., and Mass. for achievement in the past year was awarded to Evans of IOC-1BFT with appropriate remarks. This identical cup will be awarded and engraved annually. After other prize awards and speeches by Hon. Wm.R. Pattangall, L.B.Root, F.E. Handy, Ralph Given of the C.M.P. Co. and A.A. Hebert, A.R.R.L. Treasurer-Field Man had been broadcast, the wire to Portland was opened. The remainder of the evening was spent in hamfesting and perusing three reels of movies sent up from Hartford.

During the convention a special ladies program was provided for those not interested in the technical sessions. A local drug store provided free soft drinks for the thirsty delegates. An amateur station in operation during the convention was much in evidence as a window display. Those in attendance were able to attend moving pictures at the Colonial Theater free at any time by showing their badges. Movies of the convention sessions and stunts taken by the Portland Press Herald were shown throughout the state during the next week as a special feature. Daily Reports of convention doings in the Kennebec Journal were of interest to the delegates. Bills for the next annual convention were made by representatives of Portland and Bangor and the Queen City Radio Club of the latter city is already working on plans for next year.

—F.E.H.
The new Air-King Short Wave Kit consists of three plug-in coils, ranging from 15 to 130 meters (when tuned with a .00014 mfd. condenser), and a plug-in base, with variable primary, which is soldered with phosphor bronze flexible connections to permanent antenna-ground binding posts on the base. Each coil is accurately space-wound on a bakelite squirrel cage form, with ribs threaded to lock each turn in place.

Friction holds the variable primary in any position it is put in. Double contact between coil prongs and the jacks in the base assure perfect connection at all times, from the moment of inserting coils.

Send for free booklet on hook-ups and descriptions of coils.

If Your Dealer Can't Supply You, Order Direct

Mfd. by AIR-KING PRODUCTS CO.
216-WALL ABOUT ST.
 BROOKLYN, N.Y., U.S.A.

QUARTZ OSCILLATING CRYSTALS

Unconditionally Guaranteed

1 in. sections ground to 1% of your specified frequency at these prices:

| 40-75 meters | $55.00 |
| 22-100 meters | $45.00 |
| 100-200 meters | $10.00 |
| 200-300 meters | $15.00 |
| Tested blanks, 2 to 5 mm thick | 5.00 |

Sections of any practicable dimensions made to order. Prompt Delivery

J. T. Rooney, B.Sc., 31 Calumet Bldg., Buffalo, N.Y.
"Ten years crystallographic experience"

BECOME A RADIO OPERATOR

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

LEARN IN THE SECOND PORT U.S.A.

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

Nearly 100% of radio operators graduating on the Gulf during the past six years trained by Mr. Clemmons, Superintendent of Instruction. Start training now for fall runs.
Member of the A.R.R.L.—Call "G G B" Day and Night Classes—Enroll anytime—Write for circular.

GULF RADIO SCHOOL
844 Howard Ave. New Orleans, La.

FLECHTHEIM
SUPERIOR CONDENSERS

Dear OM:

You will soon be busy again at work on your transmitter, or designing and building that new power pack you've had in mind. Flechtheim Superior Condensers have created an enviable name for themselves, for they are dependable and at the same time very reasonably priced. Complete line of By-pass, Filter, High Voltage, Transmitting and special condenser blocks for the 171, 210 and 250 power amplifier tubes. Write for catalog X Tex, 0M 05 pse QSL. 73's to JA6S, Chief Engineer.

Complete Line From 250 to 3000 V. D.C.

A. M. FLECHTHEIM & CO., Inc., Dept. QT, 136 Liberty St., N. Y. C.

Say You Saw It In Q S T — It Identifies You and Helps Q S T
For Better TELEVISION

Just as CLAROSTAT has pioneered in super-reception, B-eliminators, socket-power receivers and quality amplification, so is it ready to pioneer in television. CLAROSTAT, with its precision resistance fitted to the exact needs, is ready to meet the ultra-critical requirements of television technique. It is for you to ask for CLAROSTAT engineering cooperation. Meanwhile, typical of what CLAROSTAT can do are the following:

Neon Lamp Control
The Standard CLAROSTAT is indispensable for applying a critical voltage on the neon lamp for the desired contrast between light and shade. A satisfactory image, with sufficient detail, depends on proper direct-current voltage for normal glow, but low enough to permit of ample contrast with increased brilliance due to signal modulation.

Scanning, Disk Control
Positive synchronism of receiving and transmitting scanning disks is obtained by means of special point-contact silicon rectifiers for momentary speeding up of motor to the proper step with transmitter. This arrangement is standard practice in most television receivers.

WRITE for our literature and for any special data you may require.

CLAROSTAT MFG. CO., Inc.
285 North 6th St., Brooklyn, N. Y

PACENT DUO-LATERAL COILS

For laboratories, experimenters, engineers and for special circuits, Pacent Duo-Lateral Coils are the accepted standard.

A complete line of all standard turn ratios are always in stock.

Write for information and prices

Pacent Electric Co., Inc.
91 Seventh Avenue, New York

Hey, am - have you ordered ur copy of Andy's handbook?

FREE Wholesale Radio Catalog
Set Builders-Dealers! Save Money!
Send for the most complete book of nationally known parts, kits, cabinets, consoles, speakers, power units, belts, etc. All at lowest wholesale prices. Quick service on all your needs. Write now, it is FREE.

SETBUILDERS SUPPLY CO.
Dept. 16-1 Remsen Bldg. Madison and Market Sts. CHICAGO, ILL

The Zepp
(Continued from Page 56)

quency by the amount $X$, which has the effect of shifting the voltage antinode $V_a$ from a point directly opposite $V_b$ along the wire away from the point directly opposite $V_b$ by the same amount $X$. In order to maintain the whole system in resonance with the desired frequency it is necessary to so adjust the feeder tuning as to in effect reduce the length of the feeder system by the amount $Y$. The current and voltage distribution in the two feeder wires is no longer symmetrical, and the two radio frequency ammeters A-A will not indicate equal values of current. We therefore shorten the length of the antenna by the amount $X$, and return the feeder input circuit until the system is again in resonance. The two meters will now indicate approximately equal values of current, and the voltage and current distribution will be proper as shown in A.

There should be a current antinode (voltage node) at the center of the antenna inductance when the condition shown in A of Figure 6 prevails and this may be checked by touching the center turn with a neon lamp or point of a wooden-handled screw driver. There should be no glow from the lamp or spark from the screw driver.

In the actual process of adjustment, the antenna inductance and tuning condenser arrangement is connected to the input end of the feeders, as shown in Figure 7. The two ammeters are located equal distances from the top end of the feeder system, which also makes the distance from the antenna inductance and condensers to each meter equal. Therefore, when the current as indicated by the two meters is the same, there will be the proper distribution of voltage and current in the feeders and antenna. The length of the antenna, which we made a full $\frac{1}{4}$ wavelength long in the first place, is cut off by about six inches at a cut until the difference in current as indicated by the two meters is not more than about ten percent. It should be remembered that the current as indicated by the meters may not be, and very probably is not, the maximum current in the feeders. The maximum current would only be indicated when the meters were located at current antinodes, which is not likely to occur in many cases. The importance of the readings of the two meters is not how much current they indicate, but the ratio of the currents at these two points opposite each other on the feeder system. If the distribution is perfectly symmetrical this ratio will be one to one, or both meters will read the same. The screw driver or neon lamp test on the center of the antenna inductance should indicate zero voltage at that point when the two meters indicate equal current, as mentioned above.

Figure 7 shows a suggested arrangement of the input end of the feeder system for
UNI-RECTRON POWER AMPLIFIER

(IDEAL FOR USE WITH DYNAMIC SPEAKERS)

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

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

The volume and quality delivered will be a revelation.

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

LIST PRICE $88.50 (Without Tubes)
Special $19.75 EA.

SEND FOR OUR LISTS OF RADIO BARGAINS
AMERICAN SALES CO., 19-21 Warren St., New York City

To Our Readers

who are not A. R. R. L. members

Wouldn't you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only amateur association that does things. From your reading of QST you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on page 6 of every issue. We would like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio. You will have the membership edition of QST delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

A bona fide interest in radio is the only essential qualification for membership.

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

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

........................................................................................................

..........................................................

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

........................................................................................................

Thanks
the amateur station where quick QSY with a minimum of time and effort is desired. The connections between the antenna inductance and parallel tuning condenser should be "low loss" and with plenty of cross section to carry the tank current. The parallel tuning condenser should be capable of carrying the tank current without heating and should have a voltage rating approximately the same as that of the plate circuit tuning condenser of the transmitter. Its capacity may be around 250 µfd. The series condensers may have a lower voltage rating but should be of the same quality, their capacity being also about 250 µfd, maximum. L is the usual antenna inductance of about 5 to 10 turns. When the parallel tuning arrangement is being used, the two series condensers are set at maximum, and when the series tuning arrangement is being used, the parallel condenser is set at zero.

---

Zero LB suggests that the cover designs by 8ZZ should be signed something like this:

Darr! Darr! Darr did it
Darr! Darr did it
Darr! Darr did it

That General Radio plugs will screw into Sango fixed condensers is a point that should be of interest to anyone who wants to use plug-in condensers for any purpose.

—7MJ
Protection at Last
Bunnell Combination Protector and Circuit Breaker or Plate Overload Relay

"Those Precious Bottles" -
Secondaries of high voltage transformers, choke coils, etc.
All can be protected from damage by an overload through the installation of a Bunnell Plate Overload Relay. Inserted in the negative "B" lead they will open the "B" supply instantly, if an excessive current is permitted to flow (as adjusted). The instrument is supplied with a vernier operating current adjustment, alarm contacts and manual reset. Number 10268 — $12.50 each—Schedule BB.

For those who prefer to have an additional set of contacts to break the 110 volt line at the same time we can supply our No. 10268-A, with additional contacts normally closed. They open only when the instrument trips.

SPECIFY IN EITHER CASE YOUR NORMAL OPERATING CURRENT SO THAT WE MAY SUPPLY THE CURRENT ADJUSTMENT RANGE.

J. H. BUNNELL AND COMPANY, Inc.
Manufacturers of Telegraph & Radio Apparatus
32 Park Place
New York City

SPECIAL OFFER TO AMATEURS

Barawik's new shortwave guide has everything that amateurs desire. The Barawik Radio Guide gives full details. Send 25c for it.

FREE RADIO BARGAINS

To your station that puts out over. Batter down QRM, hordes of stations, lifts em clean over the rope. Takes a mercury are to do it. The rectifier of unlimited power, life and performance. Read what the same ones. Write now and your rectifier problems are solved.

RECTIFIER ENGINEERING SERVICE
4837 Rockwood Road Radio 8ML Cleveland, Ohio

The A.R.R.L. Diamond Is the Emblem of a Real Amateur!

The League Emblem comes in four different forms. Its use by Members is endorsed and encouraged by the League. Every Member should be proud to display the insignia of his organization in every possible way.

THE PERSONAL EMBLEM. A handsome creation in extra-heavy rolled gold and black enamel, 1/2" high, supplied in lapel button or pin-back style. There are still a few fellows who are hiding their light under a bushel. Wear your emblem, OM, and take your proper place in the radio fraternity. Either style emblem, $1.00, postpaid.

THE AUTOMOBILE EMBLEM. Introduced only this spring, already more than 300 cars are proudly displaying the mark of the "Radio Rolls-Royce," 5 x 2 1/2", heavily enameled in gold and black on sheet metal, holes top and bottom, 50c each, postpaid.

THE EMBLEM CUT. A mounted printing electrotype, the same size as the lapel button, for use by Members in any type of printed matter, letterheads, cards, etc. $1.00 each, postpaid.

THE "JUMBO" EMBLEM. You've taken care of yourself, your car and your printing. How about the shack wall or that 100-footer? Think of the attention this big gold-and-black enamel metal emblem will get! 19 x 8 1/4", same style as Automobile Emblem. $1.25 each, postpaid.

Mail your order and remittance NOW to

If you insist on the best, they must hand you Tele vocals. All standard types. Ask for them at your dealers.

TELEVOCAL CORPORATION
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Dept. R-3, 588 12th Street
West New York, N. J.

Don’t Forget
That the A.R.R.L. Emblem is the badge of every real Amateur.
It is available in various sizes for button, pin, auto or radio­mast.
“That ham may recognize ham —display the A.R.R.L. Emblem.”
American Radio Relay League, Hartford, Conn.

TRANSFORMERS
Guaranteed—Mounted—Complete
250 watt 550—700 each side ........................................... $10.50
700 watt 1000—1500 each side ........................................... 14.50
700 watt 2000—2500 each side ........................................... 21.00
1 Kw 2000—2500 each side ........................................... 30.00
Add $2.00 for fil. winding

SCES F. GREBEN
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ROBERT S. KRUSE
Consultant for Shortwave Devices
103 Meadowbrook Road,
West Hartford, Conn.
Telephone Hartford 45327

The Fifth Age
(Continued from Page 39)

in ED. Anyhow I puts my best cq into getting acquainted, and before long we sound like two old maids at a ham convention. We walks on past the store, and neither one of us thinks anything about stopping. Our minds and my heart had qseyed liked someone had hanged a boarding house wash on my counterpoise.

Before either of us knew anything about it we were in front of her house and I was still holding on to her books.

"Sa," I sez, “would you get mad if I asked you something?”

“I don’t know," she sez, “Go ahead and ask it.”

I clears my throat, and like I was starting in to send one of those reliability msgs, I asks:

“I got a bid fer a frat dance and no date. Will you—Will you—er—go with me?”

She smiles sweetly or do I imagine it and sez:

“You will have to ask father.”

That comes in R9 and sounds like bad qrn on a Saturday nite.


“When is he home?”

“Every evening,” she sez. “He will be glad to see you.”

“Yea;” I says, “just like he does a hill eollector, and then he will be glad to see a bootblack.” Just then her ma announces that if she expects to eat she had better get in and start to work.

I started walking home feeling as happy as a guy that has called an aussie and gets an R8 report only to find that he failed to get the last dot on the call. I had an idea what the qso with the old man would be like. I would step up sa hello and then provide the house with a new exit. A light bulb rose over my head. ‘rhat was the reason CBY had laughed at me. He knew that I would get enough punishment to make up fer all the qrn I had ever caused him.

Anyway the next eve I goes over to the house per sked and asks for Helen. She takes me in hand and shoves me in a small room off the living room.

“Father,” she sez, “I want you to meet Bill.”

“Pleased to meet you,” he sez between throwing out condensers, voltmeters, monkey-wrenches and etc. out of a receiver that he had his head stuck in.

“Trouble?” I queries in a small meek voice.

“No. Not at all,” he sez, “I am just taking my daily dozen.”

“Oh,” I sez and he immediately straightens up and I began a hurried search fer an exit.
"Do you know anything about a radio?" he asks.
"Very little," I sez, "What is the matter?"
"This thing won't work worth a darn, and I got a bet with one of the boys down to the office that I hear better dx tonight than he does."
"Do you hear anything at all?" I asks.
"Not a blankety blank thing," he returns.
"Ah, that sounds easier," I sez and sticks my head in the cabinet. If I can only fix the set I thought to myself I sure will be in good wid the old man. I looked through the whole thing without seeing a thing wrong, and in moving around to get a better look I feels a loose wire wid my foot. One look and I saw that the B bat lead fer the R.F. tubes was nil here. So I hooked it up when he wasn't looking and then I put my head inside again. When he was looking again I pulled my head out of the set and sez:

"There, I'll bet the thing will work." I turned the switch and immediately the room was flooded with music. He looks at me like I was the radio congress kicking the hams off the air fer good.

"Your sure a wonder. How in the world did you do it?"

"Well," I sez thinking of Peck's theory, "the syncronating by pass condenser was fowled with the neutralizing oscillating listening fer dx. He waved did you do it?"

"Ah, that sounds easier." I sez and

"Do anything you want. I have lost too much time now."

"Sure is ok with me." I sez and bids Helen an affectionate goodby using 88's as

On my way home I jus't began to wonder what CBY was so happy about. I will have."

"Sure is ok with me." I sez and bids Helen an affectionate goodby using 88's as

About aussie time we return and the old man is as happy as a youngster with a new seven and a halfer. He has a list of W's as long as an unraveled filter condenser.

"Just wait until I tell the gang about this," he sez, "it sure will make 'em sit up and take notice," and he chuckles to himself in anticipation of the great time he will have.

"Sure is ok with me." I sez and bids Helen an affectionate goodby using 88's as a standard.

On my way home I just began to wonder what CBY was so happy about. I will make him laugh up the other side of his face when I tell him about the hit I have made.

It is one month later. I have sold my tube fer twenty bucks, and my filter fer ten. Still I can't see just what the laugh of CBY's meant. Sure a funny thing. Guess it will be an unexplained mystery like the origination of static.

Oh, yes. I forgot to mention that CBY has a nice note with that new fifty of his.

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HAM-ADS
ANNOUNCEMENT

Effective with the October, 1928, issue of QST the following changes will be made in the rules of this department. The Ham-Ad rate will be 15c per word. The restriction which has limited use of this column to members of the American Radio Relay League will be removed and advertising may be signed either by company name or by an individual. A special rate of 7c per word will apply to advertising which is obviously non-commercial in nature and which is placed and signed by an individual member of the American Radio Relay League. Please read carefully the following conditions under which advertising in these columns will be accepted.

POWER crystals tested 600 volts. New 80 meter band $15.00, 40 meter band $22.50. 90RD, Edwarsville, Kansas.

PURE aluminum and lead rectifier elements holes drilled brass screws and nuts, pair $1.50 volt, $1.00 square foot prepaid, $1.00 or more. Silicon transformer steel cut to order .014" 10 lb. 25c, 5 lb. 50c, less than 5 lbs. 35c lb.. .022" 5c less per lb. Not cut down kits at still lower prices. Chargers that will

---

Say You Saw It In Q S T — It Identifies You and Helps Q S T
charge in series up to 160 volts $2.75 to $4.00. Trickle B Charger for 90 to 150 volt "B" $3.75. Special transformers for batteries up to 6,000 milli-amp capacity, any voltage. Write for prices.

Jewelers, watch repairmen, mining companies, etc. B. Hawley Smith, 360 Washington Ave., Danbury, Conn.

For a number of years we have been supplying the highest quality phonograph records and accessories to radio, broadcast, experimental, marine and amateur stations. Building to order as well as standard items for any period style of the art. Our long experience is your guarantee of quality. Merely state the items in which you are interested for literature covering same. Thos. Ensall, 130 Grandview Ave., Warren, Ohio.


L. J. Ryan, 90N. 5,, Hamibat, Mo.

FOR sale—complete station receiver DET-2 and two step tuner DET-15 connected with meters, etc., $150.00. 39G. 3661 Rutler Street, St. Louis, Missouri. SALE only.—Grice 18, new condition, fifty dollars. George H. Smith, Chetleri, Penn. SANC.

SELL or trade: Western Electric portable 20-ma. telephonic transmitter-station, complete, $40.00. RCA transmitter model ET-5619 Kontron power unit, etc., model ET-5620 complete, $90.00. Rectifier tubes, meters, coils, etc., Real Estate Grazia. Write for bargain list. VESAC, Box 212, Telephonic Zones, Quebec. LARGE 22½ volt Rayovac batteries, etc. RCA 50 watt, original cartons, $12.00. REL 50 watt sockets, $1.50, 6 months guaranteed new. 216A, etc. 25 each $4.50, 6 months guaranteed 201A's and 191B's. Radiotone 2 meter tube checker, $2.00. Resistameter 49C. RCA 535 resistors 25, the rest all sizes, 16c, Willard storage B batteries $1.50, Rodal silen 214 and other Great Plug-in-Battery switches 29c, Federal transformers $1.19, pure aluminum 1/10" thick, sq. ft. 80c, Electroline 6000 ohms, etc., 2.50, 5000 ohms 500 ohms 5", inch. Bakelite panels 2 sq. in. Amateur Cell Boys, Westboro, Alta. Four volt socket power $5.25, six volt $7.50, Branden prisms $5.50. Free list, everything for hams. D. L. Marks, 125 Madison St., Chicago, Ill. LOOK—SEY'T selling out. Write for list! UX882 never used. $27.50. Set Aero coils. $6.00. 12 Jewel meters chosen. Complete transmitter and receiver. $20.00. SEY'T Lincoln, Illinois.

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FOR sale: No. 811 Jewell Service Test set, complete with battery, complete test set, will service all kinds of sets and tubes. L. W. Van Slyke, Ironwood, Michigan.

FOR SALE—Jewel No. 34 0-15 volt AC $3.00; Jewel No. 55 0-300 ma d.c. $3.00; Weston No. 301 0-600 ma d.c. $5.50; 2 Jewels Nos. 94 0-8 amps TC $4.00 each. Jewell No. 55 0-8 volts d.c. $2.50; General Radio hot-wire 0-7 amps. $1.50. Also four Xyals SRS at different frequencies in 160 meter band at $7.00 each. R. A. Donnelly, 2CPD, Binghamton, N. Y.

QST: Will your wavemeter do next year? Does it cover the ten meter band? We'•ll rebuild it to meet the new requirements. We calibrate amateur wavemeters to an accuracy of one fourth of one per-cent. Two backs home-made meters, three parts each from standard frequency crystal oscillators. All work guaranteed. Higher degree of accuracy if desired. We are always trying to make our wavemeters better. Write for dope. Something new, center-tap kit for filament transformers. Ask us, QRX We can save you money on all standard radio apparatus. Write for prices.

SOMETHING FOR YOUR NOTEBOOK! Complete diagram and three page explanation RCA 200 watt 500 cycle ACW transmitter. See July hamadio price fifty cents. C. O. Silfield, 8 LA. Frankfort, Michigan.

WANTED—power filter and rectifier supply for 250 watt tube. C. J. McDonald, Dresser Junction, Wis.

Hams: Get our samples and prices on printed carded cards made to order as you want them. 8APY Hinds, 2162 S. 8th St., St. Louis, Mo.

FOR sale or trade. Delco light plant 10 amp. 32 volts no batteries, in A1 condition. Worth $55. Want 1000 MG set. Will pay difference. SARV, Early L. Mallette, Box 31, St. Louis, Mo.

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TRADE Conn. C melody saxophone and case for REL apparatus or GR type 358 wavemeter, Westboro, Mass. At 901 C. E. Peterson, 2719 Price Ave., Cincinnati, Ohio.

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CHOKES, 30H 100 M.A. $2.00, 30H adjustable 150 M.A. $6.00, 250 M.A. $7.50. Transformers, 500 to 1000 each side midpoint, 250 watt $8.00, 325-525-75 to 75. $5.50, 525 to 755-5 4.00. Complete new lists and specifications ready. M. Leitch, Park Drive, West Orange, N. J.

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COMPLETE 60-watt short wave transmitter with power supply, tube rectifier, wave meter and specially built receiver. This is a first class, complete, powerful transmitting and receiving station for which I have no further use due to use of business interests. Parts are finest obtainable, consisting of Acme, Thordarson, National, General Radio, Weston, RCA, etc., and cost over $400. Will sell everything complete for $1500 cash and guarantee chassis first class condition. List of parts on request. K. N. Ford, Apt. 3-3, 7010 Continental Ave., Forest Hills, Long Island, N. Y.

WESTINGHOUSE Radio frequency ammeter. Type CAY, with 0.1 ampere with protective shunt. Switchboard

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WANTED: Surplus parts laying around your shack for cash. State catalog numbers and condition. Write me for used parts bargains. Big stock and quick service. Radio SLO, Ohio.

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290 Watt motorgenerator 110 Volt AC drive $45.00; 300
Watt $65.00. 400 Volt generators $8.50. Couplings $7.75.
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1734 Grand Ave., Chicago, Illinois.

WANT good dynamotor, resistance amplifier and five to eight hundred volt generator. E. V. Casey, TI2, Casey, Washington.

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Contributes

Type PL 5728 High Potential Battery [108 volts, taps at 72 and 108 volts]

In keeping with its policy of assisting in the experimental development of the art of radio, Burgess Battery Company contributes a high potential battery particularly necessary for the successful operation of the receiver used in radiovision, television, and other methods of reception where there is the transference of an image, moving or stationary. In photo electric cell experiments, the PL is indispensable. Also can be used for airplane radio, plate supply.

"Ask any Radio Engineer"

BURGESS BATTERY COMPANY
MADISON, WISCONSIN
Scandinavian-American Short-Wave Tests

RADIOLETTEREN of Copenhagen, Denmark, is sponsoring a QSO Contest which will take place between 0000 GMT Oct. 23 and 2400 GMT Oct. 30. Scandinavian amateurs (prefixes LL, EM, ED, and EB) will work between 20.8 and 21.4 meters and 43 and 47 meters. They will listen for North Americans in the 20- and 40-meter bands, and for South America in the 30-meter band. All certificates will be awarded by Radioletteren in proportion to the number of points scored.

Each contact must include the sending and receiving of at least ten words. Working the same station twice will not give extra credit. Complete data of each QSO, including log and conversation exchanged, must be mailed to A.R.R.L. headquarters if you're on this side of the Atlantic) immediately after the test. November 27th is the closing date for reports from other American participants. A.R.R.L. will forward the reports to Radioletteren.

Scandinavian contacts with Newfoundland, with Canadian first, second, and third inspection districts, and with U.S. first, second, third, fourth, and eighth inspection districts, and with Panama, Mexico and Central America, count ten points. South American amateurs may claim three points each. Respective scores on the side of the Atlantic count the same. Scandinavian contacts with Alaska, with Canadian fourth and fifth inspection districts, with U.S., fifth, sixth, seventh, and ninth inspection districts, and with Panama, Mexico, and Central America, count ten points. Summer and fall are ideal times for experimenting on ten meters because it is then that one can freely think with radiating systems without discomfort. Putting up a low ten-meter horizontal antenna in the open is not a hard job—building a good reflector wires for directional transmission is not as difficult as might be supposed—at least not for a ten-meter job. Constructing a framework for a ten-meter reflector so that the antenna as well as the line of propagation can be varied is a little harder. However, this is something that all of us in a position to do so should try if we possibly can. It is a job that can be tackled best at this season. A commercial 11-meter reflector was described in the Proceedings of the Institute of Radio Engineers for November 1927. We have a bunch that the chap who tries something of this kind will be able to break through consistently in spite of conditions that make signals from ordinary antennas pass out of the picture. All who take part in and report on our tests with whatever equipment they can muster and either positive or negative results and the next step will be two-way communication with the U.S.A. and the rest of the world on ten meters.
The Carnegie of the Department of Terrestrial Magnetism has just re-established contact with the U.S.A. at this writing. Working both 2AVB and 1MK on the night of July 28 from a point 300 miles east of Cape Farewell half way between Iceland and Greenland. The expedition left Reykjavik July 27. The 1MK (position report) handed 2AVB on the 29th was relaxed and delivered by 3G6P on the 30th. On August 3. "IJ" was again QSO 1MK and the soak and sweep again cleared both ways of a bunch of accumulated traffic. The schedules for the following days were rendered useless by local electrical storms in the U.S.A. 1ABD raised WSSS on the night of August 7 taking a good report for QST which we quote below. The Carnegie is now coming southwest in mid-Atlantic toward Barbados and Balboa. When you hear WSSS on 22. 24. 25. 26. 28. 29. 30. 31. 32. and 33. 34. and 35. 36. 37. 38. 39. and 40. do give "IJ" a call and help with the traffic OM. Your reports on WSSS signals sent via ARRL will be appreciated, too.

"From WSSS.

"Since my message of June 8. have visited Newfoundland, Hamburg. Germany, and Reykjavik. See story next week, ""A message"" in next QST. My signal was in London three days and dropped in on the R.S.G.B. office. Unable meet active hams in Hamburg as most are operating under cover. I found but one active station in England and six in the U.S.A. the operator was away for the summer. Saw very nice commercial and broadcast layout there though. We are now off Grand Banks. Newfoundland expect to arrive Barbados September 14. Had a good time and look at my first iceberg last night as we passed within 50 ft. of a big one. It was surprising to find one down here at this time of the year. From June 8 until a few days ago, we lost practically all contact with the U.S.A. NAA'S was the only station which followed us constantly, and hams were heard on any wavelength for two months. Contact with European stations was fairly good during that time. We put up a higher antenna July 8. Since contact with 1MK was lost established, have experienced two more dead nights during which both of which was observed. Have schedules with NKF, 1MK, 2AVB and 45-4AU. Other stations worked are: QX-GBB, QX-4PP. QX-4YL, QX-5VT, QX-046A and 1BI-L. As we have time to QSO more or less every evening, we should appreciate all possible reports on our signals from hams. The work of the expedition is progressing nicely with magnetic, atmospheric, electrical and oceanographic observations being made almost every day. The weather has been pretty cold most of the time although it was quite ""summery"" in Reykjavik. See you next shed. 23, (msg) Larry Jones, operator, Yacht Carnegie.""
About Disqualification

10ICMP has been disqualified as a prize-winner in the International Relay Contest. Evidence received from several sources against him as an off-wave offender, after copy had been turned in, proved conclusively that he had no right to receive prize money. It is thus entitled to some of the good things donated by the manufacturers.

TRAFFIC BRIEFS

Participants in the International Tests were protected against the likelihood of possible error by careful consideration before claims were allowed. It was interesting to note that there were no complaints against a number of participants serving the same lists as those actually disqualified which appeared in August QST. The marker stations NAA and WIZ were helpful to observers and participants alike.

We have it indirectly that 1IC used crystal control during the International Tests. This makes it hard to understand the mass of evidence received from points all over the country resulting in his disqualification for off-wave operation. 1ICMP, also disqualified, claims to have used an "stal" rig and suggests that "harmonics" may be blamed for some of the reports against him.

Though it is hard for us to find adequate explanation in this single word, it appears that the best of sets cannot behave. Recent complaints by amateurs against energy radiation from a high power commercial station QRMRing several parts of our 5000-4000 kc. band in the east at the same time it worked on its regular frequency—also the points made in a letter appearing on page 64 of August QST—lead us to wonder if some of these transmitters are operating simultaneously on two frequencies. This has been proved possible and perhaps practical in an I.R.E. paper.

Then again we can consider the possibility of receiving on a new frequency on a point near the transmitting station, perhaps a rather remote possibility. Also it is a fact that some crystals can be made to oscillate at two or more frequencies in certain conditions. If a crystal is near the edge of an amateur band then the change of frequency due to temperature changes in the crystal is important. On excellent authority we have it that this frequency variation is approximately one thousandth of one percent for each three tenths of a degree Centigrade (which is 250 cycles per second) becomes kilocycles when the crystal gets nice and hot.

Independent reports from many unprejudiced and reliable observers leave no room for doubt in the justice of the disqualifications of the Award Committee. Very possibly some well meaning amateurs (due to carelessness in checking waves and a strong intention of operating exactly on the edge of the band) suffered the penalty with those guilty of purposely working off-wave. It is impossible to discriminate between these. Both classes of operators hurt amateur radio. If any of the considerations in the paragraphs above can be considered an explanation of off-wave work it seems to us that a monitor box and an accurate wavemeter in every amateur station is the answer.

—F. E. H.

BRASS POUNDERS' LEAGUE

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Omitted last month:

3ZP 68, 42, 157, 230. 6ADH 83, 2, 165.

Again op1HR leads! Special credit should be given the following stations responsible for over 100 messages in the message-month: 6ALX, 6SEZ, 6AMM, 6CDR, 6BME, 6CFQ, op1HR. Deliveries count! All stations appearing in the Brass Pounders' League are noted for their consistent good work and reliable message-handling work in amateur radio.

A total of 200 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 qualify you for B.P.L. membership also.

TRAFFIC BRIEFS

Alaskan traffic seems to go best through 6DPW, 6FA, or 6CLZ.

OZZAG furnished the New Zealand press with dope on the Southern Cross during its flight over the Pacific.

VESBE and OZ2ME handled messages of congratulation and regret respectively to Tunney and Heeney during the recent pugilistic encounter.

1AOF and 4OC relayed a message from an African missionary to his wife at Cape Cod, Mass. 40PM was the African station. 2KR stood by to aid in case he was needed.

The "Twentieth Century Limited" route from New York City to Chicago has been greeted with approbation from all quarters. We have heard some talk of someone extending the line to the west coast. This will be a good job for the coming season. Whoever does it will surely deserve some credit, as there are fewer stations and longer distances along the way. Who will be the "western SZF"?

na7AD in Big Port Walter, Alaska, keeps us well supplied with news of that territory. He says that there are lots of hams up there at the various commercial stations. Ex-7BB is just two miles from 7AD through rock (and eight miles the usual way).
VQFO is the call for the short wave apparatus of the S.S. Beothuk of the Canadian Government Arctic Expedition. Ross Smollett of VQFO was the operator. The outfit will be QRV amateur contact and virtually will depend upon the gang in emergencies.

Fermenting grain in the hold of a helpless ship nearly asphyxiated twenty men who were effecting salvage near the Philippine Islands. op1DR was on deck (literally and figuratively) and got medical instruction via amateur radio from a source 300 miles distant. All hands saved it!

Don Mix's airplane flight has suffered all the delays that are common to flights these days, and is now in fair prospect of leaving. The call will be KQAS, with crystal controlled signals on 20.28, 35.4, 40.02, 35.65, 46.74, and 76.5 meters. For other details, see article on page 47 of July QST.

After a bump take-off which partly wrecked it, the Rockford-to-Stockholm plane is being rebuilt to start again. Call letters are KQAH; and the signals should come through on approximately 38 meters.

160 METERS

Mimeographed material for beginners who want to get started right on the 160 meter band has been prepared and will be sent to anyone requesting it. A list of volunteers, with their schedules of transmission, appears in the bulletin, telling just when you will call them and for whom to listen when you want code practice. In this issue of QST a special article, The Traffic Scope for 1928, has been written purposely for the beginner. Get the joy of creating your own apparatus by building one of these!

More volunteers are needed for the code practice transmissions. If you can keep one or two schedules reliably every week, you will be more than glad to set yourself down in supplements to the 160 Meter Bulletin as one of the volunteers.

THE U. S. NAVAL COMMUNICATION RESERVE IN FLORIDA
BY WM. JUSTICE LEE

CAPTAIN C. D. STEARNS, U.S.N., then Commandant of the Seventh Naval District, began the organization of the Volunteer Communications Reserve in his district in February 1925. A Lieutenant in the Reserve was designated to take charge of the work. But on his return, three enlisted men were in this district in the Communication Reserve at that time. Slowly but steadily enrollment and appointments were made. By December 1925, the personnel had increased to 84 officers and men of whom 16 are Communication officers. The officer personnel also includes 8 medical officers and 1 supply corps officer whose principal work is in connection with Communication Reserve activities. All service is performed without pay.

Since its inception, the Communication Reserve has enrolled among its members, the owners and operators of 24 amateur radio transmitting and receiving stations located in the largest Florida cities and in many smaller cities. The Navy Department, through cooperation of the Department of Commerce, has assigned two stations of the Reserve radio personnel, navy call letters MR6G-EF7 and ORNO-4XM at Orlando-4AR, and 4E7 at Jacksonville. The Headquarters of the 7th District Reserve are at Orlando, Fla., where 36 Communication Reservists are enrolled. The Navy Department has furnished uniforms to such Reservists as are located adjacent to a Unit Headquarters. Units have been enlisted at Orlando, Jacksonville, St. Petersburg, Tampa and other points. NERQ (Orlando) usually works NAR (Key West) three to five times a week and recently assisted in establishing contact between NAR and a Navy vessel at sea.

On Armistice Day, November 11, 1927, the Orlando Unit of the Communication Reserve participated in the memorial parade, and its members turned out 100 per cent strong for the occasion. His Excellency John Martin, Governor of Florida was escorted by members of the Naval Reserve and Company K of the Florida National Guard.

The purpose of the Volunteer Communication Reserve is to enroll and train radio and telegraph operators in Navy methods and procedures. Commercial and amateur operators are enrolled, if found qualified. They receive news bulletins and written courses of instruction and are afforded an opportunity to become acquainted with expert radio men in all parts of the United States. Each year a selected number of men have been afforded the opportunity of shore radio station duty with full pay for two weeks, and in some especially desirable instances, radio men have been sent on summer cruises on board U. S. Navy Destroyers where they have been assigned to stand radio watches at sea. Communication Reservists in addition to being trained in Navy Radio procedures also instruct to some extent in the Manual of Arms and infantry drill.

During the past two years, Captain Robert W. McNeely, USN, has been Commandant of the Seventh Naval District. His efforts and cooperation at all times has made possible the continued progress of the Volunteer Communication Reserve. This branch of the Seventh District Reserve is under the command of Lieutenant Commander Wm. Justice Lee, USNR, who has had charge of it since its inception in February 1928. He was originally qualified for aviation duty, general service, but transferred to Communication duty at his own request, on account of his interest in the Communication Reserve work.

Officers and men (photo) of U.S. Naval Communication Reserve, Orlando, Fla. Armistice Day, Nov. 11, 1927. Note the following amateurs in uniform: 4BE, 4UA, 4ACR, 4WR, 4XE, 4ACR, 4ADB, 47T, and 4NU.

TRAFFIC BRIEFS

89ME of the Western New York Army-Amateur Net, reports that 8APG, SAHK, S8PG, SCVJ, SACH and himself, all members of that net, have been handling messages by the hundreds for residents in that section of the country, the Finger Lakes region. The most noteworthy part of his letter states that all messages must contain substantial material that takes some thought to prepare, and is of interest to amateurs thru whose hands it passes. In other words, no rubber stamps are used.

MILLY AMPS AND MIKE ROW FADAD
THE HAPPY THERMO COUPLE
8M5S and 1WV use 5"x5" cards to keep data on
stations worked. These cards are filed in a little
box under the 25-speed. Men wanted on dial
settings, QRH, etc., it’s all there and
takes just a moment to find.

9APY says that 9BW sees that there are two Costa
Rican amateurs who QSO in all but Spanish. Good
chance to brush up on your Spanish, OM. They are
not listed at 9BE. 8M5S, just above until July 1st
are supposed to be on the air every night but Sunday
from about 10 to 11 E.S.T.

Who got the news across to Germany first about
the landing of the Bremen? Marconi? Nar-1AVJ
did it five minutes after the AP let it out. ek4UAH
was the lucky boy in Germany.

A unit of the Volunteer Communication Reserve,
U. S. N. R., has been organized at Wilmington,
Del. It meets each Tuesday evening to instruct men
in code and theory. An interesting mimeographed
bulletin is published from time to time. Present
at the headquarters station for the Fifth Section is
3AUV, which uses crystal control on 40 and 80
meters. Where 3AUV cannot be heard, 3AIS will be
ready to accept traffic for 8AUV. The matter of men
going on voluntary cruises of 15 days this coming
summer was taken up at the monthly meeting of
officers, and it was decided that men in any rating
might take this cruise provided there are vacancies.
The cruise will begin July 1st, and will include
goings on, voluntary cruises of 15 days this eom ing
summer. * * *

The organization of an employee amateur network
has recently become known to many members of the
Hawthorne Club of the Western Electric Co. in Chicago.
In their evening school they conduct one class per
week, where a short wave program is given, and
during noon hours, they conduct a code class. An
attempt is being made to stimulate interest in ama­
ateur radio, and all employees of the A. T. & T.
System who are amateurs are wanted in the network.
So far stations in New York, Chicago, Atlanta,
Philadelphia, New Zealand, and Ontario have joined.
Beam schedules for the stations in the network
are being arranged, and the employe amateurs,
besides getting a lot of enjoyment out of the work,
find opportunities to offer service in emergenner work.

The Los Angeles Times published an item which
should make some of you off-wavers wise. Here it
is: "This isn't the first time that advertising agents
here today despaired of establishing satisfactory
communication with the Wilkins expedition at Point
Barrow. The agents have whirled the thirty-three-meter wave used by
the Wilkins transmitter and although the Seward
station listened for three hours, it was not able to hear
signals from the expedition."

From ec2GC we hear that Great Britain's YL sta­
nion, ec2YL, is very anxious to QSO ND. She is on
44.9 meters, as a rule, and has arippily DC note.

9GZ-ZG and 9WSA have been keeping a
daily schedule. They work break-in, sending simple
and as fast as you like—weight up on bug. Can break
each other by one dot. We ought to have more of this
kind of stuff.

1FL and 9EB carried on an excellent two-way phone
program, and a month later L.A. SW7S played three phonograph records, and signal strength
was such that one of the records was audible twenty
feet from the speaker.

The Veteran Wireless Operator's Association will
award two scholarships for attendance at the Radio
Institute of America, donated by the Radiomatic
Corporation of America, in addition to 2 already
by A. H. Grebe. Awards will be made to two
applicants for six months after the successful
of the best essay on 'Why the American Merchant
Marine Needs Perfect Wireless Communication.' Com-
ment is invited and must be to Mr. Benjamin
Marecuk, Secretary, Veteran Wireless Operator's Asso­
2 Room 1899, Hotel Roosevelt, N. Y. C.

While a trans-Pacific liner was on route from
Shanghai, according to the New York Sun, a Chinese
station called them and sent the following service
message: "Greetings of the Moonbeams and the Rose
Buds. May you enjoy never-ending prosperity and
your union be blessed with seven sons. Goodby, hello,
and leave you a very pleasant message for my station."—A polite
way to say QTC, eh what?

Mr. Robert Langmuir, a BCL short wave
concert of Englewood, N. J., reports hearing nixixL call­
ing nuaAZX. He says 1X1 was 93 dc.

The National Convention of the Photographers
Assn. of America held at Louisville, Ky., was a
success. As was announced by 3AUV, broadcast to League members, the Louisville amateurs
originated messages to all photographers in the United
States extending invitations to attend the convention.
The results were even more than expected, and the
boys in Louisville wish to take this means of thanking
the stations at the receiving end for their delivery of
the messages.

SAGE was asked by a Harrisburg lady to try to
locate her brother in Newark, N. J., who had not
been heard from in 22 years. She had tried the de­
partment of police in Newark, but had been unsuccessful.
SAGE got on the air and QST'd for QSO Newark.
He worked a lady in Brooklyn, who received
the man's name in the Newark phone directory. The
man had changed his name which explains the
inability to locate him. SAGE was obtained from the man in question, and
the family re-united. SAGE says, "The people around
Harrisburg thought it was something wonderful, for
for years it followed, it was an amateur message to deliver
which was minus an address."

6AAU, who went to Alaska last year as xn8ADJ, is
going north again on S. S. Arctic, and will carry
low power SW transmitter for ham work.

8C9F is conducting a series of phone tests with
ox3AR. 8C9F uses 40 meter CW, and the Zadder
uses 83 meter tone.

5C8LZ has a sked with 9AEJ on 20 meters every
Saturday, and keeps him in touch with relatives in
Berkeley. 1AEJ is on St. George Island, in the middle of the
Behring Sea. There are only four white people
on the island, and mail from the outside arrives only
close every six months, so amateur radio is the
means to the outside. The only means of outside news.

The Whittier Radio Club recently put on a fine
A.R.R.L. meeting. There were 105 members present, and entertainment consisted of
an excellent 2nd, music by a strictly ham orchestra,
and several interesting talks. L. E. Smith, former
Director Babcock was read, and Mr. E. M. Arrow,
the present SCM, presided over the meeting, and 6AM, the present
SCM, was among the speakers. A message from
Director Babcock was read, and Mr. H. B. Watson,
engineer for the Federal Telegraph Co. gave an
interesting talk on the duties of a commercial op.

Nu6AM and ox2YT had a QSY party the other day.
They established QSO on 40-meter band at about 1010
CST, and after working a while, both went down
the twenty-meter band. They worked there until
things got a bit monotonous, and then 6AM shot
up to 79 meters, leaving 2Y2 on 20. QSO was
carried on in this fashion for a while, and then 6AM
dropped back to his original 4-meter, and 2Y2 came
back up to his original 32-meter location. All
this was accomplished within an hour or so, and
looks like it may be a record of sorts. A very
simple sending was single, and signals were good on all
waves. This was all overhead by SCEI and reported
to us.

COUNTING RUBBER STAMP MESSAGES

Because, now and again, stations fall back into
the habit of originating rubber stamps. The so-called 'rubber-stamp' messages with such texts as
'Your card received will QSL', 'greetings by radio' and the
like, it becomes necessary to re-affirm our policy with
respect to such messages. A history of our
publication shows the demoralizing effect of an influx of
such stereotyped messages in quantity. Because such
messages mean little individually and because there
is much labor and little pleasure in handling such
messages the result has always been a decrease in
the delivery column while the totals of originated
and relayed messages rise to unprecedented heights—that mean nothing at all. Because the net effect of encouraging rubber-stamp messages is to clog the low-power calling stations until these stations can no longer function, it was decided long ago to kill large quantities of such messages at their source. Therefore, good messages promptly and not counting the rubber-stamp sent out today for the report under the honor system. Several arguments in favor of ‘greeting’ messages have much in their favor. These have been given in the Correspondence Department of QST during the last year. While there is nothing against and much in favor of having a revived friendly greeting messages which do have significant value in their general use, it is necessary to maintain a firm policy with respect to counting rubber-stamp messages to further efficient traffic handling and good percentage delivery in our national scheme of affairs. The League’s system for crediting points for messages handled is based on giving one credit each time a complete message is handled by amateur radio, i.e., one credit for each originated message, one credit for each delivered message and two credits for each relayed message (one credit for the work in receiving it and one for work in transmitting it). Changes in this plan of crediting were considered and turned down by vote of the Section Managers late in 1927.

Obviously, a station in handing a rubber-stamp message has to exert only a small amount of effort in receiving the text and signature once. To hand a complete message to different points on group a large number of messages (7) can be received and transmitted in similar fashion with little expenditure of effort. The italicized statement regarding counting or not counting rubber-stamps is here with amplified to credit honest effort as it deserves, while discouraging quantities of rubber-stamp messages handled by radio complete with preamble, address, text and signature counts one-no partial message shall be counted. Possession of a claimed credit of the following:

1. If a station takes an R.S. message (10 addresses and relays it onward to another station or claims a relayed 20’ for his work, this station shall be credited with a recred or 2’ on receiving a complete preamble, address, text, and signature, one for sending a complete message on its way. For receiving and relaying to three stations (requiring the complete message to be sent three times) a total of four might be justly claimed in the relaying column.

1 MK

The following schedules are up to date:

3 ACB 11:45 a.m. — 1:45 p.m.; Mon. and Thurs., 7:15 p.m.
1 HIG (50) Mon. and Fri., 7:00 p.m.
15 IQB (50) Mon. and Fri., 9:00 p.m.
20 KNY (50) Mon. and Fri., 7:50 p.m.
1 UE (50) Thurs., 7:55 p.m.
1 VBO (90) Tues. and Fri., 7:45 p.m.
1 VFB (40) Sun., 9:15 a.m.
HEIM (50) Sat., 9:45 p.m.; Mon. and Thurs., 7:15 p.m.; Tues., 9:15 p.m.; Fri., 9:15 p.m.
2 CMT (50) Mon. and Fri., 9:30 p.m.
50 P (50) Mon. and Thurs., 9:45 p.m.
25Z (50) Mon. and Thurs., 7:45 p.m.
3 IE (80) Thurs., 11:00 a.m.
4 XG (40) Sat., 7:30 p.m.
6 GHW (40) Tues., 12:30 a.m.
80TS (50) Fri., 12:30 a.m.
67X (40) Fri., 12:30 a.m.
66X (40) Mon., 11:40 a.m.
60G (80) Mon., 1:00 a.m.
6 GD (80) Wed., 1:00 a.m.
6 WAG (50) Sun., 11:15 p.m.
66G (50) Mon., Thurs., and Fri., 9:15 p.m.; Tues., 7:15 p.m.; Thurs., 9:30 p.m.
62Z (80) Sun., 11:30 p.m.; Thurs., 9:30 p.m.
68 (80) Tues. and Fri., 7:15 p.m. (VESAL on 40 meters)
6 APY (90) Tues., 9:00 p.m. (APY on 40 meters)
68N (40) Mon. and Fri., 11:15 p.m.
69X (80) Sun., and Thurs., 11:30 p.m.
68 (50) Mon., and Thurs., 10:15 p.m.

All the latest OFFICIAL and SPECIAL BROADCASTS are sent simultaneously on 41.93 and 83.86 meters from 1MK at the following times (E.S.T.):

8:00 p.m.: Mon., Tues., Thurs., and Fri.
10:00 p.m.: Mon. and Fri.
Midnight: Sun., Tues., and Thurs.

PERIODS OF GENERAL OPERATION have been arranged in order that everybody may have a chance to work HQ. Usually these general periods follow one of the special briefs. They are listed under FORTY and EIGHTY meters.

EIGHTY METERS:

8:10 p.m.—9:00 p.m. on Sun., Mon., Tues., Thurs., and Fri. Official Broadcast sent preceding these general periods.
10:00—11:00 p.m. on Tues. and Thurs.
12:00—1:00 a.m. (or later) on Sun. night (Monday morning).

FORTY METERS:

10:10—11:00 p.m. on Sun., Mon., and Fri. Official Broadcast sent preceding these general periods.
12:00 p.m.—1:00 a.m. on the following nights (actually a.m. of the day following): Sun., Tues., Thurs., and Fri. Official Broadcast precedes these periods.

1MK operates on 750 kc. and 857 kc. (41.93 and 83.86 meters) and belongs to Robert B. Parmenter, formerly of 9WR, now chief operator at 1MK. Other familiar signs are "OHI" of Louie Ruber, "FIR" of F. E. Handy, and "AH" of A. A. Hebert.

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were turned in on or before the closing dates that had been announced for receipt of such petitions. As provided by our Constitution and By-Laws, when a 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 candidates. (The officials will welcome your monthly activity reports.)

Section

Address

Indiana

D. J. Angus, 9CYQ, 310 Illinois St., Indianapolis.

J. W. Gullett, 5AKP, 1705 23rd Ave., Columbus, Ohio

H. C. Storeck, 9BCC, 929 Carpenter St., Columbus.

Iowa

H. W. Kerr, 9DZW, Little Sioux.

No. Dak. B. S. Warner, 9DYY, 309 Fourth Av., Bismarck.

Vermont

Clayton Paulette, 1TP, North Troy.

Kansas

J. H. Amis, 9CET, 915 Lincoln Ave., Topeka.

Texas

R. E. Franklin, 5OX, 1806 Valentine St., Houston.

In the Maine Section of the New England Division, Mr. Grover C. Brown, 1AQL, 209 North Main St., Brewer, Maine and Mr. Frederick Best, 1AQB, 13 East Crescent St., Augusta, Maine were nominated. Election results: Mr. Brown, 19; Mr. Best, 6. Mr. Best has therefore been declared selected. At this writing elections are being held in the Oklahoma and Utah-Wyoming Sections by mail ballot, the results to be announced at a later date.

No valid nominating petitions were received from the following Sections before noon of July 28 so that the closing date for receipt of petitions was extended. These Sections, this candidate shall be declared elected in at least one of those Sections. Attention is called to the detailed notice on pages 51 and 52 of August QST soliciting nominating petitions from several Sections. Please get busy for your candidates where necessary.

TRAFFIC BRIEFS

8DSP used to keep a daily schedule with nclBL and one of the messages he delivered was from 1BI to a relative in Sarnia, Ont. A four-page letter of real appreciation and thanks from the addressee was DSP’s reward for mailing the message. The following brief quotation will serve to show the spirit of the letter. “Mr. Brewer is making your worth felt in all parts of the country, and it is very generous of you folks. Your work is a very good thing for all concerned, and the people should be thankful for it. I am very thankful for your good work and services.”

An inner-organization has been formed among some of the members of the Radio Operators Club of Spokane, Wash., known as the Royal Order of Spokese. It will be noted that there are seven letters in the word Spokane, each of which represents one of the seven degrees through which the candidate
must pass. The Seven Degrees follow: First, (S), Seven QSL cards from seven districts or interme-
diates, to show that seven stations have been satis-
didate mmt be on the air at least seven hours
mtry night at 10 :00 p.m. E.S.T. on 77.S m<>ters.
then, the: delivered to seven Spokane addresses within 2.1
hours of receipt. Third, (O), Oath—The station of the can-
didate must be memorized. Fourth, (K), Knowledge—Seven test questions must be answered to prove their knowledge of amateur
radio. Fifth, (A), Activity—The station of the can-
didate must be kept
on duty during ~June.
Sixth, (N), Neatness—The station must be kept
radio. Fi1th, (A), Activity-The station of the can-
didate must be kept
on duty during ~June.
Sixth, (N), Neatness—The station must be kept
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radio. Fi1th, (A), Activity-The station of the can-
didate must be kept
on duty during ~June.
VIll OHS for the last four years. Mr. Holbrook has been in the radio industry since 1927. In 1978, he retired from his position as an editorial staff writer of the San Francisco Chronicle. His office was located in the Oakland office and has been married for six years. Yes, there is a young one too.

A. D. TRUM

SCM Alabama, entered amateur radio in 1917. Trum’s station, 5AP, holds many fine traffic and DX records to its credit. The SCM is an accountant for the Alabama State Highway Dept. and Associate Member, I.R.E., and has been both operator and announcer at WIBZ, Montgomery’s municipal BC station.

BRUCE STONE of 6AMM has been doing some exceptional schedule work with the Philippine Islands for the last three years. We’re giving you his photo so you’ll know him the next time you “see” him on the air. Bruce thinks it pays to mail messages when radio QSR is not possible within forty-eight hours, because he has received from appreciative addressees the following: “1 pr bedroom slippers; 1 Javanese table cover; 1 Panama hat; 2 bottles perfume; and other things such as calendars.” Not bad, OM, not bad.

FREDERICK M. HOLBROOK

SCM Eastern New York Section, entered amateur radio in 1921, and his station, 2ONS, has been an OHS for the last four years. Mr. Holbrook is 58 years old, and earned his BS degree from Columbia University in 1927.

EARLE F. PEACOX

Peacox, former SCM of the Eastern New York Section entered the fifth stage of amateur radio last April. We have known as 2AJE in the spark. In the spark days, Peacox has handled the following calls since 1927: 2ADD, 2ADH, 2CIL, 2DD, 2AIM, 2AXR, and 2AJE. He is now “up” at 2UO. In the past, Peacox has held several positions in the A.R.L. (American Radio League) Publicity and Communications Dept., and is a freelance writer on various papers and magazines.

According to WJZC, Route Manager of Iowa, the dots and dashes will be sent at approximately the same length during 1928. In the latest release (in which we learned the above) nothing was seen of a peacoat on the probable length of spaces between the dots and dashes. If some of this does not improve we’ll expect to hear some more rotten QSC.

The Ass’t. C. M. had the pleasure of short-circuiting the output of 1MK’s mercury are with his left hand the other day. A thirty ampere fuse in the 220 volt side of the transformer was blown, and 1MK went off the air for fifteen minutes. Otherwise no damage was done except that a couple of fingers were burned slightly.

9WOP wrote in the other day with the following query: “I have very often received Marconigrams from my No. 1 Broadcast Receiver. In fact, I get them every night. All of them are signed ‘North, the Otto Dreiwag.’ Now, I have been unable to QSR on account of insufficient address. Is this guy Dreiwag that sends so many Wireless Grams?” Please, oh, please, fellows, look up Dreiwag for us so that we may answer 9WOP’s little letter.

Tax . . . tax . . . tax — yah, but what do u do in return? 1UE suggests DMI, meaning don’t mention it. Now let’s hear it on the air.

On several occasions 5UK and 5ANG have been ready to handle emergency press or traffic following the severe winds and electrical storms that have swept that part of the country but have not been able to do useful work as the expected wire failure did not occur.

Here’s a radiogram received at 1MK from one of the SCM’s, whom we suspect to have entered the fifth (married) stage of radio existence; “Dear OM disregard my funds for the last three years. We’re giving you his photo so you’ll know him the next time you ‘see’ him on the air. Bruce thinks it pays to mail messages when radio QSR is not possible within forty-eight hours, because he has received from appreciative addressees the following: “1 pr bedroom slippers; 1 Javanese table cover; 1 Panama hat; 2 bottles perfume; and other things such as calendars.” Not bad, OM, not bad.

9APY was eating dinner the other day when a lady from Clayton, Mo., to whom he had mailed a message a few days before, called him on the "far distant" thru his central operator, wanting to know if he would pay the $1.75-for-three-minutes charge while she gave him a reply message "I I I".

Don Good of 6AJM maintains one of the most reliable schedules with the Philippine Island. The fellow at the other end is op1AD, 69Q, SCM, says in a letter, referring to 6AJM: “His skeds are reliable and it is nothing unusual to receive messages handled in one morning to run up anywhere from twenty to forty. Every message received by him is verified by mail as well as forwarded via radio. Incidentally it is proving quite costly in his postages bill runs rather high.”

Lloyd of 8CFR reports re-establishing contact with the Vyatt-Brazil expedition through 8BIAW on August 14. The expedition had not been heard from during the month before this date due to trouble with Indians and un-navigable rivers and it was a relief to many to hear that “all’s well.” 1ASM succeeded in hooking GMD direct on August 18 but had some trouble with QSR.

It seems practically certain that a strong parasite in a forecast of 83 meters—one which would be copied in England as readily as the within-band signal—was responsible for the evidence turned in from different quarters against 1CMP.
Twentieth Century Limited express message service associated. Good luck to you, Maneval. Things are lucky work. Connecting channels can be seen by junior YL op. C., congrats. trick at the key at 2iz-F, with whom he will be associated in a short while and will take a residence in Phila. in a short while and will take a new transmitter. 8BR.M 16, 8CEO 15, 8DNO 35.

WESTERN PENNSYLVANIA—SCM, A. W. McCauley, 8CEO—Please note on page 3 of QST where you are supposed to report, fellows. 8BBJ and 8BYX have been combined and are now operating under the call of 8DNO. 8CFR reports that GMD has not been heard for three weeks. 8CNZ has moved again. 8CVJ is busy with telephone work. 8CQ and 8CFV were SCM visitors. 8CEO and KDHU took a three weeks trip through the south, visiting several hams en route. The SCM would like to hear from a few stations with keyers who would be interested in official observation work. Also those desiring to handle traffic and wgo do not now have an ORS.

Traffic: 8GI 39, 8CFR 25, 8CFV 21, 8CNZ 20, 8BRM 16, 8CEO 15, 8DNO 35.

EASTERN PENNSYLVANIA—SCM, J. B. Morgan, 8QJ—This month’s traffic of total is rather good. It is in large part due to reports run up by 8CQ in his Twentieth Century limited express message service from N. Y. to Chicago. Try to route your western traffic over this channel, fellows, and watch the speedy channels. Some channels can be seen referring to page 49 of the August QST. 8EU will be located in Phila. in a short while and will take a trick at the key at 8JF, with whom he will be associated. Good luck to you, Maneval. Things are pretty slow at 3QP. 8AKB had some QR.M in the transmitter. 8AGM also rebuilding for next year. 8AWJ is an up and coming new station. Our SCM reports that 8DNO will be at camp next month, 8AKZ will be at camp next month, 8ARX handled some traffic. 8BMP expects more traffic in Sept. 8BRD has been off the air due to bad transmitter trouble. 8BMP worked all OCGM and some 7AEB. 8CNT worked 29 stations in six hours one day, but QRN killed good reception. 8CNX is rebuilding very slowly and may be ready by Sept. 8CFV is off until the fall season begins. 8CSW has been at Alfred Univ. for the summer but makes over to Cook Academy # off a few mags. now and then, 8CQJ was off of line for a few months. 8CLY put out a few mags this month. 8DLD says he has an R9 YL now so sizes have changed for a while. 8CMX last has made a change in his area, and has been changing the transmitter and is going to have 1500 watts DC ready by Sept. 8DME worked Australia and Germany and handled other traffic. 8DNR is at camp but managed to handle traffic there. 8DPQ has been busy getting 8ALJ ready for fall work, etc. 8DUN says he is coming back to work and turn in some real results.

DIVISIONAL REPORTS

SOUTHERN NEW JERSEY—SCM, M. J. Lotysh, 3CFG—3CFG again lead in spite of blowing up his transmitter. A new set is being planned with another 3CFG as a plate of the new 200A. 3CFG had a chance to be famous. With his shack full of press reports trying to get out news of Capt. Carranza’s death, his tone 20A got cold feet. 3CFG requests his ORS to be cancelled. Sorry to lose you, Walt. 3COO also rebuilding for next year. 3BBW still rebuilding for next season. Off till fall. 3COO’s ORS has been reinstated, 3ARN is an up and coming new station. With the next reports he will be on the air and we get let’s get back to work and turn in some real results.

Traffic: 3CFG 24, 3BBW 6, 3ATJ 7, 3CO 2, 3ARN 3.

WESTERN PENNSYLVANIA—SCM, C. S. Taylor, 8PJ—The midsummer reports this month are fair and much progress was taken with the new building. A new club has been formed which will be known as the Syracuse Society of Transmitting Amateurs and will be located in the new building stations around Syracuse. Their object is to give 100% service to the ARRL and their Secretary is H. C. Keffer, 8CRT, Oriskany, N. Y., who awaits your application and membership. 8AHC has worked on, and oz. 8AIL will be at camp next month. 8AHC will be back in 3EWC but handled no traffic. 8AXN is off for the summer but will be on again about Sept. 8AXH handled 99 mags. FB. OM. 8BBM has been busy getting 8ALJ ready for fall work, etc. 8BMP has traffic and handles some traffic. 8BMP expects more traffic in Sept. 8BRM has been off the air due to bad transmitter trouble. 8BMP worked all OCGM and some 7AEB. 8CNT worked 29 stations in six hours one day, but QRN killed good reception. 8CNX is rebuilding very slowly and may be ready by Sept. 8CFV is off until the fall season begins. 8CSW has been at Alfred Univ. for the summer but makes over to Cook Academy # off a few mags. now and then, 8CQJ was off of line for a few months. 8CLY put out a few mags this month. 8DLD says he has an R9 YL now so sizes have changed for a while. 8CMX last has made a change in his area, and has been changing the transmitter and is going to have 1500 watts DC ready by Sept. 8DME worked Australia and Germany and handled other traffic. 8DNR is at camp but managed to handle traffic there. 8DPQ has been busy getting 8ALJ ready for fall work, etc. 8DUN says he is coming back to work and turn in some real results.

INDIANA—SCM, D. J. Angus, 9QMV—9AIN leads the section in schedules by virtue of his activity on the Ten-meter Band from Elkhart. Beginners sit in with him nightly for code practice. 9EZ handled a bunch of mags with portable stations connected with the Academy. 9ERT handled a stack and says he will build a 1229 xmitter. 9CRV comes next. 9FAP served duty for C.M.T.C. men for a while. 9BYJ is the early bird—he arises daily at six for schedules. 9CNO worked OA on 20, 9FB tries 10 meters. 9ASX took 10 meters. 9ERX at the Naval Academy writes that he is busy with work but keeps his WNP. 9CRI is runner-up for ORS. 9CNO has been changing the transmitter and is going to have 1500 watts DC ready by Sept. 8DME worked Australia and Germany and handled other traffic. 8DNR is at camp but managed to handle traffic there. 8DPQ has been busy getting 8ALJ ready for fall work, etc. 8DUN says he is coming back to work and turn in some real results.

Traffic: 8AHG 5, 8AIL 9, 8ARX 99, 8BBG 8, 8BMJ 13, 8BRD 9, 8CNT 7, 8CYJ 1, 8CYB 2, 8DHH 1, 8DME 17, 8DNE 25, 8DSP 69, ex8WU 1.

CENTRAL DIVISION

MARYLAND-DELAWARE—DIST. OF COLUMBIA—SCM, H. H. Layton, 9AIS—J. L. Ryan, 9SWJ (Acting SCM)—Dr. Layton, our SCM, has gone on vacation for two weeks to Saskatoon, Canada and boat. Let’s wish “Doc” a good time. Yes, he took off in his new DC system on his transmitter. 9ATV has a new plate supply and has been changing the transmitter and is going to have 1500 watts DC ready by Sept. 8DME worked Australia and Germany and handled other traffic. 8DNR is at camp but managed to handle traffic there. 8DPQ has been busy getting 8ALJ ready for fall work, etc. 8DUN says he is coming back to work and turn in some real results.

Traffic: 9AIS 9, 9SWJ 22, 9AKB 87, 9AVK 42, 9AJD 16, 9CEJ 25, 9CWO 9, 9DHT 99, 9DNO 15, 9AWO 7.

OHIO—SCM, H. C. Storck, 8BYX—Some Ohio ORS are getting good totals for this time of year. 8CMB takes the lead this month with 88 mages. 8BBM follows closely with 87. 8BYX with 84. Important traffic. 8DHT handled some traffic for WNP. 8CRI is runner-up for ORS. 8CNO has been working with her and 8DNS wants more work on his new DQX. 8SDS wants more work on his new DQX. 8BMP has been at the South Bend and 8AUX will be on the air as soon as things start cooking.

Traffic: 9OX 22, 9ATY 15, 9BAN 10, 9AZY 17, 9AIS 1, 9MN 2.

OKLAHOMA—SCM, F. C. Storeck, 8BYX—Some Oklahoma ORS are getting good totals for this time of year. 8CMB takes the lead this month with 88 mages. 8BBM follows closely with 87. 8BYX with 84. Important traffic. 8DHT handled some traffic for WNP. 8CRI is runner-up for ORS. 8CNO has been working with her and 8DNS wants more work on his new DQX. 8SDS wants more work on his new DQX. 8BMP has been at the South Bend and 8AUX will be on the air as soon as things start cooking.

Traffic: 9OX 22, 9ATY 15, 9BAN 10, 9AZY 17, 9AIS 1, 9MN 2.
operates mostly in the daytime. S90Z admits being busy with the YLS. S90Q blames the heat but says he's found a way to work.
JOE.CA the first of Sept. where he will try out the Boy Scout camp. We will lose him this fall and he will go to college at GA. Tech. He will be employed as an electrical engineer. He has been studying dentistry. 5AJK reports no station on 10 meter band and he is going off to college in the fall as he is leaving to take up advanced aviation. 5NAU is quite for the time being. He is going off to college and his transmitter is silent at this time as he is one of the directors at the Boy Scout camp now so his transmitter is silent at this time as he is one of the directors at the Boy Scout camp.

NEW YORK CITY & LONG ISLAND—SCM, M. B. Kahn, 2KR—Action is being taken by the SCM to establish the section of other ORSs. The next report is due, many who are indifferent to the meaning of an ORS certificate will no longer have valid tickets. It should be understood that monthly reports are necessary to the retention of an ORS appointment as the activity that is expected of every ORS. The new RMs are 2BGO for Manhattan, 2BBX for Long Island, and 2ALU for Bedford. The SCM has been the L. I. RM for some time but has received little or no cooperation from the L. I. Stations. The SCM is preparing for Station of the Year and wants as many of the fellows as possible to try for the job are invited to send me this application.

MANHATTAN: 2ALU is going strong from his new QTH and expects to better his record of last winter. 2BA and 4DX are the owners of 2ALU. 2BGO still keeps his nifty ham sheet "The Xmitter" going. 2BGO is quite for the time being. He is going off to college and is using crystal now. 2BGO reports nothing new. 2SF has a fine 210 500 cycle transmitter.

BROOKLYN: 2PFV is at Ft. Monmouth, N. J. for a vacation. 2UJ is having trouble with a BCL's superhet receiver. 2BDM just got his MO-PA going now. 2AJL can't get many mags. from the gang.

SOUTHERN NEW YORK—SCM, F. C. Diehl, 0BYG—9CHB is the new owner of 2ALU. 2BBX is receiving reports from every ham that is on the air. 2AOS will shortly change his (CRA. 2ABC is handling very little traffic. 2TC is on the air at 0700, 2TQ is QRV, 2AOP is in the air. 2CP is working nights in the air. 2CPS is QRV with a 210 500 watt station. 2CPS is working nights in the air. 2CPS is QRV with a 210 500 watt station.
soon. 9CBE is having a big rush of business this time of year. 9BQR has finally got down to 20 and walks out right smart. Good for you Art. OB, 9CBK will be on WEF later. The RM and 250. 9CBE is keeping three daily sids, 9B1P sets fed, club dope. Keep the SCM posted on traffic news and send the AM your skeds promptly.

Traffic: 9BCA 126, 9EHN 59, 9EDW 40, 9DI 27, 9P8 12, 9EIW 11, 9RZ 11, 9EFE, 9ECE, 9EFAR 1, 9DP 1.

IOWA-SCM, H. W. Keer, 9DZW—Thirty stations reporting, seven ORS and 6 non-ORS, doubling the traffic of the corresponding month a year ago. F, prospective improve! 9BCA has daily skeds with CAB M40, 9CC at Sun-ty, 9ECE at Stig-ty, 9CZC QSO now! 9DRA's best DX was oz-AEE while 9DIW gets his first EG. More reports of personnel changes are noted. The RM, again, reports that 9DVK, a great Ham-Chix-Fest it was, his heart is with us and he may QST when he gets settled later. Friday sked with 1MK. 9M58 is keeping three daily sids, 9B1P sets fed, club dope. Keep the SCM posted on traffic news and send the AM your skeds promptly.

Traffic: 9BCA 126, 9EHN 59, 9EDW 40, 9DI 27, 9P8 12, 9EIW 11, 9RZ 11, 9EFE 11, 9ECE 7, 9ECE 4, 9EFAR 1, 9DP 1.

MISSOURI-SCM, L. B. Leaird, 9BR-9AARA plans a jaunt east in Sept, before school opens. 9B1U handled some interesting traffic for sea-going operations. 9B1U also sends in the boat QST normally for 14 meters. 9BFB-FS1 work daily morning, noon and night on 178 meters if you can imagine being on that much. 9B1U reports that 9EHS are frequent visitors at 9BFB. 9DMT moved the worked the works to a new location. 9EHS did his part to boost traffic, by originating some and applied for ORS. 9EHS has his part to boost traffic, by originating some and applied for ORS.

Traffic: 9BR-9AARA plans a jaunt east in Sept, before school opens. 9B1U handled some interesting traffic for sea-going operations. 9B1U also sends in the boat QST normally for 14 meters. 9BFB-FS1 work daily morning, noon and night on 178 meters if you can imagine being on that much. 9B1U reports that 9EHS are frequent visitors at 9BFB. 9DMT moved the worked the works to a new location. 9EHS did his part to boost traffic, by originating some and applied for ORS. 9EHS has his part to boost traffic, by originating some and applied for ORS. 9EHS is on 40 for the summer. 9BMC is on the air any day now with 250.

Traffic: 9RB-9AARA plans a jaunt east in Sept, before school opens. 9B1U handled some interesting traffic for sea-going operations. 9B1U also sends in the boat QST normally for 14 meters. 9BFB-FS1 work daily morning, noon and night on 178 meters if you can imagine being on that much. 9B1U reports that 9EHS are frequent visitors at 9BFB. 9DMT moved the worked the works to a new location. 9EHS did his part to boost traffic, by originating some and applied for ORS. 9EHS has his part to boost traffic, by originating some and applied for ORS.
NEW HAMPSHIRE—SCM, V. W. Hodge, 1ATJ—Nice weather and YLs are proving great attractions to most of the gang. 1IEP being particularly hit. 1GY has the power pipes (Rig underground antenna, OM?) 1BFT is busy getting his 882 to function properly. 1AVL is doing a little Good luck, OM. 1KH tried 80 and got an answer to most is married so not much doing for a while. 1KY

LASKA—SCM, W. H. Wilson, WWDN—7SC, "The Voice of Alaska" reports that traffic is very light. 1AGS is trying for a two-letter call so that the W-prefix will not make his call too long. 1ADM worked on-1RB. 1NV says 20 is nowhere near a.a his 852 to function properly. 1AVL is doing a little traffic during the hot weather.

EASTERN MASSACHUSETTS—SCM, E. L. H., WAB2E—Reports traffic vacation Hi. Traffic report sent in reports 1WV, 1AEP and 1AXA were all QRZ vacations but are now back QRV ham radio. 1ACH and IUE have schedules with 1MK. 1AVL is back and reports that all Maine convention and had a great time. 1BQZ got the 20 meter set going which seems to be the hereafter. Malden is reporting 50 watt traffic is bad at IABA from his car. 1BBT sends in his first report. He will soon be an ORS. 1NK is still very interested in Naval Reserve work. 1BVN is making records and others expect to start a station there in the fall. 1SL is built at his summer home in Shirley.

RIO DE JANEIRO—1BDQ says business and hot weather cause terrible QRN with radio. He will be going again in the fall. 1AWE is spending a vacation at Bar Harbor but will be back on the air by the time this report is in print. 1BLS 210 went west and the receiver seems to be giving over its load as it also refuses to perk. Hi, 1JMO reports not much traffic during the hot weather.

Traffic: 1AWK 5, 1MO 8.

NORTHWESTERN DIVISION

ALASKA—SCM, W. H. Wilson, WWDN—7SC, "The Voice of Alaska" reports working a YL on al-2RL on 40 meters, signals R4 steady. 7NR and 7HL were busy as usual with relay traffic. 7AEP is off a little after a good movie and reports 1AYO has just finished rebuilding his station and reports being very busy. 1TEK has just finished re-arranging his antenna to work other stations. 7GQ just manages to operate his 75 watt but is back on the air again for a high total with 6CZP's prized UX-210. 6LXG says that his mechanics report a total 924 words, and one of them was in Spanish. Hi. He has been working OA on 20 meters, as well as keeping NU stations on the air using schedule with 1KCI’s prized UX-210. 6BZT for deliveries thru schedules with op-lCW and op-1PW, AC and NA, and is planning to be on 20 megacycles for the next few months. 6BOY has a new station in the throes of rebuilding his model station. As 6OR reports out League QSLs in Fairbanks, and the Coast Guard Cutter UNALGA

Traffic: 7HL 234, 7JR 206, 7AE2 176, 7LY 150, 700 108, 7AEB 108, 7SO 60.

MONTANA—SCM, O. W. Viera, 7AAT—7HF is still the star station of the section even though his totals have dropped. 7TQ is up on a little and reported a few. 7DD says QRN is sure fine in Butte—everything outrer. Hi. The ORS appointments of 7EL and 7AFM have been temporarily cancelled as they are very busy during the summer time and don’t get a chance to be on. 7AJU belongs to the same list as he is still pounding brasses and is playing with receivers and other things. Hi, 7AVZ reports he is busy with the open to so much work at the printing office. Please report, gang, or you’ll be sorry.

Traffic: 7HF 82, 7AAY 28, 7DD 1, 7AT 4.

OREGON—SCM, E. J. Wright, 7P—Although some traffic has been handled, there has been a decided lack of activity reports, for the reason that nearly all of the ORS are on the inactive list due to vacations and rebuilding etc. How fine, with the open printing of the Northwest Division Convention and less QRN due to warm weather, this Section promises to be "up and coming" for winter activity. 7PL is QRW but says he will keep his 250 watt for this winter. 7GQ just plans to operate his 75 watt enough to keep on the air.

Traffic: 7AKK 102, 7TALK 19, 7BKI 13, 7MV 16, 7QQ 8.

WASHINGTON—SCM, O. H. Johnson, 6CZP—Traffic totals are going higher and higher and in spite of the fact that the summer months are popularly believed to cause a decrease in activity reports. 7AFF, 7HJ and 7RJ are newcomers there. 7AFY and 7AGO are touring. 7TQ is QRW with 7XAB. Tacoma is again waking up as some good work is being done. A number of Seattle and Tacoma hams took in the Vancouver, B.C. ham convention and 7ACB brought back a 220 watt bottle as a prize won in a code contest. Seattle is being covered by 7AKK—31 and Sept. 1. A joint picnic of the Seattle and Tacoma clubs is to be held Aug. 12 at Lake Lucerne.

Traffic: 7AM 208, 7BZ 36, 7TT 29, 7AV 10, 7HJ 9, 7JY 8, 7AO 5, 7LJ 6, 7ATQ 4, 7ACA 2, 7AGB 2.

PACIFIC DIVISION

EAST BAY—SCM, J. W. Frates, 6CZK—Traffic totals are going higher and higher and in spite of the fact that the summer months are popularly believed to cause a decrease in activity reports. 7AFF, 7HJ and 7RJ are newcomers there. 7AFY and 7AGO are touring. 7TQ is QRW with 7XAB. Tacoma is again waking up as some good work is being done. A number of Seattle and Tacoma hams took in the Vancouver, B.C. ham convention and 7ACB brought back a 220 watt bottle as a prize won in a code contest. Seattle is being covered by 7AKK—31 and Sept. 1. A joint picnic of the Seattle and Tacoma clubs is to be held Aug. 12 at Lake Lucerne.

Traffic: 7AM 208, 7BZ 36, 7TT 29, 7AV 10, 7HJ 9, 7JY 8, 7AO 5, 7LJ 6, 7ATQ 4, 7ACA 2, 7AGB 2.
the world with 6CLV as commercial operator on long wave.

Traffic: 6KV 548, 6ALX 507, 6HJ 236, SSR 149, 5HY 121, 6ZCR 93, 6BX 65, 6BOY 62, 6AWM 42, 6FS 37, 6CLZ 37, 6BZA 29, 6RJ 12, 6COL 9, 6AWF 7, 6BP 6, 6DKZ 5, 6DRD 4, 6BY 3.

LOS ANGELES—SCM, C. D. Wallace, 6AM—

The regular meetings are as usual every second Monday. 6AM is back on with a 20 meter set doing 6BZV. 6AM is back on now at Santa Maria and says he wants to be an OBS soon. 6GND got married so guess he is out for a while. 6BVT is working 8B0C at Honolulu. 6EYV is in Santa Maria and is going to develop a FB fast. It seems, 6UJ is keeping some good schedules, and requests 6EZJ when he is not nearly done enough. 6UJ has good connections for delivery of traffic in Los Angeles and small town nearby and any hams with traffic should give him a call from 7:45 am to 9 am any day. 6AKD handled traffic for New Zealand college to U. S. C. Dental College through oz-2ALX. 6CUM got reports of RT and RS from and to others. 6AKD has been off air most of this month due to selling part of his station. 6OF reports QEN is getting worse up there in the mountains, and most of his time is handled on 900. 6DKV is using 1/2 kw air cooled tube for a change. 6DKV handled a message from a tennis champ sending for more messages and 15 minutes. 6DKV in trying to get to the A.R.R. club meeting on the run over a cat and dog, and had to come on rim plus one last light. 6SKR blew his 60 on Fri. the 13th and reports this is his first. 6BOC expects to have a sked with 6AJM of San Diego as soon as he completes his building operations. 6DKX reports water got to his plates in New Caledonia. 6BOW expects traffic to pick up soon. 6AMK has been working W2 of Maine. 6AMK says not going there in summer, with the shack so hot and the ocean so cool. 6ADK is building a new set and also experimenting on Transmit. 6CNR just got back on for good and is looking for skeds. 6E6T says traffic is scarce there but he is trying to get a sked with 6AMK in Southern Calif. messages. 6DMG says things are not so good there. 6OBJ declared the 20 meter band dead. 40 meters fair but not enough traffic to be found. 6GCT is completely tearing it up and reports good but very far. 6ASM wishes to thank 6DTG and 6AGG for their fine work in keeping him in touch with home in Francistown. June 10 received a visit from 9DRV. The H. P. Radio Club tried sending code practice to its members while they slept but results observed were nil. 6CHT has been "promoted" from chief operator to announcer at KFQZ. 6CGK built new 85 meter phone transmitter with stock parts and exclusive use of 9CRS rave about the tone quality. 6NHX was going to the midsummer meeting of the Pasadena Short Wave Club. He sent the night he sent his in card. There was going to be a banquet the following day, dinner and prize, and etc. was served and prepared by Mrs. 8XS, Mrs. BTM and W3 BLYA. 6GCT has been off the air most of the month for some work. 6GCG reports that Glendale is harvesting several new hams and he heard about five from last ham exam. 6AKW is going to do a little Ham All set call. 6GCT is very QRS with the radio business but hopes to have things arranged so he can get back in the fun loop. 6AEC has been making his station over. 6GAP wants a hookup with 6AMK in Call. 6AMK is back on 7 PM to 8:30 PM weekdays. 6BVT reports that the Eagle Rock 6BVT Spitters took a trip to the bench for two days this month with the portahol and their best DX was Hawaii. 6CQA reports that the Artists Studios is using its set on location on some of the TV shows. 6EY's auto gets in August he is installing it for airplane communication. 6DHU evidently had to choose between putting in a VHF and a 60 for his Ford so he put in the Ford won. 6AIQ is operating KFQZ now and doesn't have time to pound brass much. 6DPK will be SSB from 7 PM to 9 PM next month's inactivity. 6FY, 6SZ, and 6CMQ also report.

The A.R.R.C. announces that the Section banquet will be held in Los Angeles in September. 6AGBR's station will be quiet while he is doing his stuff for the 6AGBR carnival. He will be back on Aug. 4 to 18. 8SF is now in Calif. as 6CUI and proves a very fine operator for our section. The Long Beach AM club met last Saturday and the shack amateurs, met with 23 present. A low power contest with the A.R.R.C. was discussed. The Foothill High Frequency Club is a new club just organized with H. W. Kelner as Pres., C. L. Sweeten, Vice Pres., J. E. Anderson, Sec. and Treas. 6ABR is traveling around the country with his folks, and dropped in to see us at Long Beach.

Traffic: 6BZG 181, 6UJ 88, 6AKD 70, 6CUH 68, 6CC 52, 6OF 50, 6AM 32, 6DKV 31, 6BGR 30, 6MKZ 27, 6DKX 25, 6BEC 18, 6AKD 12, 6ALR 10, 6CNJ 10, 6BDM 10, 6BEY 8, 6ASM 6, 6DG 7, 6DHR 6, 6CHT 6, 6DGS 5, 6SCQ 4, 6D3C 2, 6AKW 2, 6CZT 1, 6AE 16.

PHILIPPINES—Acting SCM, J. E. Jimines, opiat—

A report received by radio from opiat via 6AMM—

"Opiat kept a sked with am-SAB for European traffic and opiat for Manila deliveries. All P.L. amateurs are requested to have their QSL cards sent to provisions of last Washington conference as regards wavelength allocations so 1D1 is operating on 10 meters."

A report received by radio from opiat via 6AMM—

"Skeds are kept with opitpp. Zambuquita, at 5 pm daily, with ae-SZW (Observatory, Shanghai, China), 6 daily, with nu-6EX 6:30 pm daily, ac-2OM 7 daily, op-IRC (Radio School, Cebu) 8 pm daily, nu-6AMM 9:15 pm daily except Sun. We worked with BA-MD and 6BGO, handling most traffic with 6AMM."

Traffic: opiat 760, 6opit 235.

SAN DIEGO—SCM, G. A. Sears, 6BG—6DNS leads the Section. Besides being on USNR cruise to Honolulu. He has a fine setup and is radio operated very adequately by the OH gang. 6AMJ has a new sked with op-ICM now and traffic is moving fast. 6HAA has 3 contacts on the air now and is testing out 10 meters. 6BG had a very good contest sked with op-1HR. 6BDZ reports but little traffic on 20. 6GKL reports 6DHQ is a good sked and has a complete transmitter. 6FE blew two 210's. 6BGJ has been sick but remodeled his shack. 6BY has a new VL in his family. 6AZK has been on a vacation. 6CNK is getting ready for 10 meters. 6BDE is working two jobs lately. 6AKK is at sea for a couple of months and is inactive. 6DOB is in charge of VL gang. Mrs. 6AKK is going to be on there. This will be news to most of the gang. She signs "PT" and Lloyd Jones is "LU" in town.

Traffic: 6DNS 32, 6AJM 26, 6HAS 18, 6BQ 15, 6BD 10, 6FP 9, 6BGL 7, 6BFE 1, 6AM 1.

SANTA CLARA VALLEY—SCM, F. J. Quenmont, 6NX—The usual run of traffic came through 6AMM this month. 200 delinquents sighted. Brove again in the lead over any O.R.S. A pair of 582's in a self-regulating circuit will soon be placed for use in this PI circuit. 6BRT also continues to handle a number of calls. 6BIM expects to move to San Jose, this month. 6ALW will soon have an 820 on the 30,000 Ke. band. His traffic has been normal. 6BYH was too QRO during the May QRP to handle several messages. 6NX is building a 9G receiver. 6BNH is also QRW. Let's have a 100% report next month.

Traffic: 6AMM 285, 6BHY 28, 6RMW 26, 6ALW 22, 6BYH 10, 6NX 6.

HAWAII—SCM, F. L. Fullaway, 6CQP—The army gang are at summer camps so their traffic is light. The air seems dead. Some activity on ten. There is a large field on 10 meters. Who is going to be the first one to help put Hawaii on the map on ten meters? 6CFQ has the highest traffic total. Traffic for the yacht race between Honolulu and San Diego with 6AIJ. 6D9S6AWR-WGDJ out the Pandora here and spent three weeks with 6CFQ. Two inter-regional skeds were kept between Honolulu and Vancouver. 6DEY has been struggling with a xtal xmitter with no luck but turned in a good total. He kept a sked with his transCLV in San Diego and splits his time between the submarine and his transCLV in San Diego and splits his time between the submarine and 6CLV is QRD around the world on the Pres. Pierce. 6ADH still handles his share of traffic but is very busy at RCA. 6DQQ for the high spots on 10 meters. 6DQT on 20 meters. He gets leave as he is in the ARMY now. 6DJU took a flyer to camp with him and works nu easily. 6BDJ as portable on 10 meters. Has an ultra audion and it WORKS. 6CLL reports that 6AKP was elected pres. of the sebor group. The 15 meter schedule. 6DIL at camp Chemists with portable call 6BBC. 6CFQ and nu-6AWR-WGDJ sure caused a commotion amongst the commercial ops. They all want to become hams now. The ops from the British tramp Saltatore, the Swede Buenos Aires, and U.S. Eur. Line, City of Honolulu, and others were shown around and entertained at 6KQ and 6CFQ. Sure made

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themselves interested in ham radio, nu6DNS, nu6PY and several other Naval Reservists were shown the town and camp. It was a perfect situation. 6CFQ's civies and went to a dance with him. Hi.

Traffic: 6CFQ 245, 6DEY 163, 6ADH 111, 6DOQ 94, 6DCU 80, 6DJU 52, 6DPG 9, 6CLJ 9, 6DLR 3, 6BB 57, 6EDJ 3, 6ADH (May-June) 166.

ARIZONA--SCM, D. B. Lamb, 6ANO--6BWS lends the state this month in traffic, making the BPL. His old Kansas school starts so he will be on the air lots during the rest of the summer. 6EAA is a newly appointed ORS with a 600-watt rig. 6LQF has the job in Electrical shop so can't be on the air as much as during the past. 6AZM reports on air with a crystal and radio transmitting. 6QIE has the job with master oscillator and 25 cycle control. 6CDE was on a 50 watter so soft now is on with a 7½ watt. 6SV is on with a DC note from soup reet. 6SLY is leaving Aug. 5 for Army encampment and taking his transmitter along for zoy work. 6BHC and 6CA are on with AC. 6CQZ is changing his call to 6LQF during the next week when he will attend the Univ. of Ariz. again. 6CBJ went to Wisconsin but no further report of him. Would 6ASY try to keep some DX cards for you being 6AYU was my former portable call. Thanks, OM. The Bisbee Radio Club dance was a success so now he is working on a 250 watter.

Traffic: 6BWS 231, 6BF 4, 6EAA 4, 6AM 2, 6ANO 8.

ROANOKE DIVISION

WEST VIRGINIA--SCM, C. S. Hoffman, 5HD--5APN handled the greatest number of messages with 5CLQ following a close second. 5APN reports very consistent QSO's with OJ, OZ, NQ, NO, and others. He is using 5G1N and 5AIN, besides working OZ's. 5ACZ and 5BJB are rebuilding. 5RPF and 5ASE are experimenting with telegraph. 5TVZ is still at ISP. 5DNS is thinking about moving. 5FV is on 5CLQ 40, 5EJJD 16, 5HD 6.

VIRGINIA--SCM, J. F. Wohlford, 3CA--3SKU expects to go to see. 3AQY is using an MO-PA circuit and gets out well. 3JF has been in for television. 3JT and 81I are going strong at the new location. 3WM is operating at 3TN. 3TN has a sked with 5AAE. 3ATF, 3EC and 3AQY are on. 3AO is 510 watters now working 104 feet on the street. 3ALS is on 10, 20 and 40 meters. 3ASC is working the 20 meter band now. 3AAJ had QRM from 500 to 4000 meters but is this week running a new receiver. 3RL is putting in an MO-PA circuit. 3CPY expects to get on the air again. 3BZ would like 5258. 3CKL did some nice work in handling messages for sick 51R and 5192. We wish to extend our sympathies to 3BSG in the loss of his wife.

Traffic: 3CKL 71, 3ECQ 17, 3RL 3, 3AACJ 21, 3ALS 14, 3SKU 8.

NORTH CAROLINA--SCM, R. S. Morria, 4JR--4TS says very QRW. 4ADJ says too much heat for radio. 4AB, the RM asks for letters from traffic men. 4BQ still has his 50-PA sked going well. 4BQZ is doing 450 watter and 50 watter. 4JJ tried to catch the beecch. He stopped off at 4AB and 4JR long enough to say hello. 4JR had a very enjoyable trip. He.htm has a sked about 900 miles to whom he has been a sked for two and a half years. 4OH just returned from a Florida trip.

Traffic: 4AB 124, 4TO 37, 4OC 23, 4JR 9, 4TS 6.

ROCKY MOUNTAIN DIVISION

COLORADO--SCM, C. E. Stedman, 9CAA--9FNM comments that he is getting a lot of QRM and keeping schedules. 9HAM still hears a lot of QRM. 9EJ wants a ham for president (of the USA) so that we will have more money in the meter band. He is using his portable at 9ZVE, Electra, Tex. 9EY has returned from the CMTC at San Antonio where he operated the 500-watt 500-cycle Army control station. 5AEN, 5AEE is working on 20, 15 and 10 meters and has a schedule with 5RJ. 6AKN is keeping a schedule with 9EMN. 6AKN's crystal control set gets through the summer QRN FB. 5JG is hard-
ONTARIO DIVISION

ONTARIO—SCM, W. Y. Sloan, 9B—Central Dist.: 3DY has been keeping a sked with 3CJ; and his traffic has flourished as a result. 3CJ is on his annual vacation—all summer—at Bobcaygeon, Ontario. He plans to travel while away, and everyone hopes with him. It is cooler there nights. "Bud" is getting traffic routes lined up throughout the Province; many others, of course, are keeping busy as well all set for fall weather. 3BP is on regularly on 52.5 meters despite the weather. 3CL has been licensed and is now on the air using a 201A in the trans­mitter to start with. He has already been reported as heard in Ottawa. 3BO is keeping schedules east and west and has departed for Stoney Lake. We believe that he will be back next season. 3DC has been using 52.5 regularly and has received a report from England. 5DV is getting ready for the Fall. 5AL has a new transmitter. 5BN says that his station is operating occasionally. 5BT was on all waves as usual. 3FCL and 5BT went to Ottawa on the latter's motorcycle and were warmly entertained by the fellows there. 5BL is going to do some survey work on reception conditions using a portable receiver and his motor-bike. His 210 still oscillates on 225 at every opportunity, and speeds the official broadcasts regularly every night at 9:30 EST.

Southern Dist.: 3CS has worked his 36th country, 29 meters is responsible, we believe. 3CB is using 40 and 80 when possible. 3CB paid a visit to Hamilton and had a very nice time there. Old fellows are always glad to see 3CB. An old timer has turned up in Windsor and is operating under the call 3BV, mostly on 52.5. 3BV may be a great help in our southern traffic net. 3AQ has been busy installing a station at the Agricultural College in his town. 3HB is a new station in London. Sarnia is not heard from very much. Wotsa matter? 5AY is preparing to make his 210 sit up and take notice. Eastern Dist.: 3JW is now on the air and going strong on 52.5 with a fine punch. Jimmy is unfortunately a bit blind and gets a great deal of help from his wife in working his set. 3CC sends time signals from the Dominion Observatory daily on 52.5 meters from 21 to 9:30 pm EST.

Northern Dist.: 3ET and 3AR are on occasionally. 3ET keeps schedules with Toronto. 3EH is active in the Bush and rolled up a pretty good score on schedule with Toronto. 3BP is keeping an OBS schedule and working with the out-post stations in the North Woods. All of this work is, of course, on 52.5 meters.

Traffic: 3ESR 62, 3ESC 47, 3ESD 25, 3ESC 29, 3ESBT 11, 3ESC 10, 3ESR 8, 3ESB 6, 3ESBL 5, 3ESAI 2, 3ESC 2, 3ESAY 1.

PRAIRIE DIVISION

MANITOBA—SCM, D. Sinclair, VE4FW: VE4BT has been the most active station in the section. He has been using 3CQ and then worked 3EQG and 3SHF on a 210. 3EQG is on 20 meters. 3EQD has been working on 40 meters. 3EQD, VE4DR and VE4DK have a 2TG circuit which, while VE4BDR thinks the series Colpitts has no peer. 3EQF is the call of ex-4NA. 3EGG has a 4B note. VE4DB and VE4FP are trying for VE4FP worked Russia. VE4DW keeps his regular daily schedule with Winni­peg. PB, OM.

Traffic: VE4BT 10.

SASKATCHEWAN—SCM, W. J. Pickering, VE4FC—Two new ones are on the air—VE4AA and VE4AI at Y-Throw Grass and Meacham. JAA has a 2TG, pushed by a 1B battery, and is covering the Sask. stations on 40. 4AI is using 2-201 A's in a MO-PA layout with B batteries and wants to meet the gang on 80. 4AI has been keeping close watch on visitors lately and very few QSO's or DX. 4PC has a new Plive and so is doing much brass-bounding. 4BL had his gong hit the U.S. for a while.