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<th>Capacitance Min.</th>
<th>Overall Dimensions</th>
<th>Weight</th>
<th>Price</th>
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<tr>
<td>334-Z</td>
<td>500 µµ f</td>
<td>350 µµ f</td>
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<tr>
<td>#334-R</td>
<td>250 µµ f</td>
<td>200 µµ f</td>
<td>3 1/4 x 3 1/4 x 6 1/2 in.</td>
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<td>#334-T</td>
<td>100 µµ f</td>
<td>75 µµ f</td>
<td>3 1/4 x 3 1/2 x 4 in.</td>
<td>1 1/2 lb.</td>
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<tr>
<td>#334-V</td>
<td>50 µµ f</td>
<td>30 µµ f</td>
<td>3 1/4 x 3 1/4 x 3 1/4 in.</td>
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*Officials appointed to act until the membership of the Section could fill permanent positions by nomination and election.*
The American Radio Relay League

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

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

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

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

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ADDRESS ALL GENERAL CORRESPONDENCE TO THE EXECUTIVE HEADQUARTERS AT HARTFORD, CONN.
THE British amateur societies have an idea which, it seems to us, our clubs might employ with profit. During the pleasant summer weather each club seems to have a "field day" or outing, and of course, being radio amateurs, the field day is distinctly of a radio complexion. It amounts, in fact, to a kind of radio "treasure hunt."

In the usual case of this kind, in preparation for the field day a competent committee is appointed to assemble and install a low-powered transmitter in an unknown location within, say, twenty miles of the home town. The station is very carefully concealed, hidden in a farmer's barn, or even in a culvert, or camouflaged if necessary, and its location and direction kept profound secrets. The individual members of the society, singly or in teams of two, equip themselves with portable receivers and loop antennas. On the appointed day they set out separately from their homes, in autos and side-cars, to find the unknown station, which transmits periodically throughout the day on schedule. A bearing is taken and the car proceeds in the general direction, stops and sets up for another shot on the next schedule, and so on, leisurely making its way across pleasant country, enjoying the scenery and perhaps picnicking enroute. When the general location of the transmitter is reached the chase frequently becomes exciting, particularly if there are several parties hot on the scent, because then it becomes a case of actually finding the apparatus. Sometimes it is hidden in a clump of woods just a few yards away and yet remains undetected for hours. The team that first finds it wins the race and the solid gold variable condenser if any.

It sounds as if it were great sport. The transmitter location of course becomes the rendezvous for "eats," sports, and so on. It may be necessary, at some appointed hour, to broadcast the location in plain language to missing searchers who have become lost, strayed or stolen. If their receivers break down and they miss the broadcast, it is just too bad but they have to go back home for supper.

Much depends upon the skill and ingenuity of the transmitter committee, of course. In our country it seems that a frequency in the 1715-2000 band would be the best to use, both with respect to the transmitting distance and to make loop reception more feasible. Unless a member of the committee has a portable license it will also mean business with the Supervisor, either to take out a license for the chosen location or to get special authority for the one day's operation. Plenty of original ideas will occur to the dubs.

With summer at hand, a season in which it normally is difficult to maintain club interest, it seems to us that this idea might well be taken up by our American clubs. QST would like to hear the results from any club that tries it.

EVERY amateur who has written us concerning our recent editorial efforts to make amateurs frequency-conscious and minimize out-of-band operation praises our endeavor, but most of them go on to say that it wouldn't be a bad idea to mention commercial interference in our bands, which is pretty fierce sometimes.

Of course: The commercial skirts are far from clean themselves. Proportionately we're not sure that they're particularly better than we are. But our thought is that everybody must be right on this important subject and that the rest of the world is improving rapidly, whereupon it is up to us to be certain that our own house is put in order promptly. The German station DHE, long a thorn in our 7000-band, has been moved out, largely as the result of a protest which the Radio Society of Great Britain filed with its govern-
ment. A few months ago Canada chased two infringing commercials out of our 14,000-band upon complaint by our Canadian General Manager. Our bands are guaranteed to us by treaty and we can always obtain action from the ratifying nations. By the same token, other people's bands are guaranteed to them and they expect protection too. There is pretty much of a spirit of give and take right now, as the radio world buckles down to the serious job of putting everything exactly where it belongs, but it's our duty here at Headquarters to tell you fellows everywhere that the world is moving rapidly now to standards of much greater precision, to much smaller tolerances, and to the general feeling that stations that can't play the game and keep out of trouble have no right to expect to operate in the crowded ether of to-day and to-morrow.

There are folks who don't think we're very important, anyway, and it takes a lot of talking to keep them convinced. The task will be infinitely easier if we can show that we stay where we are assigned. It may become impossible if we don't. That is why it is very important that we amateurs be in the clear.

K. B. W.

Strays

Time Signals from W9XAM

Many amateurs will remember the time signals transmitted by WNBT, the station of the Elgin National Watch Company, Elgin, Ill., a few years ago. The limited commercial license was cancelled last June, but the company has recently obtained an experimental license for resuming these transmissions, under the call W9XAM. The frequency is 4796 kc. A crystal-controlled transmitter with an output of 500 watts is used.

Present schedules are as follows:

<table>
<thead>
<tr>
<th>Time</th>
<th>Frequency</th>
<th>Notes</th>
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<td>7:55 a.m.</td>
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Reports on the reception of these signals will be appreciated. They should be sent to the address given above.

Radio Manufacturers' Association Convention

The R. M. A. Convention and Trade Show will be held in the municipal auditorium at Atlantic City this year, during the entire week of June 2nd. The latest developments in broadcast receivers will be on display, together with new models being brought out by all the prominent manufacturers, as well as those just entering the field. Aside from the apparatus displays, however, this year's convention will be of unusual interest because there undoubtedly will be a great deal of discussion on the pentode and its relation to manufactured receivers during the coming year. It is not at all unlikely that the trend of circuit design will be influenced by the conclusions reached at the show.

Admission to the show will be by invitation only, and tickets may be obtained by writing the Radio Manufacturers' Association, 32 W. Randolph Street, Chicago. They are issued without charge.

A new shaving cream with the name "QSS" has just made its appearance on the market. W9AKN thinks the idea is that when the lather is applied the whiskers just fade out, thus eliminating the razor from the picture! If the people that make it had been more in step with the times they'd have called it QSC.

Here's a "hot" one picked up from a newspaper after the recent rebroadcast of the opening of the London naval conference:

"Just a few minutes before King George began the address which formally inaugurated the conference, a member of the control room staff of the CBS tripped over the wires to the generator that energizes the entire network. The chief control engineer grasped the wires together in his hands to restore the circuit. Leakage of the current through his body to the floor shook his arms with spasms, but he held on without a break for twenty minutes until new wires could be connected."

Seems as though even the broadcast people aren't free from the haywire complex.

W6ARV has a good way of drilling holes in glass. A finishing nail is placed in a breast drill or drill press, and the head of the nail is used as a lap. The compound employed is either valve-grounding compound which has no oil in it or simply carborundum mixed with water. It is advisable to use a small piece of board under the glass when drilling.
GETTING THAT D.C. PLATE SUPPLY

A Résumé of the Practical Aspects of Rectifier and Filter Design

By George Grammer, Assistant Technical Editor

Quoting the new regulations, "Amateur stations must use adequately filtered direct current power supply or arrangements that produce equivalent effects to minimize frequency modulation and prevent the emission of broad signals."

This article has been written to serve as a guide to those who may not be sufficiently familiar with rectifiers and filters. It is by no means a complete exposition of the subject, however, and the bibliography at the end will be found most useful if more detailed information is desired. — Editor.

With the advent of revised amateur regulations, it behooves some of us to take stock of our power supply equipment and see how closely we conform to the provision that amateur stations must have "an adequately filtered d.c. plate supply." A generator or transformer-rectifier with a conglomeration of chokes and condensers does not necessarily provide the type of power supply required; on the other hand, the apparatus to produce such an effect is not necessarily highly complicated and expensive, provided it is properly designed.

There are many factors which enter into the production of a steady d.c. signal, not the least of which is the adjustment of the transmitter. No matter how good the rectifier and filter system might be, if given a fair chance a poorly adjusted transmitter can nullify its effects to such an extent that a great deal of the money invested is simply wasted. Paraphrasing an old adage, "All is not d.c. that has a rectifier and filter."

This article is, however, primarily concerned only with the power supply system. Adjustment of the transmitter has been so often and so well covered during the past two years that we shall not go into it now. Suffice to say that those QST articles covering the results of the Technical Development Program constitute a complete source of information on this subject.

The only source of really continuous current is a battery. Probably next in line is the d.c. generator, although the output of such a machine is not steady and continuous. A generator is simply an alternating-current machine with a mechanical rectifier, and the smoothness of the output depends almost entirely upon the construction of the rectifier, or commutator. The greater the number of segments, the better will be the output, but an infinite number would be required for "pure" d.c., whereas insulation considerations on high voltage machines and the actual space limitations are such that the output usually has a considerable amount of ripple voltage. This means that the output of such a machine cannot be considered suitable unless a filter is provided to diminish the ripple to a negligible amplitude. An unfiltered generator is therefore in almost the same category as an unfiltered transformer-rectifier system, and must be treated with the same care. The redeeming feature is that the ripple voltage is in most cases much higher in frequency and lower in amplitude than with the transformer-rectifier at ordinary supply frequencies, and consequently a small filter is sufficient, provided the commutator is kept clean and the brushes are properly adjusted.

However, the number of amateurs using high voltage d.c. generators is comparatively small; therefore we will for the present confine ourselves to those systems which use a transformer for stepping the voltage up to the required value, following which the output of the transformer is fed into a rectifier and filter.

As we cannot hope to go into a great amount of detail in this story, a bibliography on the subject of rectifiers and filters has been prepared and appears at the end of this article. It is recommended that the reader look over it for references which are of particular interest to him. Our present purpose is simply to point out the various methods and types of apparatus which are in use, the selection being left to the individual preferences of the constructor.
TYPES OF RECTIFIERS

Several types of rectifiers are available, each having its own set of advantages and disadvantages. The most commonly used ones may be divided into five general classifications: electrolytic or chemical, thermionic, hot-cathode mercury-vapor and mercury-arc.

CHEMICAL RECTIFIERS

The chemical rectifier is perhaps the cheapest of all, particularly for low-voltage installations. Its construction is simple, and it will give very satisfactory results if properly handled. The voltage drop and leakage are somewhat higher than with other types of rectifiers. The output is, however, not hard to filter, and this fact, together with its low cost, should recommend the chemical rectifier to a great number, particularly those using low-power outfits.

Such a rectifier usually takes up quite a bit of room, depending upon the type of cell and solution used. With simple solutions, such as borax or bicarbonate of soda dissolved in water, the maximum voltage per cell should not be much higher than 40 to 50. A typical cell of this kind is shown in Fig. 1. A jelly glass or preserve jar holds the solution, and the electrodes are usually lead and aluminum strips. The size of the electrodes is determined by the current which the rectifier must pass. A current density of about 50 milliampere per square inch of immersed aluminum surface is quite generally used. With organic electrolytes, however, much higher voltages than 50 can be used, ranging anywhere from 100 to 150 per cell. The construction of a chemical rectifier of the latter type will be described in a coming issue. For best results the elements and the components of the solution should be as nearly chemically pure as possible, and material of this sort is sometimes hard to obtain. Other disadvantages are that the rectifier must be formed initially, and reforming is necessary if it is allowed to remain idle for any length of time; water evaporates from the solution and must be replaced at more or less frequent intervals; and the solution sometimes creeps and makes a messy job. Electrically, however, it is entirely adequate for the purpose when properly built. The connections for both the center-tap and bridge rectifier circuits are given in Fig. 2.

THERMIONIC RECTIFIERS

Thermionic tube rectifiers, such as the Type '80 and '81, are now generally used only for the lower voltages. They have been displaced at higher voltages by the more efficient mercury-vapor rectifier. However, they, like the chemical rectifier, are entirely suitable for low-power work, and in many respects constitute the most desirable rectifier for sets employing a Type '10 tube or those of lower voltage rating. A Type '81 will pass 85 milliamperes. With a pair of tubes in a full-wave circuit, the allowable current is 170 ma.

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The connections for a full-wave rectifier using Type '81 tubes are shown in Fig. 3. The half-wave rectifier circuit requires only one tube, and the transformer secondary need not be center-tapped, but since the output has only half as many "humps" per second as with a full-wave rectifier, it is more difficult to filter. Thermionic tubes are not recommended for use in a bridge rectifier, because their high resistance and lack of close uniformity prevent the tubes from dividing the load properly.

The Type '80 tube is designed for lower voltages, and in itself is a full-wave rectifier. The applied voltage should be not greater than about 400 per plate, and the tube will pass 125 m.a. It
is thus suitable for sets employing a Type '10 or smaller tube where the voltage required is not over 400. The connections of the Type '80 tube in a full-wave rectifier circuit are shown in Fig. 5. This tube should not be used when the power transformer furnishes more than 400 volts each side of the center-tap.

Thermionic rectifiers are very easily installed, are compact, noiseless in operation, require no particular attention, and will last a long time with reasonable use. Their cost is comparatively small, and they can be obtained at almost any radio store. The voltage drop through them is not so high as to present any particular difficulty with an amateur transmitter, and is of about the same order as the drop in a good chemical rectifier. They are not so good in this respect, however, as the more expensive hot-cathode mercury-vapor rectifiers.

GASEOUS-CONDUCTION RECTIFIERS

Gaseous-conduction rectifiers, such as the Raytheon BH, can be used in transmitters employing a receiving tube as the oscillator, or for the low-power stages of an oscillator-amplifier transmitter where the voltage required is not more than about 300. At the present time these rectifiers are not manufactured for higher voltages. Since the tube has no filament, it is unnecessary to have an extra winding on the power transformer for rectifier tube filament. The voltage drop in the tube is somewhat less than with a thermionic tube of similar rating. In the field where such a rectifier can be employed, the other advantages are the same as those of thermionic rectifiers.

HOT-CATHODE MERCURY-VAPOR RECTIFIERS

Mercury-vapor rectifier tubes such as the Type '66, '72 and Rectobulbs are intended for all voltages up to about 3500, depending upon the kind of rectifier circuit used. They are, therefore, the tubes to use with sets employing Type '03-A, Type '82 and Type '04-A tubes. The ratings on these rectifiers are somewhat different from those of thermionic rectifiers, as the operation of the tube is different. With a thermionic rectifier, the voltage which the tube will stand is limited only by the insulation in the tube itself, particularly between the wires in the glass stem. This is not the case, however, with mercury-vapor rectifiers, because as the voltage is increased beyond a certain critical value, known as the "arc-back" voltage, a heavy current will flow in the opposite direction and ruin the tube. The maximum current which the tube can safely pass is limited by the filament emission. For these reasons, the tubes are rated at "maximum inverse peak voltage" and "peak current." The inverse peak voltage is the highest voltage which the tube can stand, applied in the opposite direction to normal current flow. The term "peak current" is self-explanatory.

The inverse peak voltage is the peak voltage furnished by the transformer, and in the case of a pure sine wave will be 1.41 times the total voltage across the transformer terminals. For instance, with a full-wave rectifier using a center-tapped transformer, if we assume that the transformer gives 1500 volts each side of the center tap, the total secondary voltage will be 3000, and the inverse peak voltage which each rectifier tube will have to stand will be 3000 x 1.41, or 4230 volts. The peak current depends upon the type of filter employed, or more particularly, is determined by the layout of the input side of the filter. If a 2-µfd. or larger condenser is connected directly across the rectifier output, the peak current through each tube is three times the load current (assuming two tubes in the rectifier). In other words, a load of 200 m.a. will mean a peak current of 600 m.a. through each tube which is the maximum safe current for a Type '66. If an inductance of 10 henrys or more is connected between the rectifier and the first filter condenser, the factor drops to 1.5. Under these conditions, however, the voltage is not as high as with a condenser across the rectifier without a choke in series.

The connections for these tubes are shown in Figs. 3 and 4. For d.c. voltages of 2000 and over it may be found that it is actually cheaper to use the bridge arrangement with a transformer which has only a single secondary winding, since the cost of center-tapped transformers for higher voltages is a great deal more in proportion to tube cost than is the case at the lower voltages, and the extra filament windings are relatively inexpensive.

The inverse peak voltage with either the center-tap or bridge arrangement is the same (total transformer voltage times 1.41) so that the bridge connection will give approximately twice the d.c. voltage obtainable with center-tap rectification. Hot-cathode mercury-vapor rectifiers lend themselves very well to the bridge arrangement.

FIG. 4.—A BRIDGE RECTIFIER WITH MERCURY-VAPOR TUBES

This arrangement is used when the power transformer has no center-tap, or when the d.c. voltage required is more than 3000. Four tubes and three filament transformers are necessary.

1 "A New Type of Rectifier Tube for Amateur Use," page 20, February '29 QST.
because the internal drop is small and the tubes match up well. The drop is only about 15 volts regardless of the current through the tube.

**MERCURY-ARC RECTIFIERS**

The mercury-arc rectifier is the real brute for high power work. These rectifiers are capable of standing applied a.c. voltages of the order of 5000 or 6000, and will pass a current of several amperes. The voltage drop in the tubes is approximately 15 volts—the same as in mercury vapor tubes. Their cost is comparatively low, the kind used for battery charging being suitable. As a matter of fact, a number of amateurs have successfully used old tubes which they have obtained at very low cost from power companies after the tubes had begun to operate unsteadily in series street lighting systems.

It is necessary to start the arc each time the rectifier is to be used, and as soon as the load is removed the arc goes out; therefore some means must be provided for maintaining the arc during transmission, because the load is being rapidly thrown on and off when keying. In order to start the arc the tube must be tipped mechanically so there will be an instantaneous connection between the mercury pools in the starting electrodes to form an arc, and in order to maintain it some form of "keep-alive" circuit must be employed. A typical mercury-arc rectifier and circuit are shown in Fig. 6.

The keep-alive circuit uses a transformer which gives about 50 volts each side of the center tap, and employs a full-wave rectifier with Tungar or Rectigon bulbs. In order to maintain the arc in stable operation it is necessary to filter the output to some extent, and for this purpose the choke shown in the diagram is used. A small choke which will pass about two amperes without undue heating is usually sufficient. The primary of an old transformer rated at 100 watts or more will work satisfactorily if no choke is available. The current in the circuit will ordinarily be of the order of 2 amperes, because with less current the arc is quite likely to go out. Higher keep-alive current will heat the tube unnecessarily and may shorten its life.

**FILTER CHOKES**

Filter chokes are in one respect a great deal similar to radio frequency chokes—it is hard to tell whether or not the things are operating as they should. Manufacturers' ratings are often confusing because the inductance of the choke varies widely with the amount of d.c. flowing in the winding, and it has not been the practice to state whether the inductance measurements were made with the rated d.c. flowing, or whether the rated current is simply the maximum which the winding can safely carry, and the inductance is measured with a.c. only. A choke which is rated at 30 henries with no d.c. flowing in the windings can very easily drop to 10 henries or less with a current which does not tax the capacity of the wire.

Good chokes are made with air-gaps at some point in the core. This reduces magnetic saturation of the core, and at the same time reduces the inductance of the choke, but under load conditions it is quite possible that the inductance will be higher with a choke which has an air-gap of proper size than would be the case with a choke of much higher "a.c. inductance" with no air-gap. This point should be kept in mind in selecting a manufactured choke, or in building one at home.

The design of filter chokes of different inductance values for almost any conceivable type of amateur transmitter is well covered in the manual. Tables are given showing the proper core size, size and number of turns of wire, air gaps, inductance and other factors which enter into the construction of a choke.

**FILTER CONDENSERS**

Aside from tubes, there is probably no other item in an amateur transmitter which requires more frequent replacement than the filter condenser. This is not usually the fault of the condenser manufacturer, but is more often caused by the failure of the amateur himself to take into account the conditions under which the condenser must work.

After much confusion among manufacturers' condenser ratings, the practice has been generally adopted of rating them at the maximum d.c. working voltage. This, it must be understood, is not the a.c. effective voltage supplied by a transformer. As mentioned above in connection with mercury-vapor rectifying tubes, the peak transformer voltage will be 1.41 times the rated voltage, provided the wave form is of sine shape. It often happens that the wave form is considerably distorted by the time a transformer at the end of a long line is reached, and the peak may very readily be higher than this value. A fairly good working rule to follow is that the filter condensers should be rated to stand at least 50 per cent more voltage than the transformer secondary supplies. In the case of a full-wave rectifier working from a center-tapped transformer winding, only the voltage on each side of the center-tap is considered, because so far as the filter condensers are concerned, the two halves of the transformer are in parallel.

As an example, a filter condenser to work with a transformer giving 500 volts each side of the center-tap should be rated to stand 1.5 times 550, or 825 volts. The standard safe voltage rating nearest to this is 1000, and 1000-volt condensers are therefore the size to use. Similarly a transformer giving 1500 volts each side of the center-tap would require condensers rated at 2250 volts, and a 2000-volt transformer will necessitate the use of 3000-volt condensers.
Failure to observe this rule in buying filter condensers is almost sure to result in very short condenser life. It is therefore well to invest a little more money in adequately-rated condensers in the beginning and obviate the necessity for replacement later on.

There are two types of condensers now generally available, electrolytic (d.c. only) and paper (a.c. or d.c.). For d.c. voltages of 1000 or less, the electrolytic condensers are cheaper per microfarad than the paper type. However, since electrolytic condensers are not made to stand voltages much higher than 500 per unit, it is necessary to use the proper number of them in series for higher voltages, so that the difference in cost for voltages over 1000 is a negligible consideration.

The leakage current with electrolytic condensers is much higher than is the case with good paper condensers; but on the other hand, if the voltage rating is exceeded, the electrolytic condensers will not puncture, but simply allow more leakage current to pass. The usefulness of the condenser is not impaired, although the capacity drops off rapidly as the rated voltage is exceeded. With paper condensers, the punctured section is useless and must be replaced by a new one.

The method of using electrolytic condensers with high voltage rectifiers has been covered in an article in the March 1930 issue of QST. It is recommended that those interested in using this type of condenser read it carefully.

**DESIGNING THE FILTER**

The filter which is theoretically correct for the particular case in mind may not always be the most desirable from a practical standpoint. This is usually true when a filter for a transmitter is being considered, because the filter has other functions to perform in addition to its primary purpose of smoothing out the ripple — such as maintaining the voltage at a high level, improving regulation, and others; and in addition must be designed so that it will not do certain things, such as introducing chirps or other keying difficulties.

An excellent article on this subject, "The ABC of Filter Design" appeared in the April, 1930, issue of QST. Anyone with an elementary knowledge of algebra can read this article intelligently and apply the principles set forth to his own individual case. The equations that appear in it should not "scare off" the ordinary reader without engineering education — the language is as simple and non-technical as it can possibly be made, and the information is very much worth-while. This article furnished the basis for most of the discussion below.

A plate-supply smoothing filter falls in the classification known as "low-pass" filters, in which the object is to attenuate (weaken) all frequencies higher than the highest frequency to be passed, known as the "cut-off" frequency. The cut-off frequency in the case of a smoothing filter is zero, since only direct current is wanted. However, the design of a filter with zero cut-off is impractical and would require an almost unlimited amount of apparatus, and for practical purposes is unnecessary. The most satisfactory way of attacking the problem, as pointed out in the article mentioned above, is to build a filter with as low a cut-off point as economic considerations, consistent with adequate filtering, will allow.

Before going any farther with this discussion, however, it is necessary to set up some sort of definition of the word "adequate" as applied to a filter. We can say without any qualification that the adequacy of the filter depends entirely on the transmitter and how it is adjusted. A filter which will be adequate on a crystal-controlled set is far from sufficient on a 1927 transmitter, and even a good outfit can be spoiled by poor adjustment. The answer to this is simply how much the transmitter frequency changes for a given change in plate voltage, because changes in the plate voltage at the supply voltage frequency — in other words, ripple — cause the transmitter frequency to vary at the same rate, giving rise to wobblulation and the well-known mushy and ragged r.c.e. notes so prevalent nowadays. The smaller this change, the smaller will be the filter necessary for a given quality of note, and at the same time there is less difficulty with keying chirps and clicks. A great many of the rough notes we hear on the air could be changed to d.c. or something very close to d.c. by a few simple alterations in the transmitter itself and a little intelligence in adjusting it, without a single change in the rectifier and filter. The antenna current may drop off a little — but actual tests will show a difference in antenna current of as much as 25% or more makes very little difference in signal strength at the receiving end. As a preliminary to building or changing a filter, the article in August, 1928, QST on "Overhauling the Transmitter for 1929," and Chapter VI in the Handbook, should be carefully read.

The theoretical design of filters is based on the assumption that the characteristic impedance of the filter is equal to the impedance of the output circuit and the impedance of the input circuit. The input and output impedances must therefore...
be the same — a condition not often realized in amateur practice. However, this is not as detrimental with a plate-supply filter as it would be with a filter designed for other purposes where the requirements are more exact. The general effect of a lack of matching of impedances is to attenuate all frequencies more than would otherwise be the case — which is exactly what we want to do.

The \( \pi \)-section filter is more suitable for plate supply work than the T-section. This is so because the placing of the condensers is such that voltage regulation is better, and the voltage output is greater than would be the case with a T-section filter. Having decided on this type of section, the question to be settled is how much capacity and how much inductance will be required to give adequate smoothing. About the only exception to the use of \( \pi \)sections would be in the case of a rectifier using mercury-vapor tubes when it is desired to draw more current than could safely be taken from a system with the condenser next to the rectifier, and when the drop in the voltage caused by placing a choke next to the rectifier can be neglected.

The curves on page 35 of April QST give us a clue to the amount of filter necessary. It will be seen by comparing the two drawings that there is no particular advantage in increasing the attenuation constant, \( \alpha \), beyond 5, because at that point the a.c. power passing through the filter is less than 10% of the original amount, and a further increase in \( \alpha \) makes very little difference in the result. Experience shows us that, when using a transmitter adjusted so that the frequency changes very little with changes in plate voltage, the note with a filter having such an attenuation constant will be “pure d.c.” The problem, therefore, is to build a filter of that type.

The output of a rectifier may be considered as being a steady direct current on which is superimposed an alternating current. The frequency of the superimposed alternating current may be either that of the supply line or twice that figure, depending on whether the rectification is half-wave or full-wave. A cut-off frequency lower than this frequency must be chosen in order that the input frequency and its harmonics will be suppressed. The lower the cut-off frequency chosen, the greater will be the attenuation of the ripple input frequency; also the larger the number of sections in the filter the greater will be the attenuation.

An inspection of the equations on page 35, April QST, shows that the higher the allowable cut-off frequency, the less will be the amount of both inductance and capacity required. As an example, if we assume a cut-off of 40 cycles to be sufficient for a half-wave rectifier working from a 60-cycle supply line, an 80-cycle cut-off will result in the same attenuation of a 120-cycle input frequency. The input frequency from a full-wave rectifier on 60-cycle supply is 120 cycles, and the advantage of a full-wave rectifier becomes immediately apparent, because only half as much inductance and capacity will be required to give the same degree of filtering. An even smaller filter will be sufficient with a d.c. generator, because the ripple frequency is usually much higher than 120 cycles. The equation for ripple frequency is

\[
f = \frac{\text{R.P.M.} \times \text{No. of segments}}{60}
\]

so that a generator with 40 segments running at 3000 r.p.m. will have a ripple frequency of 2400 cycles — and in addition the actual ripple voltage will be only a small fraction of that from a rectifier.

Some different filter combinations and the attenuation constant for each are given in Fig. 7. These are based on full-wave 60-cycle rectification, and the input and output impedances are assumed to be matched to the filter impedance. An impedance of 400 ohms was chosen, as this represents fairly well the plate impedance of most of the transmitting tubes used by amateurs with
the exception of the Type '52. The "brute force" filter shown at (a) is not exactly correct for any tube, as the characteristic impedance is 2500 ohms. The attenuation constant in this case is based on correct matching. It will be noticed from the equations referred to above that, although for a given cut-off frequency the product of inductance and capacity will be the same for any load impedance, the relative amount of each element changes with the load. The higher the load impedance, the greater will be the ratio of inductance to capacity, and vice versa.

The plate impedance of a tube is a variable quantity, and in general is equal to the plate voltage multiplied by the plate current divided by 2. A change in the adjustment of the transmitter which causes the plate current to vary also changes the plate impedance. For this reason the mathematics of filter design cannot be applied too strictly to a plate-supply filter problem — the load impedance is likely to vary within rather wide limits with individual transmitters even though the same kind of tube may be used.

Basing conclusions on the data given in Fig. 7, it might appear that either (c) or (e) would be the best type of filter to use. Theoretically this may be so, but in practical work other considerations are bound to influence the design.

Actual tests on plate supply filters such as are used in B eliminators, which usually consist of two \( \pi \) sections, (such as (c) in Fig. 7, but with different condenser values) indicate that the first condenser — the one next to the rectifier — has the greatest effect on the d.c. voltage output and regulation. In general, the larger this capacity, the higher will be the output voltage and the better will be the regulation, but there seems to be no particular advantage in increasing the capacity beyond 2 \( \mu F \).

The second filter condenser has less effect on the voltage and regulation, but has a very noticeable influence on the ripple, and the larger its capacity the less will be the ripple voltage passed through. Here again, tests indicate that there is no important advantage gained by using a capacity larger than 2 to 4 \( \mu F \). The chief function of the last condenser seems to be to act as a reservoir to supply momentarily large demands on the plate supply system, and the larger its capacity the better will be the tone quality of a receiver plate supply, or modulation in the case of a "phone transmitter supply. For c.w. work this is a comparatively minor consideration, and the 8 or more \( \mu F \) ordinarily used for audio-frequency work can be reduced to 2 \( \mu F \) or less without any deleterious effect. These tests were based on full-wave rectification with 60-cycle supply, and would require some modification for lower frequencies. It should be understood, however, that the various condensers do not have clean-cut distinctions in their functions, but that these functions are more or less intermingled, and a change in any part of the filter will affect all three.

A little consideration of the above facts leads us to believe that the old "brute-force" filter is still a pretty fair arrangement for general amateur work. Actual experience with it shows that it is capable of giving excellent results if the transmitter is adjusted in 1929 fashion. There is no doubt, however, that it can be improved upon if found necessary. We are almost tempted to say that if the transmitter will not give a d.c. note with a filter of this type and full-wave 60-cycle rectification, there is something wrong with the set itself, although there may be circumstances, particularly on the higher frequency bands, which make a larger filter necessary.

A two-section filter is preferable to a single-section, even though the same total amount of inductance and capacity are used in both cases. The reason for this is that the attenuation constant with two sections is twice that of one, provided both sections are alike, and in addition each added section helps to alleviate the effects of poor matching of impedance. We therefore reach the conclusion that for best filtering it is well to use two chokes and three condensers. On the other hand, the wire used in chokes is not free from resistance, and since quite a lot of wire is required to make a high-inductance coil, it is possible that the voltage will drop appreciably. This results in lower voltage for the tube and is harm-

*These tests were described in a series of articles in QST during 1927-8. The papers in question are marked with asterisks in the bibliography at the end of the present article.
ful to the regulation, and the latter development may cause a chirpy or "yooping" signal. Again the amount of capacity available may be sufficient for good regulation and voltage in a single section, but when spread over two sections may not be enough from this standpoint, although ample so far as filtering alone is concerned.

Provided there is no limitation on the amount of capacity to be used, however, and assuming that the chokes have fairly low resistance, we would recommend the combinations shown in Fig. 8 in the order given. Any one of the four with a well-adjusted transmitter, not subject to undue variations in frequency with changes in plate voltage, will give a note of excellent character, although the actual filtering decreases with the less elaborate arrangements.

All of the above recommendations are on the basis of full-wave rectification with a supply frequency of 60 cycles. As the frequency is lowered, a correspondingly greater amount of inductance and capacity will be required for the same smoothing. At 50 cycles the difference is small enough to be neglected, or can be made up by the addition of an extra microfarad or so in the second filter condenser. At 25 cycles, however, the picture changes.

The brute-force filter [Fig. 8 (4)] has a natural cut-off frequency of 29 cycles. In other words, a filter of this type will have no effect whatever on the output of a half-wave 25-cycle rectifier so far as the fundamental frequency is concerned, although of course the harmonics will be suppressed. However, in a practical filter there will probably be some attenuation at 25 cycles simply because the input, filter and load impedances are very rarely matched correctly. Even arrangement (1) in Fig. 9 would be of comparatively little value, except for this same effect of poor matching of impedances. In order to get as much filtering as would be accomplished by the brute force filter with a 60-cycle half-wave rectifier, about 10 µfd. of capacity and 75 henrys of inductance would be necessary. A half-wave 25-cycle rectifier would therefore seem to be a rather expensive proposition.

With a full-wave rectifier, however, the brute-force filter will have an attenuation constant of 2.27, as compared with 2.7 with a half-wave 60-cycle rectifier. With two sections—(1) in Fig. 8—α increases to 4.54, slightly better than a single section with full-wave 60-cycle rectification. As this represents about the least amount of filter which will give a good note with a well-adjusted transmitter, it would seem that our friends who are afflicted with 25-cycle "juice" are in a corner where there is not much to be done except get plenty of filter condensers and chokes. Under certain conditions it may be possible to do very well with less filter than this—these figures are of necessity based largely on theoretical considerations, and the final authority in all cases will have to be the monitor.

And this is equally true regardless of the supply frequency. The basis of comparison is not the number of filter chokes or condensers which may be hooked in the circuit. Final judgment will be rendered on what the thing sounds like. With the aid of the monitor and the QST's which covered 1929 transmitter adjustment it may be possible to do much with little.

BIBLIOGRAPHY OF QST ARTICLES

An Unusual Rectifier Cure, page 49, November '28.
Electrolytic Rectifiers, Exp. Section, November '28.
The Duriron-Duralumin Electrolytic Rectifier, page 45, October '28.
Simple Cure for an Old Ailment, page 44, December '27.
Successful Electrolytic Rectifiers, page 33, May '27.
Aluminum Rectifiers, page 51, September '25.

Rectifiers, Thermionic

Alternating Current Rectification as Applied to Radio, page 33, April '29.

(Continued on page 78)
The Band-Box Superhet

Converting the Old D.C. Broadcast Receiver to a Modern High-Frequency Superheterodyne

By Howard F. Anderson.*

It is generally conceded that there is no receiver like the superhet for sensitivity and selectivity at amateur frequencies—particularly where high-frequency 'phone reception is concerned. The chief handicaps—also generally conceded—which have retarded the popular adoption of this type of receiver have been high cost and involved construction. In addition to these handicaps, tricky adjustment of oscillator coupling and tedious manipulation of oscillator and first detector tuning circuits have been discouraging features of most high-frequency superhets.

Here is a real high-frequency superheterodyne receiver, however, which practically whips all these disadvantages. Low cost and simplified construction are obtained by using an obsolete broadcast receiver as the foundation and a space-charge first detector, with resistance coupling between it and the oscillator, eliminates most of the difficulty in getting these two units working together without mutual detuning effects at even the highest amateur frequencies. Moreover, the 1550-kc. intermediate frequency used precludes all possibilities of "repeat" points. The tuning is truly "single spot"—all the way up to 21,000 kc.

The general design is based on the circuit of L. W. Hatry's HY-7 superhet which also uses a space-charge first detector and 1550-kc. intermediate screen-grid amplifier.

Nowadays most everyone is familiar with the general working of superheterodyne type receivers, particularly the high intermediate frequency variety. Since it is the intention that this article be primarily a how-to-do-it affair rather than a dissertation on the theory of superhets, the how-and-why will be omitted. It might be a good idea however, for the builder to review the theoretical aspect of this type of receiver before starting actual construction; a wealth of information on the subject will be found in past issues of QST—particularly in Ross Hull's article in March, 1929, and L. W. Hatry's "Improving the All-Purpose Superheterodyne" in September, 1929.

The general scheme in this particular superhet is to use the old broadcast receiver's r.f. inductances as the intermediate frequency coupling coils with a few turns removed from each coil to raise the upper frequency limit to 1550 kc. They are tuned by the "neutralizing" condensers of the broadcast receiver. A high-frequency oscillator and first detector are added, of course, and the detector of the B.C. set becomes the second detector of the super—the audio amplifi

* W1BVS, 28 Maple, Torrington, Conn.
worked out on the same plan by the individual experimenter.

since the receiver is obsolete. Take off the dials, escutcheon plate and the four screws on the bot-

DESTRUCTION — AND RECONSTRUCTION

Procure from a local dealer a Crosley Bandbox battery set. This will cost from $5.00 to $10.00, although some dealers might give them away

Oscillator inductance. See table and Fig. 2.

Intermediate frequency coils. See text.

Pickler coil for second detector. See text.

0.25-µfd. Sprague molded fixed condensers.

1.0-µfd. by-pass condenser.


600-µfd. fixed grid coupling condensers.

200-µfd. grid condenser, second detector.

220-µfd. fixed regeneration condenser.

150-µfd. fixed regeneration condenser.

100-µfd. by-pass condenser.

Neutralizing condensers of Bandbox.

0.01-µfd. by-pass condenser.

1-ohm fixed resistor, tapped near center. See text.

15-ohm filament resistors.

100,000-ohm potentiometer. Volume control.

Rs — 500,000-ohm potentiometer. First detector bias control.

Rc — 200-ohm Electroflexible resistors.

Rs — 100,000-ohm fixed grid-leak type resistor.

Rs — 5-megohm grid leaks.

Rs — 5-megohm grid leak, second detector.

Rs — 10,000-ohm grid-leak type resistor. Oscillator coupling.

"Grounds" indicate connections to chassis.

The following additional parts are also required:

1 7" × 10" × 3 1/2" Bakelite panel.

2 Vierier dials.

3 2-prong sockets for coils.

1 2-prong socket for oscillator tube.

1 Broadcast-band radio frequency choke.

3 Gridleak mountings.

2 Toggle switches.

15 Silver-Marshall 180-P or similar coil forms for oscillator and first detector windings.

2 feet of shielded wire.

ONE OF THE INTERMEDIATE FREQUENCY COILS

The grid coupling condenser is mounted on the top of the coil form. The lead connected to one terminal of this condenser is pulled through the top of the can when the latter is put in place. The other terminal of this condenser is connected to the top end of the inductance.
these plate coils with ten turns of No. 30 d.c. wire, being sure to wind in the same direction as the winding on the r.f. coil. This rewound coil is the tickler for the second detector. The other two plate coils will not be used. It will be found that the r.f. coils each have 106 turns of wire and 20 turns should be removed from the bottom end of each one. The tickler should be put in the detector coil before it is replaced in the set.

The two grid coupling condensers for the i.f. tubes are mounted on top of the coils with the lugs bent over the coil form and a drop of Duco cement put on each to hold them in place as shown in the illustration. Leave the cans off until the wiring is finished; it will be a lot more convenient.

Now the two 50µfd. Pilot tuning condensers for detector and oscillator can be mounted. They go in the outside holes where the old tuning condensers were, with some 3/8" washers to take up the extra space. Be sure the first detector tuning condenser is insulated from the chassis as this has the bias voltage for the first detector on it. A paper washer on each side will fix this.

Mount the 100,000-ohm potentiometer in the center hole and use washers to insulate this too. Mount the detector coil socket, the oscillator tub socket and coil socket according to the diagram. The 500,000-ohm potentiometer is mounted on its bracket terminal. Now take the 1-ohm fixed resistance, R₁, and solder it in place of the old resistance. Take a tap off R₁ near its center and connect to one end of the common filament lead. This will give between .6 and .7 ohms. Mount the three 15-ohm resistors between the negative filament of the three screen grid tube sockets and the chassis.

终端。现在取下1-ohm固定电阻，R₁，并将它放在老电阻的位置。在R₁的中心附近取一个输出，然后将其连接到公共灯丝的两端。这将给出0.6到0.7欧姆。将三个15-欧姆电阻安装在三个屏幕电网管座的负灯丝之间和电池上。

THE LAYOUT OF THE BASEBOARD

Now proceed to the grid and plate leads on the first detector and i.f. amplifier. First, of all, connect the neutralizing condensers to the r.f. coils. Of the four 2000-ohm flexible resistors, two should be connected in the screen grid supply circuits and two in the plate supply circuits of the i.f. tubes. These act as r.f. chokes.

The grid leaks come out on top of the cans and grid-leak leads go down through the center of r.f. coils. The wire, which goes to all sockets, is connected to one end of R₁ and the positive lead. The other lead from the resistance and the yellow lead in the cable go to the filament switch on the panel.

Now proceed to the grid and plate leads on the first detector and intermediate amplifier. First of all, connect the neutralizing condensers to the r.f. coils. Of the four 2000-ohm flexible resistors, two should be connected in the screen grid supply circuits and two in the plate supply circuits of the i.f. tubes. These act as r.f. chokes.

The grid leaks come out on top of the cans and grid-leak leads go down through the center of r.f. coils. The wire, which goes to all sockets, is connected to one end of R₁ and the positive lead. The other lead from the resistance and the yellow lead in the cable go to the filament switch on the panel.

The photos illustrate how the by-pass condensers are mounted and every ham will have his own idea about laying out the apparatus below the base. It should be remembered, however, that the plate leads on the first and second i.f. and first detector tubes are shielded.

The second switch on the panel is the regeneration and oscillator control for the second de-
tector. There is one 150- and one 250-µfd. fixed condenser in series in the plate lead of the second detector. For regeneration the switch is open leaving the two condensers in series and for c.w. the switch is closed, which shorts the .00015-µfd. condenser and allows the second detector to oscillate. It is also possible to get regeneration without oscillation by changing the “67 volt plus” to “90” or “110 volt plus” and turning down the volume control so that the screen grid voltage is low enough to stop oscillation. This certainly boosts up the signals.

There is not much to say about the panel. There are two tuning controls, the oscillator and first detector. The oscillator really needs a vernier dial but the detector does not necessarily need one as it is not critical at all. The center knob is the 100,000-ohm potentiometer which is the volume control. The two toggle switches are for the filament and for the ‘phone-c.w. control.

The circuit uses the “Ultradyne Modulator” system on the oscillator and first detector. This seems to work the best of all and does not need any pick-up coils which cause lots of trouble by interlocking in tuning, especially on the higher frequencies.

Now for the oscillator and first detector coils. The secret of the operation of the super is to have these coils proportioned correctly.

An effort has been made to limit the tuning ranges of these coils to 1500-kc. each so as not to have any repeats on the oscillator. A few of them do run over but not badly enough to jumble up everything.

A station heard around 0 to 5 may come in again around 95 to 100 on the oscillator dial, but is very difficult to hold fast to a 1500-kc. range in the high frequency and since to do so would require too many coils to cover the necessary bands.

The detector and oscillator coils have only two windings each but are wound on S-111:10 coil forms so that a tap can be taken off from the grid coils to give band spreading in the amateur bands. The table gives the number of turns and approximate range of each coil. Of course others can make coils to suit themselves always remembering to figure on a 1500-kyc. difference in tuning range between detector and oscillator coils.

The FINAL ADJUSTMENT

After you have the set finished and wired, connect a pair of ‘phones to the speaker terminals to check up the set. Be careful and don’t clamp them on your ears tightly because this set has some kick. Then turn on a vacuum cleaner, hair dryer or some other local QRM maker to furnish a signal for balancing up the i.f. circuits. Make a

(CONTINUED ON PAGE 82)
Advanced Transmitter Design

Getting 3500-kc. Performance from the 28-mc. Transmitter

By James J. Lamb, Technical Editor

IT is often puzzling to find that the perfectly reliable old 3500-kc. transmitter becomes not so reliable at 7 mc. or that it sometimes becomes wildly erratic at 14 mc. and altogether refuses to work at 28 mc., even though the orthodox changes have been made in the tank circuits and radio-frequency chokes to transmitter which was born of our trials and tribulations.

SOME TRANSMITTER TROUBLES — AND THEIR SOURCES

It is rather difficult to determine just where to dive into a discussion of the sources of 28-mc. 

THE PUSH-PULL TRANSMITTER WHICH SOLVED THE DIFFICULTIES

It uses two Type '58 tubes and delivers d.c. signals at 28 mc. The tuned-grid circuit is in the right of the tubes and the tuned plate circuit is to their left. The antenna ammeter is supported by brass strips bolted to the wall insulators on which the two sections of the antenna coupling inductance are mounted. Filament- and plate-supply connections as well as the key-jack are on a terminal strip at the back. The antenna system connects to the two wall insulators at the extreme left of the assembly.

adapt it to these higher frequencies. Almost invariably the note gets rougher as the frequency goes up, creeping becomes a major problem and efficiency goes all to pot. Condensers break down, r.f. chokes burn up, the key sparks violently — and the perspiring ham is likely to come to the conclusion that this 28-mc. business isn't all that it has been cracked up.

Now the fault isn't that of the 28-mc. band as such nor does it lie in the transmitter which was well designed for 3500 or 7000 kc. but never intended for higher frequencies. The circuit diagram for a 28-mc. transmitter may look exactly like the circuit diagram for a 3500-kc. rig, but the assembly of the 28-mc. set involves considerations which do not enter into the make-up of transmitters for the lower frequencies at all. It is these considerations which are responsible for the evolution of this particular article as well as for a lot of preliminary circuit-sleuthing and experimenting on the part of QST's technical gang. We shall start off with a short recital of what we found ourselves up against and then describe the transmitter troubles, since they are of so many different species and a lot of them are hard to isolate. All the usual "bugs" can be grouped into a few classes, however, with the symptoms of the difficulties as a basis for classification.

That the discussion may be intelligible in a practical way, we shall take a specific circuit and tear it to pieces. The selection of the circuit is not so important but let it be one that is of a popular breed. Also, it had best be one most aptly subject to every conceivable variety of "bug" a high-frequency transmitter can have. Personal experience points to the old reliable tuned-grid tuned-plate of Fig. 1. Wait a minute, you t.g.t.p. enthusiasts -- no intended reflection on the circuit. It's one of the best, and before we get through it's going to be better yet!

The word-description of the rig is "two tubes in parallel in a high-C t.g.t.p. circuit with shunt d.c. feed to the grids and plates." It has everything in it but the kitchen stove and almost every part has trouble-making potentialities, not only at 28 mc. but at any ham frequency. Recol-
lection of past headaches with just this sort of circuit brings it all back like a bad dream.

The worst thing that can happen to any transmitter is, of course, complete refusal to oscillate, even though it be taking enough plate power to burn out the bearings in the light company's meter. The immediate conclusion is, naturally, that the grid and plate circuits are out of tune. Very well, tune them around a bit. Still no detectable oscillation, and the plates getting whiter and whiter. The grid leak must be open — no, that's not it. It was just tested and is still OK. Moreover, a d.c. milliammeter cut in series with the grid return shows some grid current flowing. The leaks are even getting warm! The tubes must be oscillating or there couldn't be any grid current. And oscillating they are, but not at any frequency to which the tank circuits may be tuned. It's a parasitic oscillation and its frequency is determined by one or both of the sections of the circuit shown in Fig. 2.

PARASITIC OSCILLATIONS

Here we have two perfectly legitimate tuned-grid tuned-plate circuits, one with just the grid-and plate-blocking condensers in series with loops in the circuit wiring forming a series push-pull hook-up, and the other with the tuning condensers in a series loop and the tubes in parallel. If either (or both) of these series-tuned circuits should happen to hit a resonance condition, requirements for successful oscillation are satisfied (as far as the respective circuits are concerned) and how they do oscillate, usually at some frequency of the order of 90 m.e. or so. Of course the chokes are all off at such frequencies, and the efficiency is terrible. The note, as heard on a monitor, sounds like a power leak.

As further evidence that conditions are not so good, it sometimes happens that the filaments get brighter when the key is closed. This is a pretty certain indication that there is a lot of r.f. flowing through the filaments and an early end to their lives may be expected if the punishment continues. The explanation for this apparent increase in filament current may be traced to several possible causes but the most likely is that the filaments are acting as closed absorption loops approximately resonant to the frequency of oscillation. We shall have more to say about that particular trouble later.

The most obvious method of curing the parasitic oscillation resulting from the series-tuned push-pull grid and plate circuits is to detune one of the circuits. This can be accomplished by increasing the series inductance on either the grid or plate end and a few turns connected at the points marked "X" in the diagram of Fig. 2 may serve the purpose. That doesn't help any in curing the parasitic oscillation of the circuit elements in series with the tuning condensers, however, although a little series inductance might help if connected in the grid portion at "Y." This is only temporizing to make the best of a bad situation, however, and the final recommendations are to be more sound in nature than such resorts to expediency.

A few other possibilities for parasitic oscillatory circuits are shown in Fig. 3. These are more or less remotely dangerous, but their liability is nevertheless worthy of consideration. Analysis of their potentialities for causing trouble is considerably involved because the networks are so mazeily inter-dependent, but a few of the more simple combinations should be mentioned.

The circuit elements of Fig. 1 have been rearranged a little in Fig. 3 in order that their trouble-making functions may be easier to point out.

Since the tuning condensers are effectively in series with the blocking condensers across the chokes in the plate circuit and across the chokes and leaks in series in the grid circuit, they are shown thus in Fig. 2. This is obviously bad business, because the tuning condensers are intended to tune the plate and grid inductances and not the chokes. The grid chokes have the leaks in series with them, of course, but leaks are not pure resistances and usually have some distributed capacitance and inductance in addition to the resistance specified on their labels. This distributed capacitance and inductance is negligible at lower frequencies but may become considerable at 28 mc., at least sufficiently considerable to warrant a little suspicion as to the effects on transmitter performance.

Like the resistors, the chokes also have some distributed capacitance (in addition to their intended inductance) although this distributed capacitance is small compared to the circuit capacitance in shunt. As a further complication, the fixed blocking condensers possess inductance as well as capacitance — particularly if the condensers happen to be of the wound type. We know of one classic case in which a moulded fixed condenser had sufficient inductance to make it a resonant circuit at approximately 10 mc., with the consequence that it burned itself up while...
being used as a by-pass condenser across a meter in a tuned r.f. circuit. Perhaps the explanation for the mysterious blowing of many filament by-pass condensers — as well as grid- and plate-blocking condensers — can be attributed to "inductive" fixed condensers.

It would seem that enough evidence already had been collected against our old reliable circuit to condemn it entirely, but we aren't through yet. We haven't considered the tube characteristics and capacitances yet; we can't start redesigning the set until a decision has been made on the tubes to be used and the method of connecting them.

With the tubes connected in parallel, the respective grid-filament capacities are in parallel and so are the plate-filament capacities, as well as the grid-plate capacities. Since the evils of such combinations have been explained quite completely in the article, "Push-Pull Transmitters," in QST for December, 1928, the whole story need not be repeated here. The conclusion is sufficient: Tubes should never be operated in parallel at high frequencies, particularly in self-excited transmitters.

The choice of tubes is comparatively easy, because it can be based on the specifications of the manufacturers which, in turn, are determined largely by the inter-element insulation and inter-electrode capacities of the tubes themselves. The best bets are the Type '10 for low power rigs and the Type '52 for higher power sets. The others, such as Type '03-A, '11, and '04-A, have comparatively high inter-electrode capacities, as well as other features making them unsuited to ultra high-frequency service. The importance of inter-electrode capacitance and inter-element insulation in tubes used at ultra-high frequencies has been aptly pointed out by H. E. Mendenhall of the Vacuum Tube Research Department, Bell Telephone Laboratories. The information is so pertinent to our problem that Mr. Mendenhall's statement will be quoted verbatim.

"There are several reasons why tubes that are structurally satisfactory for the low-frequency range were inadequate for the high-frequency range."

"In the first place, at the high frequencies the inter-electrode capacity of the elements of the tube becomes very important from the circuit standpoint. The 'charging' or displacement currents which flow through every dielectric in an alternating electric field increase with the frequency of the alternations. These displacement currents heat the various dielectrics whose power factors are not zero, used in and around the tube, thereby causing the ultimate failure of the tube. A 'high' vacuum is the only perfect dielectric, for heat is not developed in it through dielectric losses. It can fail only when leaks or a slow evo-

lution of gas from the parts of the tube change both its status as a vacuum and its insulating properties. The air separating the elements on the outside of the tube will be only about one-tenth as effective an insulator when the tube is oscillating at thirty-thousand kilocycles as compared with the non-oscillating condition, when the same plate potential is applied to the ter-

![Parasitic Circuit A](image)

![Parasitic Circuit B](image)

**FIG. 2. — CIRCUIT ELEMENTS IN WHICH PARA-
SITIC OSCILLATIONS FIND SATISFACTION**

One is push-pull series-tuned and the other is tube-in-
parallel series-tuned. Either is open to suspicion.

minials. The same air gap will be disrupted, moreover, by one-twelfth of the applied voltage if it is alternating at thirty-thousand kilocycles instead of at sixty cycles. (Italics ours.)"

"Another reason for the failure of earlier types of vacuum tubes when used in short-wave circuits is to be found in the 'skin-effect.' A high-frequency current passing through a conductor is forced to travel through a very thin layer at the outside of the conductor. The effective size of the conductor is thus reduced, its resistance correspondingly increased, and overheating engendered."

That's the whole tube story in a nutshell. Summarized in terms directly applicable to our present problem, it means that the tubes used for 28 mc. must have the lowest possible inter-electrode capacity, the greatest possible inter-element insulation both inside the envelope and out, the highest vacuum, the least occluded gas in the elements, and grid and plate leads of adequate effective conductivity at the operating frequency. Even with tubes designed to satisfy these requirements it is advisable to operate with less than maximum rated plate voltage if normal tube life is to be obtained. Leaving out those tubes not intended for operation at ultra-high frequencies, our recommendation is that the d.c. plate voltage be limited to 350 volts for the Type 10 tubes and to 1500 volts for Type 52 75-watt tubes at frequencies above 28 mc.

In order that the effect of inter-electrode capacities on the external circuits may be reduced to the very minimum, the most practical arrangement is, obviously, two tubes in a push-
pull circuit. Moreover, it happens that this type of circuit is adaptable to modifications which eliminate practically all the other weaknesses of our old reliable circuit of Fig. 1. Since the individual steps taken in progressing from the parallel arrangement to the final push-pull circuit of Fig. 4 would make this story unnecessarily tedious, the reasons for the various modifications will be incorporated in the description of the final circuit.

A TRANSMITTER THAT DELIVERS D.C. SIGNALS AT 28 MC.

Before going into the details of the construction of the final transmitter, a summary of its features and operating characteristics will be sketched, particularly for the benefit of those who make a practice of skimming through technical articles and who write the Technical Information Service asking for details which are given in the story but which they apparently didn't bother to read.

It is a completely balanced high-C push-pull transmitter with series d.c. feed to grids and plates. It uses two Type '52 75-watt tubes and is intended primarily for operation on the 2S- and 14-mc. bands. There are none of the usual blocking condensers, although there is one home-made insulating condenser which could be omitted, as explained later on. There are no filament by-pass condensers and the r.f. chokes shown in the diagram might be dispensed with, since they are in the circuit for the sake of precaution rather than because they are functionally necessary.

The grid- and plate-tuning condenser rotors are at zero r.f. and d.c. potential to ground. They can be touched while the transmitter is in operation without shock or disturbance of the set's functioning. All tendency to parasitic oscillation has been eliminated by proper proportioning and placement of the grid and plate circuit elements, without resort to choking and other afterthoughts. There are no tricky or freak features about the thing; it is based on common, ordinary, "horse-sense" ideas.

ELIMINATING THE BUG OF PARASITICS

As pointed out in the analysis of the circuit of Fig. 1, the principle sources of parasitic oscillations are the series elements in the grid and plate circuits. Since the possibility of parasitics is greatest when the series elements in the grid and plate circuits are in approximate resonance, the best insurance against their occurrence is to make the series elements of non-resonant proportions right at the start. Here is a case where short leads are important on one side and long leads are important on the other. This is one instance in which the time-worn recommendation, "all leads should be as short and direct as possible," must be modified. The plate leads should be short (as short as possible) but the grid leads must be long.

This ratio of grid-lead length to plate-lead length is an important consideration in the design of any piece of high-frequency apparatus containing one or more vacuum tubes. It isn't necessary to have more than one tube to have parasitic oscillations, either. Many a single-tube oscillator or amplifier is "lousy" with them, although they are not often of sufficient amplitude to make the set entirely inoperative. Single-tube tuned-grid tuned-plate rigs are particularly addicted to them, especially those using a Type '04-A 250-watt tube. The usual indication of parasitics in a minor degree is abnormal heating of the tube, poor efficiency, a bum note and erratic oscillation; missing dots, jumping frequency and the like. (If your set shows these symptoms, go on a parasitic hunt.)

In this particular transmitter, the plate leads go directly to the plate tank-circuit tuning condenser and each lead is 3.5 inches long. The grid tank circuit arrangement is a bit different from the usual in that the inductance is mounted between the tubes and the tuning condenser. This allows sufficient length in the leads from the grids to the tuning condenser terminals without overly stringing out the assembly. The total length of each grid lead—measured from the tube end—was...
slope to the condenser terminal — is 13.5 inches. The connections within each tank circuit (between condenser and coil terminals) are necessarily short, direct, and heavy. The connections within any tank circuit should always be short, of course, because it is in these circuits that large r.f. currents flow and losses must be kept down to the very minimum.

A little study of the various “favorite” circuits immediately reveals that the push-pull t.g.t.p. is the only one which allows a high ratio of grid-lead length to plate-lead length, since all the others require the connection of the grid and plate leads to terminals on a single tank circuit and automatically restrict these leads to approximately one length — unless some of them are run around the block just to make them a little longer. All the other circuits have an additional condemning handicap which would eliminate them from consideration if lead-length ratio didn’t put them out. This handicap is their requirement for shunt d.c. feed to either grids or plates. If series plate feed is used, a shunt d.c. grid return must be provided; if series grid feed is attempted, a shunt plate-supply feed becomes automatically necessary. This applies to all the Hartley, Ultra-audion, and Colpitts circuits except those which have a blocking condenser in the center of the tank inductance — and the latter arrangement is impractical because a blocking condenser so placed in a high-C tank circuit must carry more r.f. current than any but the most expensive condensers can handle. Moreover, we are skeptical of ordinary fixed condensers in high-frequency r.f. circuits anyway, and one of our aims is to eliminate them as much as possible.

It is impractical to build up a compact fixed condenser without considerable dielectric other than air in the electric field; losses in dielectrics other than air can be quite vicious at frequencies above 25 mc., and the more common insulating materials are liable to break-down in even moderate power transmitters. This brings up the matter of blocking and by-pass condensers in general.

ELIMINATING DEPENDENCE ON FIXED CONDENSERS

A study of the circuit of Fig. 4 reveals that there is no fixed condenser in any r.f. portion of the circuit. Moreover, fixed condensers have been omitted where precedent would lead us to believe they ought to be. This has not been done without justification. Their omission not only is possible but is advantageous also. This applies especially to the grid-blocking condenser and filament by-pass condensers.

The fixed condenser between the rotor of the plate tuning condenser and the negative high voltage is simply an insulating condenser, made necessary because the plate tuning condenser sparked over with keying surges. It has no radio-frequency potential across it and can be shorted out at reduced plate voltage.

The omission of the orthodox filament by-pass condenser was decided upon after a number of tests and trials which brought out some interesting though puzzling results. By-pass condensers of several different sizes and types all gave poorer results than none at all. One of the original pair shorted across (apparently from a keying surge) and removal of both of them immediately resulted in an improved note. The substitution of others made no improvement over the first pair and caused a reduction in the quality of the signal. A pair of lamps connected as a center-tapped resistor had the same effect as the various fixed condensers. Using the filament center-tap of the transformer only, however, the note is invariably “near d.c.” — the plate rectifier being two Type '06 tubes in a full-wave hook-up and the filter consisting of 1 µfd., 30 henries and 2 µfd. in
the regular brute-force combination. Moreover, there is no sign on r.f. at the filament terminals or in any part of the filament-supply circuit. In fact, this is the first 28- or 14-mc. transmitter or in any part of the filament-supply circuit. In supply equipment as well as into the 110-volt lines. The filament- and plate-supply leads are actually at zero r.f. voltage to ground.

An explanation for the inferior performance of the transmitter when filament by-pass condensers

![Diagram](image)

**FIG. 4.—THERE ARE NO FIXED CONDENSERS OR RADIO FREQUENCY CHOKES CONNECTED TO POINTS OF HIGH R.F. POTENTIAL IN THIS CIRCUIT**

1—Split center inductance. Each section has 6 turns of 1/4-inch copper tubing and is 2 inches in diameter. Both sections are wound in the same direction.

1a—1/4-inch copper tubing plate inductance. 2 turns 2 inches in diameter, spaced 1/4 inch between turns, for 28 mc. 5 turns 3 inches in diameter, spaced 1/2 inch between turns, for 14 mc. Inductances turned at centers.

1b—1/4-inch copper tubing grid inductance. 2 turns, 2 inches in diameter, spaced 1 inch between turns, for 28 mc. 6 turns spaced 1/2 inch for 14 mc. Tuned at center.

C1—Cardwell 35-plate receiving condensers double-spaced. Capacity, maximum 800 µfd., minimum 50 µfd.

C2—Rebuilt TM-400 National transmitting condenser. See text. Cardwell Type 155-B or General Radio Type 804-2 may be used instead.

C3—Cardwell Multiple Type 155-B receiving condenser. Each section has a capacity of 500 µfd.

C4—Fixed air-electric inducting condenser, 75 µfd. See text for details. May be omitted at reduced plate voltage. (1600 or less).

C5—Spark-absorption condenser for key. .0012 µfd. May be omitted if key-hump filter is used.

B,—Allen-Bradley Type E-210 Bradleymaker. Fixed resistor of 20,000 ohms might be substituted.

RFC—28-mc. radio-frequency choke. May be omitted but are recommended. See text for details.

K—Single-circuit telephone jack for key connection.

Tubes are Type 577 tubes.

were used has not been definitely decided upon, and the most logical conclusion so far reached is that the inductance of the filaments in shunt with the condensers resulted in a pair of absorption circuits, since the filaments are in the intense electric fields inside the tubes and could pick up considerable r.f. The electric fields of the respective tubes are 180 degrees out of phase, of course, and with the filaments properly connected together, without by-pass condensers, the resultant r.f. current through one should be in opposition to that through the other. If the introduction of by-pass condensers should upset this balance, there might be a net flow of r.f. current which, "modulated" by the low-frequency a.c. through the filaments, might in turn modulate the r.f. output of the transmitter. This is largely speculation, however, and is offered for what it may be worth. It remains that with this particular rig the signal and operating stability are better without filament by-pass condensers than with them.

**SYMOMETRICAL TANK AND ANTENNA-COUPLING CIRCUITS**

Although the transmitter's plate circuit is not symmetrical with respect to the grid circuit, the plate circuit of one tube must be symmetrical with respect to the plate circuit of the other, as must also be the grid circuit of one tube with respect to the grid circuit of the other. The two grid connections to the grid tank must be of the same length and so must be the two plate connections to the plate tank.

In addition to symmetrical connections between the tubes and the respective tank circuits, the tank circuits themselves must be symmetrical about their respective electrical "centers." This requirement calls for not only an exact center tap on the tank inductance but also for tuning condensers which have symmetrical electrical properties. Tuning condensers of the double stator and single rotor type have this feature and such condensers are used for tuning the tank circuits in the transmitter.

The two sections of such a condenser are in series across the tank circuit and the rotor is grounded. Since the rotor is at zero r.f. and d.c. potential to ground, the danger of shock as well as the serious detuning of the set when the dials are touched are eliminated. Moreover, the insulation of one section of the condenser is in series with the insulation of the other (across the high r.f. potential ends of the inductance) and the insulation is thereby made doubly effective. Since the two sections are in parallel with respect to the d.c., the d.c. flash-over voltage is the same as if a single-section condenser of the same plate spacing were used. It is usually r.f. voltage rather than d.c. voltage that breaks down condenser insulation, however, and a fixed insulating condenser between the rotor and negative high voltage will be adequate insurance against d.c. flash-over with standard types of tuning condensers.

The balanced tuning condenser is also advantageous in making possible the achievement of symmetrical connections within the tank circuit, since the leads between the condenser and the tank inductance both connect to the stator plates and can be made exactly equal in length. Such symmetry is difficult to obtain when one connection must be made to the stator plates and the other to the rotor (frame) of the condenser.
The total capacity across the tank circuit is approximately half the capacity of one section (since the two sections are in series) and a condenser of comparatively high capacity per section is necessary for high-C at the lower amateur frequencies. Since the balancing of the tank circuits is not so critical at the lower frequencies Radio frequency meters have a considerable amount of inherent impedance at very high frequencies and it is advisable to place the meter in a part of the circuit where this impedance can be least effective. The disadvantages of the arrangement are the necessity for two tuning condensers and their location at points of consider-

D.C. AND LOW-FREQUENCY A.C. WIRING IS RUN BENEATH THE FRAME

The terminal strip, by-pass condenser for key, grid-leak, and r.f. chokes are grouped beneath the tubes in the neutral area of the radio-frequency field.

(below the 14-mc. band, say) it would be practicable to connect a single-section condenser in parallel with the balanced condenser to get the necessary high-C plate tank for these lower frequencies. The effective capacity range of the rebuilt National plate tuning condenser used in this set is from a minimum of 28 µfd. to a maximum of 110 µfd., measured with the condenser out of the set. This maximum gives a satisfactorily high-C plate tank at 28 and 14 mc. with Type '52 tubes in push-pull. The capacity range of the Cardwell grid-tank condenser is from a minimum of 45 µfd. to a maximum of 275 µfd., wiring and grid-filament capacities included.

The centers of the tank inductance are also at ground r.f. potential and are therefore the ideal points at which to make the d.e. feed connections to the grid and plate circuits. If the plate-supply and grid-leak connections were made exactly at the electrical centers of the inductances, there would be no necessity for radio-frequency chokes at these points. As insurance against the possibility that these connections may not be exactly at the voltage nodes, however, it is advisable to have r.f. chokes in the circuit as shown in the diagram of Fig. 4. The chokes are not functionally necessary and if the taps are carefully placed on the inductances they may be omitted.

The idea of electrical symmetry is also carried on into the antenna coupling circuit. The antenna inductance is split in two sections with the antenna ammeter connected between them. This places the anmeter at the point of maximum current (with symmetrical current distribution in the antenna or feeder system) which is advantageous in some ways — and disadvantageous in others. The advantages are the requirement for but one meter and the placement of the meter at a point of maximum impedance in the system.

able r.f. potential. The latter disadvantage is principally noticeable when making tuning adjustments, since bringing the hands near to the condensers has a considerable detuning effect on the coupling system. Weighing the advantages and disadvantages seems to favor the arrangement shown in Fig. 4, although modification of the whole scheme might prove profitable.

The transmitter is intended for operation with a Hertz antenna fed by a two-wire tuned feeder system (Zeppelin style) and adaptation to other systems will require revamping of the coupling arrangement.

PRACTICAL CONSTRUCTION

The actual how-to-make-it part of this article has been reserved for complete recital in one piece because it has been found that the practical constructional details are not so readily dug out when they are tangled up with the theory and "why" which must also be given in a technical article. This arrangement should particularly suit those who have the habit of reading only the constructional parts of articles — and who often miss details which are not conspicuously set apart. (We have a wistful hope that some of these theory-dodgers have unconsciously absorbed a little of their pet aversion while hunting for the constructional information in the first part of the story.)

The simplicity and straightforwardness characterizing the layout of the transmitter are graphically brought out in the illustrations. The foundation for the assembly is a skeleton frame made of "printers' furniture." This wood is cherry impregnated with linseed oil and is obtainable at printers' supply houses and at most large printing plants. It comes in 36-inch lengths with one cross-sectional dimension of approximately 3/8 inch and the other ranging from ap-
approximately 3/4 inch to 1 3/4 inches. The side-rails in the transmitter are two pieces each 36" long and 1 3/4" wide. The overall depth is 6 3/8". The grid- and plate-tank condensers are mounted on angle-brackets bolted to the side rails, the grid condenser being a Cardwell "multiple," Type 156-B and the plate condenser a rebuilt National Type TM-450, the latter having Crolite insulation.

The Cardwell condenser is a standard multiple-type receiving condenser and needs no remodeling to adapt it to our purpose. The National transmitting condenser, originally a single-section affair, requires some remodeling to convert it to a two-section type. This is easily done, however, since changes in the stator assembly only are necessary. The stator is removed by taking off the nuts on the supporting rods and then unfastening the supporting Crolite insulators. The stator is completely disassembled and the rods are each cut in the center. Copper washers are soldered to the unthreaded ends of the six half-rods and the stator is reassembled with the center plate left out. The result is two separate stators, each supported by three rods held fast to the insulators by hex nuts. In reassembling the condenser, care should be taken to get identical spacing between the plates and proper alignment of the two sections. This can be done quite accurately by "sighting" across the plates and along the rods. When finally lined up, the plates should be tightened carefully. Too much tension will pull the rods out of the washers soldered to the ends but insufficient tightening will cause high-resistance contacts between adjacent stator plates. Long brass bolts of the proper length, diameter, and thread would be better than the revamped rods if they could be obtained.

A ready-made multiple-type condenser may be used if rebuilding is distasteful. The Cardwell Type 157-B and the General Radio Type 334-Z have approximately the same characteristics as the rebuilt National used in this transmitter and may be substituted in its place.

The fixed air condenser, $C_4$, is made up from the surplus stator plates of a National straight-line-capacity receiving condenser which had been double-spaced. These plates are stacked up triple-spaced with the same washers used as separators in the variable condenser of which they are relics. The end plates are pieces of bakelite and the supporting screws are 6-32 brass flat-heads. The total number of plates is 8 and the capacity is approximately 75 µfd. Its breakdown voltage rating is approximately 3000 volts at 60 cycles. The condenser is shown "close-up" in one of the illustrations.

The spacing between the various pieces of apparatus can be determined with sufficient accuracy by studying the illustrations. The spacing need not be followed exactly, of course, but adherence to the layout in general is recommended.

The grid and plate inductances are supported on General Radio wall insulators and are fastened in place by bolting through holes drilled in the flattened ends of the copper tubing of which the coils are made. Clips are not used for making the center-tap connections to the coils but leads are permanently soldered to the inductances at their exact centers (as estimated by inspection). Most of the clips available are made of steel, and become very hot in the intense field about a transmitter inductance. This heating is good evidence of losses — and we are trying to eliminate all the sources of loss. The clip is therefore put on the other end of the lead, where it will be out of the tank-inductance field. Specifications for the inductances are given under Fig. 4.

The grid leak is an Allen-Bradley Type E-210 Radiolake, and is fastened to a small bakelite panel on the front rail of the frame. A variable leak is used because it has been found that adjustable grid bias is advantageous in getting the best signal-quality and efficiency at very high frequencies. Adjustment of the grid bias is the final operation in tuning the transmitter and although it is not extremely critical, as a tuning refinement it is well worth having.

The radio-frequency chokes are designed for the 28-mc. band and are all identically alike. Each consists of 48 turns of No. 30 d.c.c. wire wound over a 2-inch length of wooden dowel 1/2 inch in diameter. The method of winding is to measure off 2" on the form and wind 24 turns per inch over the 2 inches, estimating the spacing at slightly more than the diameter of the wire. After the winding is completed, it should be doped with acetone or collodion to prevent the wire from slipping. Wood-screws through holes drilled in the forms hold the chokes in place on the transmitter. These chokes are satisfactory at 28 mc.

(Continued on page 80)
More Progress on 28 Megacycles


By Clark C. Rodimon, Assistant Editor

We have received the photographs and diagrams of the successful 28-megacycle station W2JN, owned and operated by Mr. C. K. Atwater, Upper Montclair, N. J. Last month we mentioned the records this station and other stations have set up on 28 mc.

The radiating system at W2JN is a Zeppelin type antenna designed to operate at best efficiency in the 14-mc. band. It is a horizontal wire 98 feet long and 30 feet high running in a N.W. by S.E. direction. It is excited at the north-westerly end by a 2-wire 48-foot transmission line which is spaced ten inches between wires. At 14,200 kc. the antenna operates at its third harmonic while the transmission line is three quarters of a wave in length. When operating on 28,400 kc. the same antenna is used but a change in the free leg of the feed line is made in order to maintain a voltage node at the antenna coil. At the point "X" (shown in antenna drawing and photograph) this feed wire is opened, thus making the length from the base to the dotted line equal to approximately three quarters of a ten-meter wavelength. The radiating part of the system is thus changed, in effect, to an "L" shaped antenna with a vertical component of 24 feet and horizontal length of 98 feet. The complete radiating system for 28 mc. has a total of 3 1/2 standing waves, making it radiate around the 7th harmonic. The antenna location is not a particularly favorable one. It is over level ground and about 200 feet above sea level. From the house a view of New York City skyline may be had, twelve miles to the east. About one mile west there is a small mountain ridge which rises to about 500 feet in elevation, though this does not seem to hinder the propagation of signals in a westerly direction as equally good reports are received from this direction.

The receiver used at W2JN is the conventional untuned r.f. antenna stage, detector and one stage of audio amplification. The r.f. stage is shielded from the rest of the set and the complete receiver is enclosed within a brass 1/16" shield, 15" long, 7" high and 8" deep. The component parts and specifications may be noted from the diagram. W2JN originally started business on the 28-mc. band with a self-excited rig. It is with this transmitter that the Atlantic Ocean was first spanned in 1928. The antenna used then was a half-wave Zepp with a quarter-wave feeder. We are reproducing a diagram of the antenna along with the self-excited transmitter.
The transmitter in use at present is crystal controlled from a 1775-kc. quartz plate. Frequency doubling to 3550 kc. is done in the plate circuit of the oscillator. The next doubler is on 7100 kc. which in turn doubles to the next tube which is on 14,200 kc. For 28,400-kc. work another stage is added and tuned to that frequency. This transmitter is completely described by the diagram and cut label of Fig. 4.

W2JN is remotely controlled from the house. The transmitter is located in the building at the far end of the antenna.

This transmitter is also used for operation on the 7000-kc. band. It is accomplished by the use of a Type '60 screen grid 75-watt tube which is run as an r.f. amplifier on the same frequency as the Type '10 7-mc. stage. When the excitation is switched from the 14-mc. doubler to the 7-mc. amplifier the last two Type '52 tubes are not in use.

**XU2UU WORKS W6BAX**

From several sources we learn that XU2UU and W6BAX were QSO on March 9th. We believe this to be the first communication between Asia and U. S. A. on 28 mc. XU2UU uses an input of about 15 watts and the antenna is one designed for work as a 1/4-wave Hertz for 14-mc. operation. A single wire feeder is used.

**GENERAL**

Except for the above item we have had no reports of new records this past month. Conditions appear to be holding up and it seems that each weekend there are a few new hams who try out the band for the first time. To the newcomers on the 28-mc. band we want to give all the encouragement we can; one should not be disheartened if results are not forthcoming at the first crack. Stick at it and you will be amply rewarded.

W1ZL, one of the original 28-mc. experimenters, is still active and his latest report mentions working England during the R.S.G.B. 28-mc. tests. The transmitter has a Type '10 tube and is self-excited and until just recently a non-directive antenna was being used. This station has just completed a simple half-wave directive antenna, Zepp fed.

W1AQD is back on 28 mc. with a pair of Type '52's in push-pull.

W1PI is active on 28 megacycles with a Type '10 transmitter.

W2ALS is testing at noon daily on 29,000 kc. Transmitter is an m.o.p.a. with a Type '50 in final stage.

VE2AC has been carrying out some transmission tests on 28 mc. daily with a half-wave directive antenna. A Type '52 is used in the self-excited transmitter at VE2AC.

W6BXV reports working K6ALM on March 16th. As far as we are aware this is the first work between the mainland of U. S. A. and Hawaii. G5HJ was heard by W6BXV during the British tests.
June, 1939

W6DCI reports that G6WK is ready to go on 28 mc. at all times. W4NH has an automatic xtal transmitter on 28.4 mc.

June A.R.R.L. 28-MC. Tests

As announced in May QST, the A.R.R.L. is sponsoring world-wide 28-mc. tests on all weekends in June. For those who did not notice the dates we will repeat again that the tests are unscheduled on 28.4 mc.

W4NH has an automatic xtal transmitter on 28.4 mc. at all times. W4NH has an automatic xtal transmitter on 28.4 mc.

A.R.R.L. has been notified of this covers Saturday and Sunday of each week during June.

Sections of the I.A.R.U. have been notified of these tests and many stations have written in signing their desire to enter the tests and inquiring for more information on antennas and transmitters. This issue of QST has plenty of information on transmitters and rectifiers.

W1WZ-WIAWY at South Dartmouth, Mass., will be active during the coming tests.

W1SZ will use the transmitter featured on the cover of this month's QST, and described in detail elsewhere in this issue. The antenna will be a half-wave directive affair.

All stations desiring to enter these tests should not hesitate because they are under the impression that special hokus pokus charm apparatus is necessary to perk on 28 mc.

May QST has been out less than a week as this is being written. However, we have encouragement from several sources, informing us that they would be going strong during the tests and most of the hams mentioned the fact that the simple reflector, as mentioned last month, was made use of. Amateurs who are going to enter these tests would do well to seriously consider the use of a directive antenna. There has been very little experimenting with directive antennas by amateurs. We want to hear of results (good or bad) from users of directive antennas.

During the past month we have had several reports from Australian amateurs who appear to be on every week-end and besides hearing other Aussies each week, they hear west coast U. S. A. signals and UX2UU. We originally heard there were a dozen active Australian stations on the 28-mc. band but from later reports we make a newer estimate of at least two dozen.

Well, gang, it’s up to us now. All the skids have been greased. Father Heaviside has promised to shift his layer around to our best advantage and OM Static doesn’t get a look-in on this band of frequencies. Some hams may be worried as to the whereabouts of ten meters when making the plug-in coil. About the easiest method we have found is to hook up a simple detector oscillator working on 20 meters and cut and try with our coil until the second harmonic is picked up. Then again, different commercial harmonics will be heard just below the 28-mc. band. Therefore, one need not waste time worrying whether he is around 28 mc. or not for when one approaches it, something will be heard: If it isn’t an amateur signal it will be a commercial.

Furthermore, don’t listen for five minutes and become discouraged because no signal is heard.

The original 28-MC. Self-excitied Transmitter and Antenna System at W2JN

The band is wide and the amateurs are scattered all over this 1000-ke. band at 28 mc.
Here's wishing you all the greatest month of rolling off DX minus the QRM and QRN that you have ever experienced — and with any power, regardless of how low.

**EXCERPTS ON R.S.G.B. 28-MC. TESTS**

We have scant reports on the outcome of the 28-mc. tests held by the R.S.G.B. as reported (Continued on page 64)

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**FIG. 4. — COMPLETE DIAGRAM OF CRYSTAL CONTROLLED TRANSMITTER ON 1.2 AND 28.4 MC. USED AT W2JN**

- **A** — 1775-ke. quartz crystal. Kept in Constant Temperature Oven.
- **B** — 50,000-ohm grid bias resistor (wire wound Super-Dowhm).
- **C** — 30 turns No. 29 280 wire on 2½" form.
- **D** — 200-muf. variable condenser to tune coil C to the frequency of the crystal to sustain oscillations of same.
- **E** — 9 turns No. 16 s.w.c. wire 3" diameter, spaced the length of a turn.
- **F** — 200-muf. variable condenser to tune coil E to second harmonic of crystal frequency, or 3560-ke.
- **G** — .001-muf. Sanyamo condenser.
- **H** — Small plastic duodecater choke, 5/8" OD by ½" inside diameter.
- **I** — 1-muf. 300-watt condenser.
- **J** — 6 turns No. 16 s.w.c. wire 3" diameter, spaced the length of a turn.
- **K** — 250-muf. variable condenser to tune coil J to 7100-ke.
- **L** — .0005-muf. Sanyamo condenser.
- **M** — 60 turns No. 20 d.c.e. wire on 2" diameter form, close wound.
- **N** — 1-muf. 500-watt condenser.
- **O** — 6 turns of ⅞" copper tubing spaced ½" 3" diameter.
- **P** — 13-muf. variable condenser to tune O to 14200-ke.
- **Q** — 2 .001 Sanyamo condensers in series.
- **R** — 50,000-ohm Ward-Leonard type AK resistor.
- **S** — 6 turns of ¾" copper tubing 4" dia. spaced ½" for operation on 28,500 kc.
- **T** — 100-muf. variable condenser to tune coil S or S1.
- **U** — 10 turns of ¾" copper tubing 4" dia. spaced ½" for operation on 14,200 kc.
- **V** — 25,000-ohm (2 Ward-Leonard type 307-3 resistors in series) to reduce 880-volt supply to 180 v. at .200 amps, for crystal oscillator tube.
- **W** — 0-100 milliammeter.
- **X** — 0-100 milliammeter.
- **Y** — 0-100 milliammeter.
- **Z** — 0-250 milliammeter.

**NOTE.** — UX-856 tubes are used in the last two stages because of their low grid to plate capacity of 6 µfd. When operating on 10 meters, frequency doubling system is used throughout. When operating on 20 meters, LC circuits PQ and TS are both tuned to 14,200 kc, but no neutralization is used. Sufficient grid excitation to final stage is had by tapping low on coil O. Some regeneration is present which is desired, but it is not enough to make the circuit unstable.

- 1 — 1-muf. condenser.
- 2 — 1750-ohm variable resistor.
- 3 — S-Henry choke coil.
- 4 — 8-muf. high voltage condenser.
- 5 — 100,000-ohm resistor (larger type) to lower the peak voltage.

The rectifier tubes for the Type '10 tubes are Type '31. Those for the high voltage stages are Type '59.
COUPLING THE SINGLE-WIRE FEEDER ANTENNA TO A PUSH-PULL TRANSMITTER

THE problem of coupling a push-pull transmitter to the type of antenna described in September, 1929, QST has proved bothersome to a number of amateurs. One way to do it is to couple a tuned tank circuit to the oscillator and tap the feeder on the coil in the separate tank.

There is another method, however, and curiously enough, it was suggested almost simultaneously by two different experimenters, Vincent S. Roddy, W8DJV, and James J. Callahan, W9FGQ. It simply involves the use of two separate feeders, each placed the proper distance from the center of the antenna, but on opposite sides. The idea is shown in Fig. 1, the antenna in this case being designed for the 7000-kc. band.

Both feeders should be exactly the same length, otherwise the phase relationships in both halves of the antenna will not be correct. It is also important that the feeders be tapped at points equidistant from the node on the tank inductance. They should also be kept as far apart as possible, and as far from surrounding objects as space will permit.

This method of feeding, while simple, is theoretically correct, because the polarities on the antenna will be in correct relationship so long as the precautions mentioned above are observed. Neither of our correspondents mentioned how well the method works when the antenna is operated on a harmonic but it should be at least as efficient as with the single feeder.

CONCERNING THE BIBLIOGRAPHY

About a year ago it was announced that the formal organization of the Experimenters' Section had been discontinued, and that instead of distributing outlines of the various problems and references to periodicals and textbooks in which material on those problems could be found, the policy would be adopted of going over one of the major problems each month in these pages, and appending a bibliography covering all available references on the subject. This has been done, and to date the following problems, constituting the most important of those confronting us, have been considered:

May, 1930 — Crystal Control.
April, 1930 — Frequency Measurement.
March, 1930 — Amateur 'Phone Transmitters
February, 1930 — Constant-Frequency Transmitters.
January, 1930 — Audio-Frequency Selectivity.
December, 1929 — Radio-Frequency Chokes.
November, 1929 — Tube Characteristic Data.
September, 1929 — Loop Transmission and Reception.
August, 1929 — Keying Methods.
July, 1929 — Portable Transmitters.
June, 1929 — R. F. Amplifiers for Amateur Bands.
May, 1929 — Antenna and Feeder Systems.

Included in the above list are just about all the problems which are causing us any trouble at the present time. Continuance of the policy stated above will simply mean duplicating material which has been published previously, with such additions as may have occurred during the year. The question naturally arises as to whether the bibliographies are sufficiently valuable to our membership to justify the use of the necessary space in QST, or whether that space could not be more advantageously used in presenting ideas and kinks which experimenters find useful. We incline to the latter, and are therefore discontinuing the publishing of bibliographies except when there appears to be a real need or demand for them on particular problems. If we have guessed wrong, and the present bibliographies are actually proving valuable to experimenters, nothing would please us more than to be informed of that fact.

The work of the Experimenters' Section is entirely informal. Your name does not have to appear on the membership list to make you eligible to contribute. Worthwhile contributions are welcomed from all sources — and whether an idea is worthwhile or not is not always a matter which the originator should decide. We often receive contributions from writers who mention that "so-and-so was the one who really thought of this, but was too modest to send it in" and that particular idea may have been something which

(Continued on page 64)
Conducted by A. L. Budlong

It is still impossible to present the final results of the returning votes from the member-societies regarding the matters taken up in the December Calendar, particularly regarding the election of new members, which is of most specific interest.

As promised last month, we are presenting the DX time table furnished by Al Giddis, W1ABG. These lists are timely, having been compiled for the months of June, July and August, regarding which we have had little previous information. Here they are:

14,000 kc. (Time given E.S.T. and G.C.T.)

**NORTH AMERICA**
Labrador-Newfoundland
12:00 noon-8:30 p.m. (1700-0130)

- **Cuba-Porto Rico-Jamaica-Virgin Islands and Costa Rica**
- **Mexico**
  4:00 p.m.-10:00 p.m. (2000-0000)
- **Northwest (scarce)**
  9:00 p.m.-12 midnite (0000-0500)

**SOUTH AMERICA**

- **Brazil**
  5:00 p.m.-12 midnite (2100-0000)
- **Ecuador**
  8:00 p.m.-12 midnite (0000-0500)
- **Paraguay-Peru-Fr. Guiana**
  6:00 p.m.-10:00 p.m. (2200-0000)
- **Argentina-Chile-Uruguay**
  7:00 p.m.-12 midnite (2300-0500)
- **(South Americans slightly weaker around 10:00 p.m. but much easier to copy due to absence of QRM.)**

**EUROPE**

- **England, Ireland, Scotland**
  1:00 p.m.-8:00 p.m. (1300-0000)
- **France, Belgium**
  12:00 noon-10:00 p.m. (1800-0000)
- **Sweden, Denmark, Netherlands**
  1:00 p.m.-9:00 p.m. (1300-0900)
- **Italy, Spain, Portugal, Germany, Poland and Russia (the latter scarce)***
  3:00 p.m.-7:30 p.m. (1500-2100)
- **Hungary**
  9:00 p.m.-10:30 p.m. (2100-2300)
- **(Most Europeans are noisiest between 4:00 p.m. and 7:00 p.m.)**

**AFRICA**

- **Algeria, Tunis, Sahara, Egypt**
  2:00 p.m.-8:30 p.m. (1400-2000)
- **Cameroon, S. Rhodesia**
  5:00 p.m.-10:00 p.m. (2200-0000)
- **S. Africa**
  5:00 p.m.-8:00 p.m. (2200-0000)
- **Asia**
  1:00 p.m.-7:00 p.m. (1300-2100)
- **Japan (very scarce)**
  7:00 p.m.-10:00 p.m. (2100-0000)
- **Oceania**
  5:00 p.m.-12 midnite (2200-0500)
- **Hawaii, Philippines, Australia, New Zealand**
  11:00 p.m.-2:00 a.m. (0300-0600)

Some more achievements are called forth in the way of WAC. L. A. Paul, VK3LP, sends us a radiogram telling of working all continents in four and one-half hours on Feb. 11th. The stations worked were G5YG, XU2UU, FO3SR, W8UF, OA4J, KA1JR.

Then comes L. E. Dutton, now down in Florida with W4MK and W4XQ, who recalls that, while at 0EZ during the contests in 1928, he worked all five continents on 40 meters for five consecutive nights, and a short time afterward worked all continents on 20 meters for four nights within one week.

(Continued on page 70)
Second Roumanian Arctic Expedition
XORC to Contact Amateurs — Bassett of W6SSB Chosen as Operator

ON July 1st the Second Roumanian Arctic Expedition sails from Cherbourg, France, for Greenland for a stay of one year. A study of meteorological, aerological, and radio conditions in the Arctic will be made by Dr. Constantin Dumbrava, the Roumanian explorer, who has already made four trips to Greenland. Dr. Dumbrava is convinced that a daily plane service between the United States and Europe is practical over the Arctic route. The Fast Air Transport Co. of Canada in accord with this belief will send a plane over the proposed route late this summer. There are no water jumps of over four hundred and fifty miles.

An expedition must carry a complete stock of the necessities of life as well as scientific apparatus and repair parts. This makes even a small expedition a costly project. Little does the world realize the tremendous value it receives. To maintain contact with the world, radio facilities will be available. A four-cylinder Fairbanks Morse gas engine will operate a 32-volt farm lighting plant and also run the 110-volt 60-cycle 1500 v.a. Eaco generator, making it possible to use standard plate and filament heating transformers for the radio equipment.

The largest transmitter will be a Hartley using four 75-watt tubes operating on 23.65 (12,680 kc.) meters and 40 meters (15,700 kc.). Another 75-watt transmitter will also be available for amateur work. The third outfit is a 15-watt (one set for operation on 50 meters (6000 kc.). This will be used for communicating with the plane.

The plane will use a pair of 50-watters on about the same frequency. A self-reciprocated circuit will be used to reduce weight and make it easy to follow the signal.

Four receivers will be available, a 150 to 550 kc. for receiving foreign press and meteorological data, one medium frequency set for broadcast work, one plane receiver covering from 6250 kc. (48 meters) to 4400 kc. (75 meters) and the receiver for the high frequency work is a new DeForest set type CSS using two screen-grid tubes and two type 01A. It consists of one stage of a periodic R.F. followed by a screen-grid regenerative detector and two stages of audio amplification. This covers a range of 15 to 200 meters and has several features making it an ideal receiver for the work.

Burgess batteries will be used for the receivers and 'phone transmitter, due to their long life and ability to stand the cold climate.

It is our aim to contact reliable amateurs to facilitate the handling of our personal messages. The amateurs putting the most consistent signal into our base will be favored with the traffic. This does not mean that we shall not work other stations. If at all humanly possible, we will work every one we hear calling us whether we have traffic or not. Auroral effects are expected to play an important part in the transmission and reception of signals to all ends of the earth, with a complete report of the other fellow's mind.

The traffic man needs an accurate check on messages handled, a record of reliability of QSO with a certain station or locality, and a place to note frequencies and hours of scheduled stations.

The DX man wants a record of his QSO with the other ends of the earth, with a complete report of the other fellow's signal. Even though said other fellow does not QSL, a neat and complete log is pretty good evidence of contact, particularly when backed up by a station with a 1930 signal.

A serious experimenter would have great difficulty in drawing accurate conclusions from results that were never recorded. He must note the details of every change made in his circuits and their constants, and the performance of the layout.

Why Keep a Log?
By E. H. Gibbs

THE matter of keeping a log is one phase of good amateur operating practice which has remained virtually unchanged since the beginning. Yet the number of stations today without logs is surprising. Not many ORS are guilty, however, for a good log is absolutely vital to traffic work. Some system of recording station activity is a necessity regardless of the type of work (or play) indulged in. When an operator fails to keep a log, he not only robs himself of something interesting and valuable, but also does his fellow amateurs an injustice as well. From his log he should be able to check back for the signal report that his DX or experimenter friend wants so badly; or determine the exact hour that he took that important rush message from WYCO. If he cannot do these things, he should be branded slipshod, in the other fellow's mind.

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Even the fellow who just "chews the rag" and makes
friends through his contacts is the more likeable for knowing that he has worked you before. If he has a log well suited to his use, he could call you by your personal "sine" and comment on the last QSO and happenings since then.

In addition to the comments, it may be said that the logless station owner misses one of the game’s greatest thrills — the kick that comes from spending an otherwise dull hour or two browsing over logs of by-gone years.

Practically every one of us is a combination, in varying proportions, of DX hound, traffic man, experimenter, and rag-chewer. For this reason it would be a difficult task to design a log for the vast majority of amateur stations. In the vast majority of cases, the man for himself, and the devil takes the ham who doesn’t think enough of his station to keep a log of its activities.

**One consistent operator we know keeps a complete and accessible card file of stations worked in addition to a station log and obtains much enjoyment from reference to the conditions or subject matter of the first contact on subsequent QSO’s.

Suggestions regarding the design of station logs are given in the Radio Amateur’s Handbook.

Traffic Briefs

W9UM suggests that one of the factors most likely to be overlooked in the quest for a steady note is the house wiring and the capacity of the pole transformer supplying electrically to the set. Plenty of current can be had through "number of 14’s" of the house wiring to light the filaments and to run the motor-generator and supply magnetizing current to the plate transformer — but what about the drain on the line when the key is pressed? Perhaps it would pay to get in touch with the local power company and determine if the transformer supplying your particular section of the distribution system is large enough to care for the load that your set and all of the neighbors’ flat irons, washing machines, etc., put upon it. Generally the power company men are as keenly interested in efficient regulation of their systems as you are.

Joshua J. Joninger wrote in the other day with the following query: "When a radio operator says he is going to send a message blind, does that mean that the operator on the other end cannot see it?" This is a tough one — we can’t say blind because almost none of our communication is by sight. Therefore, Josh, old terrapin, we should amend the statement to read: "When one operator is compelled to send a message without the acknowledgement of the receiving operator, such messages should be designated as one which is sent 'dog.'"

W6DME, an Official Broadcast Station, was pleased and surprised the other day to receive a tape record of one of his broadcasts from PY1DB of Brazil.

NN1NCT requests that the gang listen for him on his old frequency of 2000 kc., as he has difficulty in working through on his 7000-kc. band frequency.

Just to prove that the 1750-kc. band is occupied, W9CRN made a list of the stations he had worked there in a little over a year. When he had finished, he had 350 calls chalked up — and all of these done with a transmitter using 204A tubes. We understand that W9WOF did the same thing and had over a thousand. Come on, boys — what’s the matter with the 1750-kc. band? Let’s go back up there and enjoy some of those old-time rag-chews and some of the home-leave local QSO’s that used to be so easy back in "the good old days."

When the U. S. S. West Virginia was in Panama Bay, W6AM accepted messages from the wives, sweethearts, and friends of the officers aboard. During three months several hundred messages were transmitted from W6AM and received aboard the battleship without acknowledgment. When it was impossible for any reason to receive a message, the battleship wired W6AM for a report on some ensuing schedule.

VE1BM claims that low power is the easiest and cheapest means of obtaining the much-coveted "1930 type" signal. With "High C" (a high ratio of capacity to inductance), a UX210, and 150 volts of direct current from 8 batteries, his note is one that is praised by all who work him.

In addition to missing QSO’s, some operators likewise miss W6BPQ, W6APQ says: "When I tell operators "QSO" they come back and ask why I mention their notes when I have already given them 'pure d.c.' reports. On top of that, some of them have the nerve to ask 'QSS?', although there is no longer any such Q signal."

W2YY worked WQBG, a yacht lying in Nassau Harbor, Bahamas Islands, and was requested by the operator to call Peekskill, N. Y., by telephone. This was done, and the operator of WQBG was informed by his wife of the time that she would arrive in Miami to meet him. FB!

We were surprised to receive news the other day that W6CRR was during a recent cyclone suffered the loss of his pants, which were torn from him by the high wind. There was a sum of $20 in the pants, too, but this was insignificant when compared to the fact that the antenna towers of WRHM were entirely demolished, and the transmitting building (aw, g-wan — shack is the proper name) was blown off so far that it has not yet been found. W6CRR was fortunate in losing only his pants, and not his health with them. A newspaper headline recounting other details of the same storm bears the following hair-raising news: "3 Horses Take to Air in Storm: Creek Blown Away... Whev!"

When W6BYX worked W6YG, the physics instructor in a California high school, W6YG asked him to send a quart of water from the Great Salt Lake, to be used for testing and analysis. W6BYX sent the water and later received a radiogram acknowledging receipt of the quart. FB for amateur radio!

HIGH QUALITY SIGNALS

Every amateur takes pride in the audibility of his signals. He should take equal pride in the quality! We cannot all have the loudest signal on the air, but we can have a high quality signal if we so desire. It may take time and many adjustments but surely our efforts will be for the good of all.

What is the definition of a High Quality Signal? It must be a steady signal. It cannot be a.c. — i.e. w. or other pass type. It must be clean-cut. There can be no ripples, no backlash and no key clicks. Any amateur can judge a received signal. He can also judge his own signal... by the use of a monitor.

To obtain a High Quality Signal you must use a certain amount of money, and a larger amount of brain work. Most downfalls of good signals come with the sili. "What’s the use of having a high quality signal? As long as I get out, I don’t care about anything else." This excuse has no grounds to stand on and, the less it is used, the better all signals will be.

Any c.w. or 'phone amateur whose call is listed in QST’s "High Quality Signal" list should feel justly proud of his signals. Let us hope that the number of "prout" amateurs will increase each month.

— R. L. Sakkors, W6DED

While Q50 W9GDM one night, Mayer, K4KD, discovered that W9GDM was located a few miles from his old home town. W9GDM called Mayer and asked him on the 'phone to get his father on the line, and a two-way conversation between father and son ensued. As K4KD has been away from home for ten years, every one concerned got quite a kick out of that QSO. K4KD and W9GDM now keep a weekly schedule, which beats the mails by seven days!
The following "Famous Last Words" are quoted from the February issue of the Oscillator, published by the A.R.R.L. of Los Angeles: "I haven't got any license yet, but I'll only operate a little while and nobody'll get wise."

If properly adjusted and operated, a low-power station will work just as efficiently as a high-power rig. For three months or more W4UM has been keeping a daily schedule with W4BU on the 14,000-kc. band. Both stations are using UX2X tubes. This schedule has proven most consistent and is very commendable socially in view of the power and frequency used.

We remember old u2UO operated by the New York Times, and the brute-strength signal that came from it. The call 2U0 changed hands some time ago, and W2NH tells us that the new W2UO is using a UX-190 with 180 volts from a "B" eliminator.

The following headline appearing in the Dayton (Ohio) Daily News is furnished through the courtesy of W4DKK: "Fort William Hanks Robbed By Amateurs." This gives us quite a jolt until we read on and find that they were not "radio amateurs," but rather "amateur bandits." III.

From the Personal Office of the New York Stock Exchange and NAKD we receive the report of the exchange of scores covering a rifle match held between the teams of the Stock Exchange and the University of Porto Rico at Rio Piedras. KA4K (Monkeal, Canada), W8CPC (Brockton, Mass.), and W2NH (Ponce, P.R.) took care of the Porto Rico end, and W8CPC (Buffalo, N.Y.), managed the New York end. The line-up for both teams was exchanged, and when final scores were available, Lieutenant Hobergman, in charge of the University team, telegraphed them to KA4K, who passed them on to W8CPC. W8CPC in turn telegraphed the results to the Exchange. The Stock Exchange team won the match with a score of 3648 to 3172. In addition to this match, the Exchange has used amateur radio for a number of other matches. W8SEAJ relayed scores to W7GL in a match shot against a team in Jerome, Idaho. Scores have also been exchanged in matches shot with teams in Montreal, Canada; Worcester, Mass.; Chicago, Ill.; Houston, Texas; and other cities.

Use of the early morning hours for operating—or schedules held at any time when interference is light during the day—will make possible dozens of pleasant contacts you may be missing now. Low-power men especially will find the odd operating hours better for rolling up enviable records.

DX is far from dead on 5000 kc. On November 28 W1AZW worked W5APG, W6CSU, W7TN, W5CYF and W6PW in that band all inside of one hour!

When summer comes, many of the fellows move to the 14-mc. band in order to escape the QRN and QRN that are so prevalent on some of the other more commonly used bands. Another consideration leading many toward increased use of the 14-mc. band is the "unimportance of the power" consideration—the fellow with the 7½-watt tube seems to stand about as good a chance for everything as does the fellow with a water-cooled tube. Many stations can be worked after darkness falls (in spite of rumors to the contrary). A significant fact is that the 28 mc. fellows make most of their arrangements for tests and contacts via the 14-mc. band. It's an ideal band for summer work—you're missing something if you don't use 14 mc.

The beginning amateur is, of course, anxious to get on the air. He wants to rush his transmitter in the process of building, so that he can get on the air and work somebody. (We know, for we used to be beginners ourselves.) But the fellow who takes time and puts everything together in the best fashion is the fellow who will be farthest ahead a year later. If it is necessary to wait a few weeks for those little condensers, let's take the time to do it. When we finally get that transmitter put together as it should be, then we can go on the air proudly. And in this day the fellow with the clear-cut, pure signal is respected!

We are pleased to announce that WSCYK, who has been prominent in amateur activities in Western New York, has graduated recently from the Communications Course in Aircraft Radio at the United States Army Air Corps Technical School at Chanute Field, Rantoul, Ill. with a grade of 93.89, the second highest ever attained in the school. EBl

We call attention here to the fact that W8DBK has relayed scores to W8CPC, who passed them on to W8GAL. W8GAL then telegraphed them to Rio Piedras. K4AKV (Ponce, P.R.) using UX2X tubes. This schedule has proven most consistent. A.R.R.C. of Los Angeles:

As Webh says in his letter, "75 itself covers a lot of territory and should be sufficient. Let's make an effort to eliminate all that other superfluous stuff, and make our operating more snappy."

To improve the speed and dependability of amateur traffic handling, G. L. Graham suggests that individual amateurs select dependable stations well within range, and at various points of the compass, arranging schedules to suit all concerned often enough to keep the book clear, keeping the frequency of each station fixed and observing the hour of the schedules most faithfully. Of course, each station in the net should endeavor to originate traffic for the other cities concerned so that some real worthwhile activity can be built up. This is the only way it can be done. The character of the operators selected to cooperate in this plan and their ability to be on the job. The "5-point system" detailed in these columns some four years ago embodied this idea and the results have shown that the idea is entirely practical and workable. Go to it, OMs.

The following, which was read at the Roanoke Division Convention held at Charlotte, N.C., in March, is addressed to "the members of the American Radio Relay League," and comes from the Director of Naval Communications, Captain S. C. Hooper. Captain Hooper has an amateur station and is on the air signing W5NL.

The Navy is particularly interested in the amateur, and its organization, the A.R.R.L. Representing the Navy, I wish to take every opportunity to impress this interest upon the membership.

During the World War it was necessary to expand the radio personnel ten times, and such measure of expansion will be necessary in any war. The radio personnel called to colors must be qualified in operation, naval procedure, code and other work. Use of Naval calls and frequencies, and in fact must be trained in the habit of Naval communications the day they are mobilized. It is impossible to accomplish this training except through a well drilled Naval Reserve. Funds will never be available to adequately train a reserve in peace time, except through the medium of a Volunteer Reserve, in which the Navy contributes only the opportunity, certain pamphlets and some instruction. Such a reserve is now under way.

For a volunteer organization to be successful, it must be built upon a solid foundation, first, the desire for the individual to perform at reasonable, but slight self-sacrifice, patriotic service in memory of the debt each owes those who have gone before; second, the work must be interesting and of value in perfecting the individual in something worth while. This latter is true of amateur work generally, otherwise the A.R.R.L. would not have prospered and survived these many years.

Therefore, the Navy has chosen to build its Volunteer Reserve on the foundation of the A.R.R.L., to rely on its members for service, its directors for advice, and any suggestions from this body will always be most welcome indeed.

The amateur has pointed the way for progress in the past, and will do so in the future.
The hours for direct relay to China. This is just another star in amateur radio's crown. QSO happy stuff, OMs.

When a party in New Jersey was unable to conduct urgent business with a friend in Peking, China, by cable, he turned to amateur radio. W5IN gave the 84-word message to W6CBW, who QSPed to W1HR within 24 hours. This is just another star in amateur radio's crown. Snappy stuff, OMs!

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W6CUH recently had an odd QSO with HC1FG. The owner's sister was at the key and spoke nothing but Spanish. A 45-minute rag chow ensued (entirely in Spanish), and W6CUH was kept hopping to keep up with her rapid-fire Spanish, as she handed the key as well as the language, Hi. You did well, OMs.

At the time the Graf Zepelin was in Japan prior to its flight to Los Angeles W6CBW was QSO J7LL, who was located near the field where the Zepelin was sheltered. The Jap could look out of his window and see the Graf being hauled out of its hangar to be groomed for its trip. He told W6CBW of the beauty of the scene—how long, low silver shape alone in the moonlight. That is something new—a picturesque QSO.

Traffic handlers—what do you think of W6TM's ingenious method of securing message boxes for filing his traffic? He got an old hard rubber, 12-volt storage battery case from which the plates had been removed. All that he did to make it ready for use was chip off the several small ridges that protruded from the bottom of each compartment, and then paint it to make the appearance nearer. The finished product is an indestructible case, having six compartments just the right size for message paper. The various compartments are labeled, "Originated," "Delivered," "Relayed," etc. Sounds good, eh?

**OBSERVED OPERATIONS are not simultaneously on 3575 kc. and 7150 kc. at all times.**

**GENERAL OPERATIONS have been arranged so that they usually follow an official broadcast. They are listed under the two headings of 3575 kc. and 7000 kc. to indicate whether the watch is devoted to listening on the 20-meter band or to the 40-meter band.**

**W1MK**

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W.A.R.L. Headquarters' Station W1MK operates on frequencies of 3575 kc. and 7150 kc. Robert B. Parmen-ter, "RP," is the chief operator; his job is to familiarize most of the amateur fraternity. Occasionally other members of the Headquarters' staff operate at W1MK. Their personal calls may be found in the QSO Section of QST.

Throughout the following schedules Eastern Standard Time will be used.

**OFFICIAL AND SPECIAL BROADCASTS are not simultaneously on 3575 kc. and 7150 kc. at all times.**

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**Traffic Briefs**

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be given for code speed and various other contests, and a "big time" is planned. A nominal charge of $2 will be asked of each ham who attends. Write to Mr. Barron, Suite 2, Warwick Apt., Edmonton, Alberta, for reservations.

FOX HIVER RADIO LEAGUE HAMFEST

The Fox River Radio League extends a cordial invitation to all amateurs to attend its third Annual Hamfest to be held at Aurora, Ill., on June 21st and 22nd. A real "get-together" is planned and a good time is promised to all who are there. Write to Mr. J. J. Sloan, W9DTC, Sec.-Treas., P.O.R.L., Naperville, Illinois, for full particulars.

Official Broadcasting Stations

CHANGES AND ADDITIONS

(Local Standard Time)

Official Observer W3MC, who has done some mighty fine work in this section. We welcome into amateur radio W3AQG; here's wishing you fellows luck and plenty of traffic. Don't forget the convention at Erie, fellows. The SCM hopes to be on hand and sign up a few ORS prospects. W3ZPF has a new superhet picking nicely.


MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Forrest Calhoun, W3BBW — It looks as though the summer "rest" period is starting early this year. Quite a few of the gang forgot to report this time, We can't get that banner that way. So let's make another stab at it. What say, OMs? Maryland: W3CGC leads this state by a big margin. He is QTH track work at J. H. U. W3LA reports some DX but not much traffic. W3AFF sent in a nice report and says he is putting in remote control to the cellar for the summer. He also reports W3WF has a new B/C set, so it is only on once a while. HL W3ON is a new one and is waiting for a tube. Let's hear from you, OMs. W3BBW is experimenting with A.C. S/W receivers, also changing the shack around this month. He also reports W3AF has done some fine work using only 2 200A's. W3DG handled some traffic this month to sections for the past month is printed above. What place does yours take? What Section will carry the Banner next month and help its Division head the list?

Due to an error in last month's summary, Arkansas was given as leading the Delta Division instead of Louisiana. Louisiana led the Division with a total of 485.

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Traffic Summaries

(MARCH-APRIL)


DIVISIONAL REPORTS

ATLANTIC DIVISION

SOUTHERN NEW JERSEY — Acting SCM. Bayard Allen, W3ATJ — Our SCM, W3BWJ, has left the state and is busy installing the squawks. He has left one temporarily in charge. Please cooperate with me in the matter of reports, fellows, the percentage of reporting stations to active stations in this section is disgracefully low. Whether you are an ORS or not, please report every month. W3DH, the Princeton University station, with the aid of eight skeds twenty-seven times a week, makes the HPL for one continent plying that total. W3ALW is working in the southern part of the state, and will be on with a portable this month. W3FAN is a new station at Eastayestown.


Columbia: Due to an error on my part in April QST, W3AWM, who handled quite a few, is listed as W3A11M. This has been corrected. We concur with W3BERT lead in traffic. He says no shut-down during the summer. FB, W3BF was chased down some on the band by off-wave tones. He was visited by W3OE. W3PM made the FB. They have delivered. FB, they also expect to get on 14,000 soon. W3ASO sends a report. W3BGD is busy dailing 79 messages. W3JO was also visited by W3OE. He has quite a few nice skeds and should do some fine work. W3CDQ, who is a new OBS, lost her antenna in a storm, but in a few minutes W3KH just reported his traffic, I have some news, OM, W3GT has just returned from a tour of Central America as op on AB6. He is now trying for a WAC on 14,000 kc.

Traffic: W3BVT 544, W3BF 214, W3PM 111, W3GCC 57, W3OF 2, W3LA 29, W3A11E 37, W3BWB 12, W3CDQ 10, W3A00 8, W3AQR 7, W3JAL 6, W3DG 6, W3G5 F.

WESTERN PENNSYLVANIA — SCM, A. W. McAuley, W3CFO — W3YA again leads with a fine total. They work on both the 3500- and 7000-kc. bands. W3DLS plans to keep a five-point system of schedules going during the summer. W3CUG relayed a message from Rio de Janeiro to Princeton, N. J., in fifteen minutes. W3CUG is still in Brazil, but will be home by the time this gets into print. It takes 21 days to get his report from Brazil. W3CSP is keeping seven schedules. W3DUT says that his schedules and the W3MJO schedule have a new sked in them. W3AVG has put up a new antenna. W3HQR is a new station in State College. He is also one of the ops at W3YA. W3BWL sends in a nice total. W3KCM is a new ham in Altoona. W3CB, operated by W3V1, is the new Juniata College station. Uniontown is represented by W3DKS and W3BZE. W3AVB is now using a 250-watt. W3AVV has grown from 15 watts to 30. W3AQP won the Section Certificate in the Sweepstakes. He is looking for a schedule with Pittsburgh. W3OFE has received a fine 20 meter CW band, W3SW is in good shape. W3HTA is now using a 250-watt while W3AVY has grown from 25 watts to 50. W3AQP won the Section Certificate in the Sweepsstakes. He is looking for a schedule with Pittsburgh. W3OFE has received a fine 20 meter CW band, W3SW is in good shape. W3HTA is now using a 250-watt while W3AVY has grown from 25 watts to 50.

TRAFFIC


WESTERN NEW YORK — Acting SCM, John R. Blum, W3CKG — W3DSP leads the list with 325. W3BRQ is right behind with 295. W3CNX handles plenty of messages on the SHO band. W3BAG has a new Hi C, W3M II is now on the circuit as the slack, and noted a good improvement. W3T7Z gets an ORS. W3AFM reports good cooperation from all off-frequency stations he notified. W3CHG has a beautiful stai xmitter on 14 mc. W3CPC just returned from California. W3ALY and W3AZL have had some lock on 56 mc. W3CHI handles traffic. The Utica gang had a few schedules with Pittsburgh. W3OFE is still busy with traffic. Let's all try to attend this year. It looks good. If you do not see your station or vicinity mentioned in the section reports, it is because no one sends in a report to the SCM. Mail letters and cards on the 16th of the month.


CENTRAL DIVISION

ILLINOIS — SCM, F. J. Hinds, W9AYP — Any station handling traffic may send in his totals to the SCM and help our state total. W9PFC has been appointed Army-Amateur station for his locality. 14,000 is still bringing in foreigners consistently at W9BRX. W9JL is revamping the receiver. A new receiver is coming out at W9CMK. W9BV Y has radioogram service for the company with W9AKZ only personal messages. W9CZRZ says the R. I. was down about 12 days taking the exam procedures. W9BLL complains of QRN getting worse. W9FDJ is rebuilding to stop BCT. W9AR is bad at W9FO, 'but he will soon he on. W9WNT is working on a crystal-contact oscillator with W9RFCU. W9BLC has a new power supply. W9EEN, W9FLA and W9CNY are the only hams in town and are going all 100%. W9GI Y is back home from Honolulu. W9KA is moving again. 180 volts on 171A with "B" batteries is the power at W9ACL. A mechanic neighbor of W9GIV grounded the sky wires at W9GV with No. 8 wire. Hi, W9FPN is mostly on 14 mc. The Morton High School Radio Club will soon poke a hole in the ether with a new 75-watt outfit. W9CQO is the new call at the Downers Grove High School Radio Club, of which W9JL is presi­dent. W9HMQ built a new shielded set, but the old 'phone ringers still come in to QRM the dials. W9CTU says he is now on 20 for the summer. W9DJ will send baseball scores to W9CSS, who is on guard on W9PB. On the lake station W9EJF has moved into Illinois — thanks to him for our large traffic totals this month. Hi, W9ER has been QSO Lawson's Yacht W9DI, and now has his WAC certificate. W9EJO is batting off traffic in spite of getting ready for college. W9BOZ has a new screen grid with full a.c. operation, and no hum. W9ANF has a 210 with which he is working better than the old 852. W9BV V is using remote control and has a new 40-meter Zepp. W9AFF is still busy with speech amplifiers work. W9DXZ has a nice new home brew high in the hills, and it works. He claims the world champion­ship for most foreign contacts with least contacts. W9FFQ is getting out well on 165 meters. W9DAX has a report from WGARM stating he is on again now. W9ERU just reported his traffic. Let's all try to attend this year. It looks good. If you do not see your station or vicinity mentioned in the section reports, it is because no one sends in a report to the SCM. Mail letters and cards on the 16th of the month.


INDIANA — 8CM, D. J. Angus, W9CQO — W9CW is working on a portable screen-grid receiver. W9BUT has moved to 3500 kc. W9BYD is coming back on with a 201A on 3.5 mc. W9CHI is on 7 mc. W9CLB has a new power supply. W9CLN an old-timer, is back on the air on 3 mc. with an 852. W9CMN has been very sick recently. Ex-W9DIQ now has his new W4QAU. He is getting along much better with a new antenna system. The Jamestown Amateur Radio Association is growing by leaps and bounds. W9QBB, the first CW ham in Jamestown, is now located in Warren, Pa. The Radio Association of Western New York held its annual meeting at Rochester, April 26th. A pleasant evening was spent by all present.

supply of blanks holds out. Leo Wilcox at Fort Wayne has bloomed out with a new call, W9BMI, after a few years of the air. W9LBK has a portable, low power in operation for code instruction for beginners Monday, Wednesday and Friday. W9AGU is the new set in the Fort Wayne N. G. armory. W9BYF blew his 50-watter, but gets out just as well on the fresh rig. W9AXI is putting in an a.c. receiver. W9AAI is putting in an xtal in order to keep his tone in the band. FB, W9CXY is still xtal-controlled even though his xtal has dwindled down to the size of a pea. W9WIW is rebuilding his phone set so it will be bigger and better. W9AEY is putting in a new 7000 crystal-controlled rig. W9AEC has just asked anyone who has a good lucky charm to send it to her. W9BAC has been out on the coast with the Army in the Minnie Warfare there, so no report for this month. W9DMS, W9CAT, W9CPE, W9DHY and W8VT have been busy getting things ready for the coming ham-fest at Ypsilanti. W9WF is busy remodeling the tone set.


OHIO — SCM, H. C. Storek, W8SYN — A lot of you have been neglected and, perhaps, some reports will not get into this report. Business forced me to get behind in correspondence and then April 1st, I left Columbus to work in Dayton and since then have been very busy. As soon as possible I will send W8SYN up to date. The old mill wears out. W8HKN is with us again and makes the BPL two ways. He leads Ohio, but on the same card he states that he will leave again this summer. W8CN0 comes next and is the only other making the BPL. W8BAC has been having luck with DX on 14,000 kc. W8CHC is faithful, turns in a round 71. His name is North, and he says NP stands for North Pole. W8DDF was home for a week and earned 96 messages. W8AFC blew most of his letter correspondence, and says he is doing W8DHY and W9BAC — Any Ky. ham who missed the "Fest at Livingston well, seems to be an OHS as soon as I can get around to him. Welcome, OM, W8AO won the Sweepstakes trophy for Ohio. Congrats, OM, W8BDU is another who is anxious for OHS. W8TK explores the lack of traffic and asks how he can make the BPL without it. W8CFT reports activity with DX. W9HKN reports conditions on 700 kc. rotten in daylight. W8BKM says he is using a couple of dual and gets traffic reports, also that W8CHC has fallen for the woman. W8DSD is ex-W8KPK, and will be an OHS as soon as I can get around to him. W8DSF, W8BAX was the winner of the Sweepstakes trophy for Ohio. W8SOX will be in the market for schedules. W8FMR is running two sets now, one on "phone. W8DDF is busy installing Police Radio System. W8ALS has been too busy with work to be on much. W8CPE has been experimenting with low power "phone. W8DDQ is to have some new ops soon when school starts up again. W8DKR was on the air only a few days, but is now going strong. W8DF is going to install MOPA and perhaps xtal later on. W8BRL sent me in a nice bunch of signal reports. W8CPE is pretty busy with school, but has a little time for RM work. W8L1I has not had much luck for traffic either, but expects to do things when school lets up. W8SLP reports things pretty dead. Do you know that for the February-March period, 34 out of 35 stations reported with traffic, that we led the Division, and Ohio is second in the last RS very, and keep up the good work. W8SYH is off the air for the present but expects to be on with something, somehow soon. Plans are under way for the convention here at Dayton sometime this fall, probably in October.

WISCONSIN — SCM, C. C. Crapo, W9VD — W9EOD is sticking in the 20-meter band pretty consistently lately, doing a lot of DX and trying to get a WAC. W9DTR is building a 300-watt receiver. W9BZW is keeping up with four schedules, and is out after the guy that has been using his call, and off-air at that! W9SL says DX has been good the past month — good at his totals seems to report. W9EOD had tough luck this month — ruined a plate transformer and three 210s. W9EOK has installed rectobolux with excellent results, and will be on during the summer, with occasional traffic. W9JWE has complaints about poor signals and fading. W9EHV is on 40 and 20 has gone haywire. W9VDS is finished his tuned R.F. screen grid receiver and will be heard consistently from now on. Five new fellows are going at Racine, W9AGX, W9CCG, W9CFB, W9AMS and W9DFT.


DAKOTA DIVISION

SOUTHERN MINNESOTA — SCM, J. C. Peholkeh, W9ECK — The hamfest season started off with a bang at Duluth the 19th of April with a large attendance including W9AIR, W9DHP, W9BG-LV-4HT, W9AME, W9BB, W9PDK and W9ECK from Minn. Due to the Duluth gang's hospitality, coupled with perfect weather, a peach of a time was had by all. It is a great pleasure to sit and down and find all reports here every month. FB gang. The Division is planning on Sunday morning get-togethers on 7000 from the sound of things at the Duluth band. Fastest, get on, fellows, and QSO in our own Division. W9COS leads the section with a terrific total, closely followed by W9BEH and W9CDG. W9BNN of Heron Lake is going on the road for the summer, but will be on stronger this fall. W9FHX held an inauguration and christened his new transmitter. W9GHO is on with 100 watts and BCL trouble. Hi, W9DTR is chief at W9RM now. W9ETL is on 14,000 most of the time. W9HEX at St. Paul, was detailed on special duty, maneuvering the golf course. Hi, W9NFE and W9DGC operate occasionally. W9AIR will be on the lakes this summer. W9LJ-VG-21ST is on 14,000 in Minneapolis and getting out nicely. W9EAT says that ex-W9BCN is now W7CE of Evanston, Wy. W7CE sends 73s to the Minn. gang. He is on 3.5-mc. 'phone. W9LE is too busy to be on a lot. W9FQQ is completing 3 xmitters for all bands. W9BHZ, W9CWA and W9DMA are all on regularly. W9DGC is back on the hiver, W9YC has been working good DX.


NORTHERN MINNESOTA — SCM, C. L. Jabs, W9VFF — The usual summer traffic slump seems to be here. Most stations report no traffic and inactivity. W9GGQ is moving his amateurs at the Palace Hotel to another location. W9HDD is very busy. W9BEH works DX while not handling traffic. W9EIH complans about poor signals and fading on 7000 kc. W9CKI is on 14 mc. regularly. W9DFB kept a sked with FY1AW and will be on during the summer, with his newly built transmitter, W9ADS and W9CWC are re-building to crystal control and more power. W9CTW has a new receiver, but uses it very little. W9BEH is inactive due to lack of time. The outstanding event of the month was the banquet given by the Arrowhead Radio Amateurs at Duluth. The Twin City gang turned out in fine style and the banquet was a huge success. The Arrowhead Radio Amateurs are to be congratulated on the way they put it over. The talk by Prof. C. J. Comandy kept all interested and was well worth the admission price alone. W9DQO is now at his new location and wishes to thank W9CWC and W9ADS for erecting his antenna. W9BL is using a new 852. W9CPD is a new station in St. Paul. W9FPPD is working to try DX on 15 and 20.


NORTH DAKOTA — SCM, R. S. Warner, W9DTH — W9PCA's plate supply went south, so he thinks that he will QRT the ham game. Better try again, OM. W9BYF reports a very nice traffic total. W9DM has moved to a new location, but has not had time to install his new qst. W9DGS was visited by W9CVM and reports that he blew his plate transformer. W9CRD sends in a report for the first time and states that he will apply for an ORS ticket in the near future. W9AAN is using 2 watt output from four 20A's in push-pull Hartley, Heising mod. When this report is in, the new SCM will be in charge of this section, and I want to take this opportunity to thank all the ORS members in this section for the splendid cooperation which has been shown me, and I hope you will continue to give the newly elected SCM the very best of support; as that is what makes a good section in any division.


SOUTHERN MINNESOTA — SCM, Dwight M. Paeck, W9DGR — The reports dwindle with the coming of good weather. W9DNS and W9DRC are the only stations that have made reports of DX on 11 mc, and Q9M on 3.5 mc. He is keeping South Dakota on the A-A map, however, maintaining skeds with W9DGR, W9CR and W9DNS. W9DNS still runs his Minneapolis schedule regularly and has a nice traffic report. He also reports W9DTI and W9DQS busy building equipment. W9DNS is looking for aaxed west! W9CR in Mitchell is on 3.5 mc. every evening and is one of the regular A-A stations.


DELA DIVISION

ARKANSAS — SCM, Henry E. Yelte, W5AIB — We have reports from several new stations which we are very glad to have. W5BML on 14,000 is located in Little Rock. W5BVH has 180 volts on the plate, was worked, 7 U.S. districts and VE3 and VE4. His portable call is W5BNQ. W5ACM expects to be on the upper four bands with both CW and 'phone. W5BDG and W5GRL are both proud fathers of new sons. Congratulations, OMs. W5IQ is back on the air after having to tear down and move. W5HN is increasing power and has been busy getting a new ham station on the air. FB, OM, W5LW is on 7 and 14 mc. He has been appointed our new Route Manager. If you want skeds, drop him a line and he will try and arrange them for you. Address is P. O. Box 672, Dermott, Ark. W5DBD has a new MOPA transmitter. He skeds with W5AM6 and W5WQ. W5AM6 is a new station in Texarkana and expects to be on soon. Remember, gang, this report depends on you and the more reports we have, the bigger the report. So let 'em come.

Traffic: W5BML 18, W5BN 12, W5LV 6, W5DBD 3.

LOUISIANA — SCM, Frank Watts, Jr., W5SWF — The gang seems to have awakened to the fact that it takes a report to build up our section. The Monroe fellows have organized the Pelican Wireless Club and are going to have a FB organization. Good idea, you fellows. W5WIF is back with us after a trip to sea. No, he wasn't on — he was cook. W5WY reports that the ops there are suffering from spring fever. W5AXA wishes skeds with New Orleans. W5BCM is now working thru the High School. W5AGG has just had a 50-watt morr, Watch him go. W5SWF was off the air for a few days, as the recetor went west. Now come on, fellows, with a larger report next month. This SCM report is just what you make it, I can't make a good report if I don't get a report from you.


MISSISSIPPI — SCM, June W. Gullette, W5AKP — W5AYZ reports that amateur radio is on the boom in Jackson, and he says that two of his code class now have licenses and their calls are W5BNN and W5BNX. W5AYZ's code classes have presented him with a crystal, so it looks as though he will try a crystal-controlled transmitter soon. W5BME is the call of the amateur transmitter at WJDJ. W9AAP operates on 7160 kc. and has a schedule with the SCM daily at 1:45 p.m. W5AWF is putting a new transmitter on the air. He is using the 7000 kc. band and has just had his license renewed. W5AM6 is now in the 14,000-kc. band and has worked 40 states, all VE's, YS, Canal Zone, OA, LU, 2 CT's and 2 VK's and has hopes of working Asia and Africa with his 210. W5AKP is having trouble getting two "GI" tubes that will work together.

Traffic: W5AKP 84, W5AYZ 77, W5AAP 10, W5AWF 16.

TENNESSEE — SCM, James B. Witt, W4SP — I hope we can do as well during the summer months as we have
during the winter. Our state seems to be getting lined up pretty well, and let’s keep it that way, fellows. W2BH has worked a lot of DX and has also put in a lot of work on the air. W2AIW sent in the best report again this month and he was off the air in the evenings. The OM, W2AFS, says one of his 50-watters went west. W2AYV sends in a nice report and says he’s been doing a good job of it for the last five months and is putting in new push-pull parts. W2BFR sends in another report which is quite good. W2AVP has been reporting hard for a WAC. W2VGH says having had a good report from Atlantic City, where he reports having had the experience of handling traffic on the air. W2AHE is helping W2CLA get a new high-powered CC job on the air. W2BIV will soon be using crystal control on all bands; he has just completed W2AQF, the station on Long Island University, and has it working nicely. W2BOD can be heard on 20 with a bit of DX. W2ASE has returned from the expedition to the caves of New Mexico, but expects to leave for Europe very soon. W2BEV, a new QR, is on now and stepping up the work. Long Island: W2AYP, L. J. RM, leads that part of the section, as usual, and is having better luck getting traffic into New York City. W2BNX is working hard for an Asian QSO so he can get a WAC. W2GYM, the Boy Scout station, has been forced to cancel all skeds, but will resume that work in the near future.

Traffic: Manhattan: W2AFO 38, W2BDJ 22, W2BYV 23, W2AHU 22, W2JX 19, W2AOY 6, W2BQK 3, W2BY 2, W2AVK 1, Bronic: W2BQJ 104, W2BQJ 55, W2AYK 51, W2CXY 18, W2VG 39, W2APY 21, W2AQF 30, W2AET 14, Brooklyn: W2APK 143, W2BO 67, W2ARQ 61, W2PF 46, W2BY 23, W2CDJ 24, W2ATZ 10, W2BEV 5, Long Island: W2APK 81, W2BNX 3, W2BHP 4, EASTERN NEW YORK: W2AIS H. J. Rosenthal, W2QW: -Some very good traffic totals were handled in this month, and it is hoped that the good work will keep up. With one exception, the big reports are coming from the men handling foreign schedules, so here is an idea for anyone looking for messages to handle. W2QN now has a Reliable QSO with W2AP using phone and CW with that point. W2FH in Washington has a daily schedule with the Virgin Islands and says the messages originate from the station or the district there on war maneuvers. W2QO is still keeping traffic moving between New Rochelle and New York. W2BC ran the transmitter at the Port Chester Radio Fair and built up a big total from that source. W2LU handled a large number of domestic messages, and reports that the Seminac Amateur Radio Association now has a membership of 73. W2BOU is also handling Virgin Island traffic. W2BNT is a doctor, writes that he pushed traffic between operations at the hospital and is moving to the eighth district next month. W2ACB now has a crystal working in 20 meters. W2BDR finally has his crystal phone set going on 90 meters and also has a CW set for 40. W2AII says Hopewell Junction is still doing well and that the DX on 20-meter bands, to spring and summer labor, but look at the bunch of reports. Our RM tops the list and is in the BPL.

Hudson Division

Northern New Jersey SCM, A. G. Wester, W2VRW - Traffic takes another jolt, as usual, in your SCM hopes that it will continue over the summer months. Fine interest is being shown by non ORS. Their reports are always welcome. W2WFR is closed down for a complete overhaul. W2BF makes the BPL. W2AUN is busy with Army skeds. W2APU bemoans the loss of another 20. W2ANH and W2AVQ are doing fine work on 14 mc. W2CWK is getting a Vibroplex for his Pyrex arm. W2BME is feeling with push-pull, W2UK, W2BJ and W2AFN are playing with 2500-ke. tone, etc. W2BMU is building a MOPA for 7 mc. W2ABS is doing fine DX work on 7 mc. The Itaritan Valley Club of New Brunswick is holding a banquet on June 14th. Anybody interested should write to W2BJS. W2AJW is working very hard on foreign stations, 20, 15, 10 meters. W2BDF just returned from Haiti as chief of the S.S. Padilla. W2CJX worked all continents on April 6th. W2BBW and W2CQD are new in Ridgefield, W2BY is having fine results on 14 mc. W2BIR is still finding it hard to get time on the air. W2IR is on the back. W2ACO is installing a new MOPA. W2BZB has been experimenting with tone and statics. W2BWT is working good DX on both 7 and 15 meters, but will try to get on the air more. W2AUAP passed the century mark in traffic. W2BHPY is trying to get settled on some small gap in the 7-mc. band. W2BYV has cured all his 14 mc. troubles. W2PC is in line for an OH8, W2AJW is getting a chance to air.


New York City and Long Island: - Acting SCM, V. T. Kennedy, W2BGO: Reports are much better. DX, but traffic is still very light. Too bad we did not receive any report from our prize traffic station W2SC this month, but we assume that regular Army work is taking all the space in the very short-hand. W2BHN, who belong to the Naval Amateur Hearing have not been sending in their monthly reports. Our RM tops the list and is in the BPL. W2BDR has been on active duty and all report they enjoyed his service. W2AIZ has an MOPA going and is still busy with the QSOs. W2AYQ has an MOPA going and is still busy with skeds on that band. W2AVK goes on the inactive list due to business and studies. W2BNB, a new ham, is using a 500 in a TPTQ. Bronx: This hams comes through with some good totals this month led by W2BHFQ, our route manager. W2BIW is working plenty of DX as well as handling traffic, although he recently blew out his 210. W2CXY comes through with some good totals this month led by W2BHQ, our route manager. W2BIW is working plenty of DX as well as handling traffic, although he recently blew out his 210. W2CXY comes through with some good totals this month led by W2BHQ, our route manager.

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Midwest Division

Iowa - SCM, H. W. Kerr, W9DZW - Migration has been in progress for a week or more from here to other bands, to spring and summer labor, but look at the bunch of reports. Our RM tops the list and is in the BPL.
as is W9BCA. W9F0Z is QSO'd a K6 on 7100 kc. W9DNZ has a d.c. note now. W9DPO is a new ham at Malvern. W9DPO says the Martians are hearing Nic, soon, for the first time. It is quite a job for him. W9DPO's traffic for him is still up. W9DXP tears down again to add another stage. W9FED finds business improving. W9ELV is rebuilding and improving the power supply of W9CEA, the Tri-State Portable. W9FXF is a new ham at Des Moines. W9FTP there are two new hams in his town. Lost: two skeds, please return to W9EOF. W9DUU-W9BQZ sends in his first report. Another "gas" up at Peru (Illinois) motors, with the usual results. W9DUX has our thanks for his report from Early. W9EUF worked K1DK. W9GKL still upholds Ames' reputation. W9GKL was heard again with crystal. W9DNP now has two 210s. We want W9ALU to have credit for 21 messages on last month's report which did not reach us in time. W9FYC wants to know if it is out of the ordinary to hear 5GYG at 5:30 a.m. C.S.T. on 14,000 kc. The Club at Iowa City has changed its name to the "University Amateur Radio Club" and has a station, WUH, which was exhibited at the Merce Week Exhibition. Under the leadership of W9AWA, the club sponsored an exhibition at the Iowa City Better Homes Show.


CONNECTICUT -- SCM, F. E. Ellis, Jr., WICTI -- W1BHM keeps a daily schedule with W8KZ and has been operating the new W1BHM for the last month. W1JN has time for only one schedule, which is with W1AJF. W1TW finds 2500 kc. somewhat tricky. Your sign sound OK here. OM, W1HJQ says most of his traffic was on 14 mc. W1BQ, the new headquarters for the Amateur Radio Club, is under construction at W1CK. W1AMQ is working lots of DX and gets excellent reports. W1AMQ has been put in considering time at the Naval Reserve Armory preparing quarters for the U.S.N. gang to hold their instruction classes.


NEW ENGLAND DIVISION

Traffic: W9EWE 24, W9DFR 3, W9DVR 5, W9DEF 13, W9EWH 14, W9BQQ 3, W9BSS 5, W9CGE 1, W9DFP 6, KANSAS -- SCM, J. H. Ams, W9CTF -- Traffic handling on W9CJQ, the KM, W9EWE is working loads of DX from his new QRA. W9DFY wants the gang to listen for his YL op who is signing "Kate." W9BQV worked his first Amateur. W9EOC is the one with the crystal. W9EOC is a new station in Marquette, W9ELW is experimenting with 28 mc. He will be on 14 mc. soon. W9BBS is quite busy on his railroad now. W9EOC works on 14 mc. W9CGE has time to be on. W9CGE and W9DFP report again.

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hers of the U.S.N.R. WIAH seems to be busy this month. FB, WIAF says he is on with a new $62 now. WICDX reports that he has a portable station in Portland. WIGH reports bad weather conditions this month. WIGF was a recent visitor in Boston, his trip being associated with Reserve Signal Corps in which he holds the Commission of First Lieutenant. WIBFZ reports bad power losses in his shack. WLYH is unable to make schedules with any of the Maine gang. WIAU says that he is more or less busy with the U.S.N.R.

Traffic: WIAH 51, WIBE 47, WIAFA 42, WICDX 21, WIGF 8, WIGH 10, WILQ 19, WIBZ 17, WIAQG 17, WIAU 6, WIBE 25.

EASTERN MASSACHUSETTS — SCM, M. W. Weeks, W1WW — In spite of approaching summer weather and less favorable conditions, section traffic shows no let up. WICMZ, after two months’ absence from these columns, turns in more evidence of his activity with a large total. Five stations make the BPL, WICMZ, WITT, W1RY, WIBX and W1BKL. WITL expects soon to leave for New Hampshire where he hopes to be heard from VOA. W1RY spent a few days in the hospital for spring overhauling preparatory to a commercial job. Navy drill traffic helped WIFKR to run up a good total, aided by his OW, W1DS. WICX is G3L hunting for a new job. W1Q5 is still experimenting with push-pull circuits. W1WV took a six day auto trip visiting stations in Worcester, Springfield, Danbury, Hartford, New Haven and around New York City. W1CWX reports in March he worked for 14 hours a day in his bakery, so progress is slow. W1LQ expects soon to be back on 3500, but has been DXing on 11,000. WICMZ is on 3500 at night and on 7000 during the day. W1KX is in the U.S.N.R. and unit commander for Salem. W1CHW is still plugging along on 3500 keeping the usual skeds, including one with WIMK. W1ACA still finds a little DX on 14 mc. W1KX has found little time for radio lately on account of his four harder jobs. He is thoroughly enjoying his new installation in an accident and has been in the hospital, so is off the air temporarily. W1BZQ is on 7000 during early morning hours, but expects a change soon. WICCP, W1CHR and W1CQN are new stations who began reporting traffic almost as soon as they got on the air. We hope there will be more like these. W1AHV is back on the air with a new call, W1Z0. W1KE is using the new DeForest 310’s and reports greater output and steadier signals. W1KX reports again this month and is looking for an ORS. All are reminded that the new amateur regulations call for d.c. notes, and it is hoped that from now on the RAC note will vanish with a minimum of grief in regulation enforcement. WIBX has been a busy station this month.

Traffic: WICMX 43, WITT 212, W1RVS 153, W1WY 390, WIBZ 123, W1ACH 95, W1LM 79, WIBQ 82, W1ACA 44, W1AXL 37, W1AAT 27, W1AZE 26, W1WU 25, W1BMX 19, W1AEK 10, W1LQ 15, W1CNO 9, W1CCP 5, W1CHR 4, W1KY 2, W1BLD 2, W1BXB 222.

NEW HAMPSHIRE — SCM, V. W. Hodge, WIAJ — Most of the active stations reported this month, which was very busy gang. The fellows at Dartmouth, W1ACW, W1WIT and W1BMS poured out a big traffic of using, the call W1ET. A new 14 kw. xtal rig is planned. Due to weekly, WIAJ spent a little time at the key between osteopath and patients! The new crystal rig at Phillips-Exeter will be going soon, 15 mc, is claiming W1FF’s spare time. Outside work is also claiming W1AEF, but he expects to be back on 3900 soon. W1CWX, W1CHR and W1CQN are three new stations who began reporting traffic almost as soon as they got on the air. We hope there will be more like these. W1AHV is back on the air with a new call, W1Z0. W1KE is using the new DeForest 310’s and reports greater output and steadier signals. W1KX reports again this month and is looking for an ORS. All are reminded that the new amateur regulations call for d.c. notes, and it is hoped that from now on the RAC note will vanish with a minimum of grief in regulation enforcement. WIBX has been a busy station this month.

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MONTANA — SCM, O. W. Viers, W1AAT — W1AAM leads the section this month. W1DST is still going on W1GQF. W1DST has just arrived! Phone and wants to know who has heard him. W1AKO, W1AEM, W1ALN and W1JC are new Billings stations. W1M7M operates the B.C. station. KGQF, there. W1AKO is a Morse operator. W1AAT has three transmitters on now.

Traffic: W1AZD 261, W1AMZ 10, W1BMK-W1BEG 12, W1BVR 21, W1BZJ 21, W1A77 107, W1BNL 1, W1DR 18.

NORTHERN DIVISION

Traffic: W1AAW 65, W1AAT 40, W1DST 20, W1GQF 30, W1PST 101, W1ALM 98, W1AHJ 41, W1AXJ 6, W1AMF 23, W1PE 17, W1QY 15, W1TWL 12, W1TEO 5, W1EC 2, W1JW 1, W1AOF 70, W1TO 7.
old skeds again. Three fellows report for the first time this month. They are W7AJS from Centralia, WFKX from Kinkaid and W7AO from Southwark. Fine work, fellows. W7IG is busy with his chickens and farm work. In sending in the news from Yakima, W7ANP states that they have about ten prospective hams there and fourteen of their club are going to join the A.R.R.L. W70V sends in a very new report. W7AAB is back again and is looking for all of his old friends. W7KTP is busy working at KMO. The Radio Club of Tacoma, now in their new club house, will be on with W7DK soon. W7AFO is back in town working for the telephone company. Don’t forget your reports next month, OMs.

Traffic: W7OJ 47, W7TK 24, W7ACY 22, W70V 14, W7AEE 14, W7AFP 11, W7FX 11, W7FJ 9, W7AJS 8, W7ANP 8, W7TX 7, W7NR 6, W7IC 2.

Traffic:

OS ANGELES — Acting SCM, C. A. Nichols, W6ASM

The following make the BPL this month and should be given a round ovation: W6DEP, W6WA, W6AKW, W6AKD, W6QP, W6HZY, W6AOA, W6FE. W6DEP, a new ORS, leads the section in traffic, and in his spare moments he is a jeweler. FB. The A.R.R.C. visited the Pacific Short Wave Club Monday, April 7th, and went through the Telegraph Photograph Department. A demonstration was given and then the gang were taken through the Exchange and a talk on the operation and care of telephones was made in the A.R.R.C. gang journeyed to Long Beach Sunday, April 15th, and were shown through the U.S.R. Radio Club of Bakersfield. Speaking for all of them, I can say that we never had a better time in our lives. They have one of the peepiest clubs in Southern California. The Pasadena Short Wave Club continues to hold meetings at members’ homes, and have been having some interesting talks on tals by W6KA. The Long Beach gang has not sent the SCM any news, but we think they are still meeting in the City Hall. We hope that new Club is becoming a success, and during the quarterly banquet in June, W6ELZ is going xtal.

W6DZI is repairing Fords. W6ID has been busy with work. W6CHA is working at KM1CJ now. W6EFI wants to know why skeds stay up all night. W6EPQ, the SCM, is in Guadalajara, Mexico, and continues to get his signals into L. A. O. K. W6FE and W6BRO are his two main contact stations in L. A. If IPF doesn’t answer you, fellows, you can rest assured that he is too busy with business. W6ZA is not traveling much now. W6AZL is building a new receiver. W6ERL was QSO 88X, who was 125 miles off SMM. W6BVZ reports death of his Kress 250. W6W10 is repairing a 906 word message. W6ASM has been very busy with work but had time to go up to Bakersfield to the hamfest there. W6UI is using a portable to keep skeds with his 208 total. He came forth with 271 this month for his work during the month of December when he handled more than 10,000 messages. W6ETJ is the new Crew Route Manager. W6ERL was QSO SSIXE, who was 125 miles off L. A. O. K. W6FE and W6BRO are his two main contact stations now. W6OF has a rebuilt W6EX fifty. W6DZI is repairing Fords. W6ID has been busy with work. W6CHA is working at KM1CJ now. W6EFI wants to know why skeds stay up all night. W6EPQ, the SCM, is in Guadalajara, Mexico, and continues to get his signals into L. A. O. K. W6FE and W6BRO are his two main contact stations in L. A. If IPF doesn’t answer you, fellows, you can rest assured that he is too busy with business. W6ZA is not traveling much now. W6AZL is building a new receiver. W6ERL was QSO 88X, who was 125 miles off SMM. W6BVZ reports death of his Kress 250. W6W10 is repairing a 906 word message. W6ASM has been very busy with work but had time to go up to Bakersfield to the hamfest there. W6UI is using a portable to keep skeds with while rebuilding his other transmitter into crystal control. Fellow, let’s keep up the good work and handle a little more traffic. W6OA, W6BCK and W6CXY have ideas that they might own an Xtal some day. W6LW is taking care of the Long Beach end of a chess game between Argentina and Long Beach. This is being handled on 20 meters and the Argentina station is LU3FA.

W6AD is taking care of some of the problems in W6EAF and reports receiving a 906 word message. W6ASM has been very busy with work but had time to go up to Bakersfield to the hamfest there. W6UI is using a portable to keep skeds

PACIFIC DIVISION

SANTA CLARA VALLEY — SCM, F. J. Quenest, W6XN — W6XM continues to be the main outlet for Trans-Pacific traffic. Quote from W6HAX’s report: “These 383 messages all trans-Pacific. The originated are messages that came to me by mail, airmail or telegraph. The delivered were all messages received from abroad, of course, mostly F. I. and China.” It is doubted whether there is another mirror man in the U. S. A. handling such a volume of important traffic, W6ALW made the BPL this month, maintaining a daily sked with W6GU. W6YG has been consistently handling traffic. skeds with W6ALX. W6DVY and W6DFV are responsible for sked with W6UGT, the SCM, is handling many Army contacts. W6GU contacts all bands. W6DZL has a daily sked with W6BH. W6BMW has been developing portable phone sets for State Fire Wardens. W6BAX QSL’d five Aussies and 2 Zedders on 28 me., with reports of being received in England and China. FB. There is a rumor that the wedding bells will soon ring for W6BNH. Hi. W6BYH is now an OHS. W6DCP has a 2/W receiver now and W6SEC is a new OHS. W6AME is handling a lot of bad DX and W6DFU is in putting in xtal control for all bands except 5 meters. Stations desiring skeds should get in touch with RM W6DQH.


HAWAII — Acting SCM, L. A. Walworth, K7CIB — K7CIB made the BPL in January but was not reported with his 508 total. He came forth with 271 this month and is 11pplymg for OHS, Official Observer. W6DQH, the SCM, is handling a lot of bad DX and W6DFU is in putting in xtal control for all bands except 5 meters. Stations desiring skeds should get in touch with RM W6DQH.

Traffic: K7CIB 271, K7ALM 99, K7CIB 42, K7AVL 38, K7DR 32, K7EO 9, K7EOH 7, K7CH 6, K7CWO 2, K7EVY 40.

EAST BAY — SCM, J. Walter Frates, W6CZR — W6CZR, the old reliable, is still in lead position for the section in traffic with a fine total secured from skeds with KAC1M-V, K6ST, K6DQY and W6ASM. These skeds give a fine idea of the range and reliability of his very FB station. At the present time he is arranging a transmitter and booth during the meeting of the Redmen in Vallejo which should bring in a fine total for next month. He will be glad to handle any traffic for P. I., the Hawaianas, and Pacific Coast points. W6ASIX in the second highest man in traffic, all secured with some early morning skeds with Pacific Coast stations. W6ALW’s totals have begun to creep up again. It is thought that they may get down to the point they were when he won one of the individual cups in the L. A.-East Bay competition last year. In addition he is turning out commercial operators for the trans-Pacific skeds from his fast se box. Due to the immense amount of work on the West Coast, W6BXR reports that he did not have the time to spend on radio last month. W6EDO is back in

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Pope Valley but is QRW work. W6EED recently received his Signal Corps flag from the War Department for his work with the First Pursuit Group flight last winter. W6B1W reports that he has been trying 14 mc, with some success, but the band is erratic. W6CGM gets a card from Germany and says he has been QSO with VK, KA and K6 stations with his low powered transmitter. W6BBM has new receiver and has some station welcome. He will be expected each month. W6RJ says he has been QSA4 in New Zealand on 3500, but that he has been devoting considerable of his time to OO work. W6BZU is pounding away at Concord, but is being kept busy by other radio work. W6B5F got a new 14-mc. phone key this month, but he has not been reporting very long. W6AUT reports that W6BYS has returned from a Naval Reserve cruise and is on again with his 220-watt; that W6CQZ has an s700 grid superhet short wave receiver with its antenna eliminator. W6BATS is a regular and heavy contributor to the monthly totals. W6ACT continues to pound nails in the bay and brass at night. W6WBS copped off the honors for the section in the January Sweepstakes and also hooked his extra first ham ticket for 14-me. phone operation last month. He is doing a good keying job and hants W6AX's country in hopes of improving his DX. The S.F.R.C., after much debate, has decided to affiliate with the A.R.A. The organization resulting from such a move cannot help being the greatest S. F. has ever known and is conducive to better understanding and cooperation within our section. The name will be the Associated Radio Amateurs of San Francisco and we all look forward to bigger and better meetings. The testing place will remain at California Hall, Polk and Turk Sts., San Francisco.


SAN DIEGO — SCM, H. A. Amberl, W6EOP — All stations but two reported this month. W6ACJ as usual leads the Over 100-club with 1040. W6BRS is building a portable for some future sweepstakes. W6BDM reports with a 171 works 1IP and W6BXY with 100 reports. W6BAM moved V5KGH on 28 mc. W6EOS is building a 100-watt transmitters and will be on again soon. W6CNK has trouble keeping his battery charged with his battery charger, but is getting along alright with a 7500 kc. W6BPF is going in for Navy amateur work. W6EOM is now W6EOP, as he lost his old call. W6CTF has a new QRA. W6DGC is building a new tower. W6EPF has got his old ticket for 14-mo. "phone. W6FKF sneaks off on the weekends and has not been heard as yet. W6AU1 continues to pound nails in the day and brass at night. W6WBS copped off the honors for the section in the January Sweepstakes and also hooked his extra first ham ticket for 14-me. phone operation last month. He is doing a good keying job and hants W6AX's country in hopes of improving his DX. The S.F.R.C., after much debate, has decided to affiliate with the A.R.A. The organization resulting from such a move cannot help being the greatest S. F. has ever known and is conducive to better understanding and cooperation within our section. The name will be the Associated Radio Amateurs of San Francisco and we all look forward to bigger and better meetings. The testing place will remain at California Hall, Polk and Turk Sts., San Francisco.


SAN FRANCISCO — SCM, C. Pana, W6OB — The section is pleased to be thanked for their efforts for the division, thereby winning the much desired banner for that month. The men reporting are to be thanked for their bit in making this possible in such a small section. Particular credit is due, of course, to our star traffic man, W6ACJ, and his second operator, who contributed greatly to our success. Our R.M., W6ERK, has been moving mountains to stimulate interest in traffic besides being a regular and heavy contributor to the monthly totals. W6PW rejoins our ranks this month with a bang, having done some deep traffic handling, W6PPF moved his AA booth and sprints to get traffic for the section, and WHAM is another new ORS. W6ACT makes Radio A1mateur of San Francisco and we all look forward to bigger and better meetings. The testing place will remain at California Hall, Polk and Turk Sts., San Francisco.

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Tobacco Division

ROANOKE DIVISION

NORTH CAROLINA — SCM, Hal S. Justice, WATS — Things have been very quiet in the Section and traffic handling is on the decrease. All active stations are requested to send in reports and bits of gossips to liven things up. W4ABV, our leader in traffic for several months, is not forwarding his operation for a little while. Here's hoping you are with us again soon, OM. WNRC sends the Official Broadcast daily on 1440 kc., both AM and CW. Following the OBO, code practice is sent at 5, 10 and 20 words per minute. All such schedules will soon have 3.2 kc., and is arranging some good skeds. W4EWF says traffic is on the bun, and is trying to arrange an entirely new set of skeds. W4RX has two UX552 in pull-push, e.c., and is building a s.s.c. screen-grid superhet. W4JR is finding more time to be on the air than ever. W4LS is disposing of most of his apparatus. W4AA organized the Greensboro Radio Amateur Club. W4ZB is rebuilding to use a 50-watt station.


VIRGINIA — Acting SCM, T. P. Mathewson, W3FJ — W3FJ now has crystal control, W3CA is using an MOPA, W3C/KL is busy trying to finish college. W3ARU won the Va. certificate in the January Sweepstakes Contest. W3NO is the Va. Control station for the A-A net. W3BDZ is going to try his phone with a Zepp antenna. W3RIR now has a bug. W3JO is doing excellent work with his many schedules. W3AKQ worked VK3ES with his 210. W3AM3 at last has a d.c. note. W3F3E had coal wall QRM. OM. W3ABC aspires to be an O8S. W3IZ is a new ham in Richmond. W3FJ visited W2KU in New York. Ham radio is very active in Hampden and the Short WAVEers are getting new members. At a recent meeting, W4VB won a tube for being the DX visitor. W3ASA won a 50-watter donated by WRVA. Hammond of W3CEL offered his 75-watt transmitter to the club room.


WEST VIRGINIA — SCM, D. B. Morris, W8JM — W8DPO sends in a nice list of off-wave stations, and the fine thing is that no W. Va. hams are in that report. W8HD keeps skeds with W8OK, W8DXN and had as visitors W8KS and W8DXN. W8CBV gets good DX and reliable traffic on 14,000 kc. W8ACZ passed the amateur first while attending the Convention at Charlotte, N. C. W8TIT kept up sked work with W8SHU, W8ADO, W9F1G and W8DEN, also worked west coast 12 times last month. W8SM is trying to put a station on in the Sigma Tau frat house, at Fairmont State College. W8ID keeps improving W8MMN. W8BCN said he didn't think much of all the new rules being passed. Hl. C'mon, gang, where's that traffic? Skeds and traffic is what counts. Also, please check your wave, each time before you go on the air.


ROCKY MOUNTAIN DIVISION

UTAH-WYOMING — Acting SCM, L. D. Searles, W8BTX — In spite of coming summer, activity is increasing. W7H has been appointed Official Observer — keep your eyes on the frequency meter. W7AAE in Jackson Hole reports a coming station. W6DPO in traffic, and won a certificate in the January Sweepstakes Contest. The Utah Amateur Radio Club shows new splittings with proposed station. W6BV built the Y.L.A. set. Now she teaches in Idaho and they click every night on sked.


COLORADO — SCM, C. R. Sedman, W9CAA — W9CVE leads in traffic. W9EWJ did fine work. W9EAM is on 7000 and 3500 kc. W9CXR is operating on 28 mc. W9CAA has dismantled.


SOUTHEASTERN DIVISION

ALABAMA — SCM, Robert Troy, Jr., W4APH — W4LM leads the State in traffic. FB, OB, W4AJR is not on much. The gang's prayers are asked that W4PA1 will work Asia and Africa. Hi. W4T1 is running his part of the State A-A system very well. W4AG is working DX. Good luck. W4AHF has been busy refinishing furniture for the O.W. We are sorry to lose W4ificador as an O8S. He let his A.A.R.L. membership lapse. Hi. W4E9Z is having a hard time with his fence. He and W4AP keep a sked every day on the same frequency. Here's hoping you are with us again soon, OM. W4NC leads in traffic. W4JL and W4BV are building a crystal-control v.f. Very FB. W4DBS is joining the A-A net. Welcome. OM. W4KAB is busy answering c.q. on e.c.; W4BB and W4AS are building a crystal-control v.f. The telephone switchboard. Hi. His other 50-watter broke, but he has another one. What has happened to you fellows in South Alabama? Not even a QO out of you.


GEORGIA-SOUTH CAROLINA-CUBA-ISLAND OF PINES — SCM, M. S. Alexander. W4RZ — W4AFQ and W4DID did some fine work at the Southeastern Open Golf Tournament in Augusta, Ga. They set up stations at the club house and at the ninth hole and as the players passed the ninth hole, the scores were sent via radiophone to the club house where they were turned over to the reporters and score keepers. The officials and newspaper men were very much pleased with the novel way of keeping in touch with the players on the course, and expressed a wish for such services at the National Open Golf Tournament. That certainly is FB and shows the amateur spirit. W4GS just received a letter from headquarters informing him that he made the highest score in the fourth district in the Sweepstakes Contest. W4TL, W4ACH and W4ABP are all new members. CM8DF down in Cuba seem to have a lot of fun. W4JL made the highest score in the fourth district and, with the help of W4IPD and CM8DF, was able to send a lot of messages. W4ID did some fine work at the Southeastern Open Golf Tournament.


COLORADO — SCM, C. R. Sedman, W9CAA — W9CVE leads in traffic. W9EWJ did fine work. W9EAM is on 7000 and 3500 kc. W9CXR is operating on 28 mc. W9CAA has dismantled.

QSO. K4ACKY is helping out in off-frequency observation work on the 14-mc. band, K4KD received his "Sweepstakes Certificate" for work in the 14 MC ACM Contest. W4PFU, W4KDP, and W4ADP are heard from the west coast. K4CFK now offers reliable QSP to Haiti and Cuba through stations operated by naval operators in those countries.


FIORIDA — SCM, Harvey Chain, W4AII-W4PAW — W4SK wins the state traffic banner this month with a total of 113, W4AOM, the Naval Reserve station is second. W4APU has not reported a ship, a school, and the W4B station at Havana, K4AWG, during the race from St. Petersburg, fla., to Havana, Cuba. Messages were exchanged every day and delivered to the crews' families, posting them on the race.

W4MWH is owner of the winning boat. W4MS was heard in Nicaragua. W4AQ has been working a sked with a radiophone station in Chicago. W4FQV has a FB tone set on the air. W4ADP, up at Crescent City, is applying for an ORS appointment. W4MWN is a new prospect for an ORS appointment. W4ACF has been working with the W4A station at Haligonian, 3GAW, through stations operated by naval operators in those countries.


NEW ENGLAND — SCM, C. M. Farnsworth, W4ACF — W4AJW is helping out in off-frequency observation work in the January contest. WA4UL has turned over his power transformer and is temporarily off the air pending repairs. WA4UL has a new portable call, W5BOK. W5AEM has one of the new Aero short-wave timers. W5AIF kicked about my not printing hearing reports, but as yet I have never received a message report from there. Send them in, OMs, we are always glad to have them.


NORTHERN TEXAS — SCM, J. H. Robinson, W5BG — Well fellow, this will be the last report from this SCM. It has been a pleasure to serve this section. W5SW challenges any ORS in Northern Texas in traffic handling. He reports DX good any time. W5RJ has a BCL op's license now. W5RAM is working...
NEWFOUNDLAND — Acting SCM, E. V. Jerrett, VOSZ — VOQ is going to Northeast Greenland again this summer and is carrying a short-wave transmitter. More about that later, VOSAE will soon be eligible for WAC. VOSC works European countries consistently. VOSIl has a new MOPA transmitter, YOSM is rebuilding for higher power, VOSAW built himself a new TPTG transmitter. VOSN has begun work in the 7000-kc. band and wants local QSOs. VOSA reports being heard in Austria on phone. VOSCG drove 180 miles on dog team and delivered some traffic. VOSZ took 39 messages from VOSWG at one sitting. Don't forget to try for VESO’s Wednesday nights, boys.

Here is a chance for every Canadian to get a real kick. It has been suggested by the Publicity Manager of the T. & R. of the U.S.G.B. that each and every Canadian try to get a message of loyal greeting to their Patron H.R.H. the Prince of Wales. His birthday, as you all know, is on the 23rd of June. This year the 23rd falls on Monday which would constitute a holiday. VOSDQ is rebuilding for high power. VOSAB has taken over a new TPTG transmitter. VOSI has begun work in the 7000-kc. band and wants local QSOs. VOSA reports being heard in Austria on phone.

Traffic: TO3W 10, TO3D 5, TO3A 3. VE2A W 3, VE2BM 8, VE2BG 14, VE2B8 6, VE2B7 6, VE2B6 4, VE2B5 3, VE2A 1.

ONTARIO DIVISION

ONTARIO — SCM, E. C. Thompson, VE3FC — Central District; VE3AF again leads in traffic handled. VE3BC has contacted 1750 stations and handled 850 messages since October, 1927. VE3BP shows increased activity on 3000 kc. EP also reports two new arrivals on the air in VE8CK and VE8HE.

OMs. VE3DA reports another new station about to show its teeth in Belleville. VE3DW is still using his “sea-power” transmitter. VE3GM, the outstanding amateur phone station in Toronto, is showing the rest of the boys how it is done. VE3FC has been silent during the month. VE3GC, the Western District; VE3GR has added a real list of DX. VE3XM is moving. Southern District: VE3HB and VE3FD are now devoting their time to DX operating, and to helping new hams get started. VE3ZM is working a lot of DX and VE3WM. Welcome, fellows. VE3CB has been moderately active, but reports conditions all the way from punk to rotten. Northern District: VE3HN is heading straight for an ORS appointment, with bigger and better totals. VE3DJ also handles traffic. Move over, gang, and make room for VE3DM’s brother-in-law, who has just been licensed as VE3HD. VE3AR has gone to Red Lake to operate CFI, and will use his brother’s portable set, VE3RF, from there. VE3RI will keep VE3AR on the air, VE3GD worked Spain on 14 mc. VE3CA has moved the outfit to a new shack. VE3AG is in regularly. VE3ET set the works and will be off for a while. The Port William Radio Club, with VE3GD as President and VE3FG as Vice-President, is going strong with well over 200 members.

Traffic: VE8HT 20, VE3ET 10, VE3DM 8, VE9AL 43, VE3BC 18, VE3BP 11, VE3DA 9, VE3XC 2, VE3CB 4.

VANALTA DIVISION

ALBERTA — SCM, G. F. Barron, VE14EC — What is the matter, fellows? Your reports are as scarce as hens’ teeth. VE4FA is our star station. Our prospective ham at Fort Saskatchewan expects his ticket soon. VE14AF is still experimenting with crystal. VE14HA handled an important message from Churchill in regard to some missing flyers. VE14DS plans on busting the air with a portable. VE14GD made us a visit recently and VE14BV. VE14AP, VE14DJ and VE14EC took him for a ride around the city. VE14EC has rebuilt twice in the last month. VE14FJ is pushing his sign out FB, VE14BM, VE14MT and VE14FU are on occasionally. VE4FA had his 28 mc. sign reported in Ohio.

Traffic: VE14EC 53, VE14EC 3, VE14HA 1, VE14EA 2, VE14EA 1.

BRITISH COLUMBIA — SCM, King Cavaleky, VE15AL — In Vancouver VE15AM manages to spew the odd message. VE15BM has stal on 7000 kc. VE15CA has his new mant up. VE15CI is trying to get going again. VE15DR worked a K7 with a little old 201A. VE15F1 blew his filter. Spring and golf have hit VE15AL. Victoria: The Victoria gang have been very active of late. VE15UD is getting xtal reports from their route and VE15RP. VE15AP, VE15DZ and VE15EC took him for a ride around the city. VE14EC has rebuilt twice in the last month. VE14FJ is pushing his sign out FB, VE14BM, VE14MT and VE14FU are on occasionally. VE4FA had his 28 mc. sign reported in Ohio.

Traffic: VE15AC 17, VE15DJ 9, VE15BU 8, VE15AQ 5, VE15AR 3.

PRAIRIE DIVISION

MANITOBA — SCM, A. V. Chace, VE4HR — VE4DJ is on very consistently. VE4IC heads the section in traffic. VE4GQ has returned to his old love, the Telegraph, VE4DQ has been QRK, with U exams. VE4BU has been granted an ORS appointment. VE4EK and VE4FP have had their certificates cancelled on account of inactivity. VE4IQ has obtained a Belgian 75-watt battery for his station.

Traffic: VE4IC 17, VE4DJ 9, VE4BU 8, VE4GQ 5, VE4HR 3.

SASKATCHEWAN — SCM, W. J. Pickering, VE4FC — The approach to summer is getting hectic work in all sections. As shown by the few reports VE14HI comes through with his usual nice total. VE4BB and VE4OH say that the weather has been very bad. VE14CY of Swift Current is disturbing the ether with a 210, on 7 and 14 mc.

Traffic: VE4IR 45, VE4BB 17.
Between Bermuda and the Equator to Santos, Brazil.
Correspondence

The Publishers of QST assume no responsibility for statements made herein by correspondents.

All-American Mohawk Malaysian Expedition

Base Camp, Poeroek-Tjahoe

Editor, QST:

Although Mr. Harry W. Wells (W2ZD, Chevy Chase, Md.), radio operator with the Expedition, has from time to time reported to the League through QST of the radio activities of the Expedition in Borneo, I wish to take this opportunity before we leave for the coast and PMZ is dismantled, to thank the American Radio Relay League for the splendid cooperation we have received in keeping up communication with the United States through members at home and abroad.

Sergeant Paul Holbrook, KA1AF, Ft. Mills, P. I.; Commander S. M. Mathes, KA1CY, Manila, P. I.; L. R. Potter, W6AKW, Lancaster, Calif., and Colonel Clair Foster, W6HM, Carmel, Calif., are the operators, Mr. Wells informs me, who gave him such generous support.

You have very likely heard by this time of the splendid service PMZ was able to render the government of the Dutch East Indies at the time of the assassination here of the military post commandant, Captain J. C. DeQuant, and the subsequent disturbance. Mr. Wells, through Station KA1AF and KA1CY was able to notify the garrison at Bandjermasin of the tragedy, and has since been handling all official reports regarding political consequences, etc., for the isolated post. There is a feeling here now that through this incident, made possible by the A.R.R.L., the Dutch colonial government will elevate the status of amateur radio operators in these great islands and license them just as our own government does members of the League. If this comes about we shall feel mighty proud, and I personally shall bring the matter to the attention of the Governor-General at the first opportunity.

— Theodore Seelmann

Pertinent Comment from Overseas

13 Seagry Road, London, E. 11

Editor, QST:

Your editorial in March QST hits the nail right on the head. To listen to the average ham, one would hardly realize that such an excellent series of articles on modern station equipment had been so ably written by Mr. Hull. It must be a great disappointment to the A.R.R.L. executives, as sponsors of Mr. Hull's work, to know that after twelve months' working under the new conditions, the position is so little changed.

Considering how easy it is to obtain a pure d.c. note, it really is surprising that a good 75% of the U. S. A. stations received on this side still sound like the proverbial band-saw.

With regard to "off-wave" working, only one British amateur to my knowledge has been heard by the authorities working outside the "band," and he found himself a B.C.L. again within twenty-four hours of the offense. This will show you the position in England.

Wishing QST every success.

— Lawrence C. Fuller, GU6LB

The Far-Reaching Ham Spirit

Houlton, Maine

Editor, QST:

Last June I had the misfortune of being the victim of an auto accident which left me with a broken back. Up until a few weeks ago I have been confined to the house, enclosed in a cast, which made it impossible for me to do anything which required the least effort on my part.

It is during moments of trial and hardship that one appreciates the kindness and friendship of those about him. So through the medium of QST, I want to extend my sincere thanks and appreciation to all of my fellow hams who have been so kind and generous to me during my illness.

The fine spirit of fellowship extended by all those with whom I had the pleasure to work certainly helped very much in passing away what would have been many a long, lonesome hour. In all districts worked, especially the first and second, I found every ham a real sport, ever willing to do some little thing to make life more pleasant for me. The gang here at Houlton also stood by me in my trouble. The unseen amateur friend is certainly one of sterling worth.

73 from a very grateful fellow ham.

— Phillip Clark, W1BKN

Constructive Work on 'Phone

Olathe, Kans.

Editor, QST:

In response to a request published in QST for 1750-ke. stations to send code lessons, I volun-
More than a score of different Cardwell Condensers were used in equipping the Byrd Antarctic Expedition

Be Right The First Time!

Guessing may prove successful occasionally, but in the long run reliance on past performance proves the wisest course.

The Byrd Antarctic Expedition, now successfully concluded, used 25 different types of Cardwell condensers. The success attained in maintaining Radio Communication with home and between isolated units of the Expedition is well known, and no comment on our part can add to the glory of these achievements.

Cardwell condensers have always proved worthy of the confidence of winners and are worthy of your confidence. If you are in need of condensers you can play a sure thing and eliminate doubt—use Cardwells.

Send direct if your dealer does not stock. Literature sent on request.

The 201E
A 2 plate variable condenser having the stator plate readily adjustable to permit changes in maximum capacity ranging from 50 to 10 mmfds, with a constant minimum of 7 mmfds.

Since broadcasting began

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

is important in your tube selection

For your mark of recognition, we have reproduced the characteristics that identify genuine CUNNINGHAMS.

Visible proof of in-built quality

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RADIO TUBES

Cunningham
RADIO TUBES
Standard Since 1915

Type C-32
Screened Radio F. A. M.
Heat Heald Plugs

During October and the first part of November, with the help of my sister, W9UA, sent 34 lessons, missing but one night, when lightning became so bad as to burn out the line telephone here. We conducted the lessons one-half hour in length, starting each one with alphabet review, then following with sentences sent slowly, and the last 10 minutes running the omnigraph. About 10 minutes divided into several periods was taken up by explanation and answering of cards and letters. At the conclusion reports were asked with promise of sending a card when I came on the air again. About 50 reports were received.

During November and December I built a new crystal controlled transmitter following many suggestions published in QST. The set uses two Type '52's as power amplifiers, modulated by two '45's.

With this transmitter completed I came on the air Christmas and up until March 1st sent 50 lessons of an average of one hour in length. The new transmitter practically eliminated BCL interference so I ran it from 7:30 to 8:30 p.m. and sometimes later. The lessons were conducted on same lines as before, by starting each with the alphabet, following with slowly sent sentences taken from the Handbook, then running the omnigraph from 7 words upward to about 15 words per minute.

Reports soon began to come in from far and wide; 39 states, Canada and Mexico have been heard from. The set reached out consistently 1000 miles in every direction and 50 per cent of the time, 1500 miles. Many have claimed 15 words per minute speed gained, while dozens have applied for licenses or appeared before inspectors. Others have not yet received action on examinations or applications. Besides these there were a great many operating on provisional licenses, capable of doing only about 6 words, who listened and gained up to 12-15 and more.

I write this to let you know that I have kept the schedules in spite of the fact that my sister, on whom I depended for help when I agreed to send, has been sick since December.

Anyone securing 25 or 30 of these lessons gained speed enough to read calls and make the grade for examination as proven from reports. I have sent each Friday and Saturday since March 1st just to give several of the last fellows getting on a little boost. Now agree with me that no 7- or 11-mc. man has done more to help out the hundreds of fellows who want a little lift getting started, or tell me who he is and how he did it and I'll go his method one better next winter.

Keep the good work up at Headquarters.

Marshall H. Ensor, W9BSP-W9UA

Office Supervisor of Radio,
2116 L. S. Smith Bldg., Seattle, Wash.

My dear Mr. Warner:

Believing that you may be interested in some of the amateur inquiries reaching this office, I am forwarding the enclosed letter, dated March 22, 1930.

Edwin W. Lovejoy, U. S. Supervisor of Radio,
Seventh Radio District
HERE'S the real "surprise package" of the radio industry. The new, perfected Sprague electrolytic condenser — with the exclusive one-piece, rolled-edge anode — concentrating 8 MFD capacity into a space of only 1 3/8" diameter and 5" long.

Individual socket mounting makes it instantly adaptable to any circuit. Protected vent integral with top prevents all liquid leakage. And because there isn't a soldered or welded joint anywhere — the Sprague gives you in practical performance the maximum of efficiency.

It has the endorsement of the leading "hams" for transmitting use (names on request). Write for information of special interest to "hams."

SPRAGUE SPECIALTIES CO.

Offices & Laboratories: Quincy, Mass.


$250
it would be FATAL to lose Control

Barred wire—trenches—dug-outs—a field set and a thin strand of wire. The difference between control and lack of control may spell life or death to an entire brigade. It's a far cry from No Man's Land to the comforts of your home. But even in your radio set, control plays a vital part... and it has been the privilege of CENTRALAB to furnish the volume controls of millions of radio receivers. Is your radio—CENTRALAB equipped?

Federal Radio Supervisor:
Dear Sir:
Am enclosing a diagram of spark transmitter.

Is a license required to operate such a set and is it unlawful to operate such a set within the state?
Would you please send me a complete set of rules governing radio communications?
Thanking you in advance.

A Suggestion

Editor, QST:
I have just read with interest the letter by Charles Manley of Summit, N. J., with reference to rag-chewing. In this connection it occurs to me that it is about time QST did something to bring together those amateurs who are not primarily interested in traffic. I think this everlasting "QRU CU later," coming as it usually does immediately after two stations have made contact, is the main reason why so many amateurs have turned to radiophone for a change.

Personally I am most interested in experimental work and have been devoting a considerable portion of my spare time during the past twelve months to aircraft radiophone communication experiments. This leaves me comparatively little time for ham work, and while I am always glad to accept an important message for relay or delivery, I do not feel that I must accept the unimportant messages which take up most of the time of our traffic stations. Granting that traffic work is excellent training for any operator, it cannot be indulged in consistently except by operators who can keep regular schedules and be on the air for a reasonable time at least every other day.

My amateur interest is about equally divided between telegraph and telephone but I think probably I get the most enjoyment out of a good rag-chew or exchange of interesting information. I also like to hook up with other amateurs who are willing to check transmission tests and who are competent to give an accurate report. During the past twelve months, however, I have not QSO'd more than fifty amateurs of this type and 75% of them have been working in the 14,000-ke. band.

In the past it has been suggested that a special...
A NEW LINE
OF TRANSFORMERS

Again ACME leads in transmitting apparatus

Here's a brand new line of transformers and chokes for transmitting stations. Back in 1920 when C. W. power began, Acme was the first to have the transformers ready for the tubes. Again Acme pioneers in transmitting apparatus, this time with a line developed after years of experience and by studying the needs of the amateur and the transmitting station.

Note the construction of this new line and some of the features exclusive to Acme. There's the porcelain insulators on the high tension terminals; there's the strong metal case in which the transformers and chokes are submerged in insulating compound.

All these transformers and choke coils are insulated to (and tested at) 5000 R. M. S. (7000 peak) between all high voltage windings and ground. No more worry about the power supply failing just when you have an important message.

Send for Bulletins 110 and 111 and learn all about this new line. You'll want to have this information on hand when you get ready to improve your station. Just fill in the coupon below and mail it to the Acme Apparatus Corporation, Cambridge, Mass.

ACME APPARATUS CORP.
Cambridge, Mass.

Gentlemen: Please send me a copy of Bulletin 110-111.
Dept. Q-1

Name ..................................................
Address ............................................
City .................................................. State ..........................
Can you turn back the pages of time?

If you have the 1920 series of QST — and probably you have not — you are one of the few. Even 1922 and 1923 copies are getting scarce. And copies before the war! Well, let's change the subject.

A few years from now QST copies of to-day no doubt will be just as scarce. Every reader of QST appreciates its reference value. We are daily reminded of this fact by the many requests we get for back copies, many of which we cannot supply.

Next year — or probably later this year — you will be looking for a certain 1930 issue of QST. You had better resolve right now to keep your copies in a

QST Binder

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

One-fifty each postpaid

A binder will keep your QSTs always together and protect them for future use. And it's a good-looking binder, too.

QST
1711 Park St., Hartford, Conn.

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QST
1711 Park St., Hartford, Conn.
AMATEURS who operate phone transmitters of medium power will find that Radiotron UV-849 is a very effective modulator. Its characteristics have been so designed as to make it particularly suited for use with oscillators operating at plate voltages of from 2000 to 3000 volts. The high quality of phone transmission obtainable through its use will gratify the most exacting amateur.

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

Filament Volts 11 Filament Amperes 5 Amplification Factor 19

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Say You Saw It in QST — It Identifies You and Helps QST
FOR PURE D.C. POWER SUPPLY

Under the new regulations all amateurs must use an adequately filtered D.C. current supply.

P. R. 866 and P. R. 372, both mercury vapor rectifiers, besides emitting a wave form easy to filter, furnish a stable source of plate voltage—full load or no load, because both tubes possess a low and practically constant voltage drop. The unusually long life of the P. R. 866 and P. R. 372 is due to the low operating temperature of the oxide coated filament combined with the extremely low voltage drop resulting from their mercury content.

Use these Perryman rectifiers, famous for their rugged strength, in bringing your station in line with the new regulations.

Attractive prices for licensed amateurs

---

Calls Heard
(Continued from page 41)

14,000-ke. band

W6EQO-W6BBY, F. C. Thompson, 155 N. Canyon Blvd., Monrovia, Calif.

W2AJP, Norman B. Krim, 227 Haven Ave., New York City, N. Y.
Be prepared to meet the NEW REGULATIONS

One of the new regulations which the Federal Radio Commission has recently adopted with reference to the amateur is that he must keep an accurate station log showing, among other things, the input power to the last amplifier stage in the case of a multi-tube transmitter, or the watts input to a self-excited oscillator.

The new regulations also state that the amateur must use "an adequately filtered direct current power supply or its equivalent."

These regulations now in effect require that the amateur should be able to properly adjust his equipment to conform with them. But before the amateur can do so he must be provided with meters of suitable characteristics and proper ranges for accurately indicating the voltages being applied to his tubes and the current he is drawing from them.

For this service Weston offers three new instruments of the famous Model 301 design equipped with Bakelite cases — shown in the illustrations. For complete descriptions and instructions in the use of these meters write to the factory direct, addressing your inquiry to the Radio Engineering Department.
COMPLETE DATA ON CONSTRUCTION AND REPAIR OF MODERN RADIO SETS

These three books cover the entire field of building, repairing and "trouble-shooting" on modern broadcast receiving sets. The Library has been brought right up-to-the-minute in every respect, including the very latest developments in the design and manufacture of equipment. The recent interest in short wave reception is reflected in a section which deals with the construction of this type of receiver.

THE RADIO CONSTRUCTION LIBRARY

Three Volumes, 6 x 9, 993 pages, 561 Illustrations

These three books embody not only a thorough home-study course, but a ready means of reference for the more experienced radiotrician. Step-by-step information is given on wiring, "trouble-shooting," installation and servicing to get the best tone quality, distance and selectivity in broadcast reception from all types of sets.

Data is given on equipment, such as loudspeakers, antenna systems, battery eliminators, chargers, vacuum tubes, etc. The text is profusely illustrated throughout.

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You may send me the Radio Construction Library, three volumes, for ten days' free examination. I agree to remit an initial payment of $1.50 at the end of ten days and $2.00 a month until the price of $7.50 is paid — or — I will return the books at the end of ten days.

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"We found over a period of two years that CeCo Tubes were the most profitable to handle in more than one way."

ALBERT A. LIST, List Brothers Distributors, Fall River, Mass.

Increasing use of high-quality phone transmitters by amateurs created demand for rugged, long-lived, powerful modulator tubes...capable of withstanding heavy overloads and high voltages. The new CeCo 250 Tube with its rugged filament, high emission, small grid current and super vacuum is well adapted for this service.

FRANKLIN S. HUDDY, Assistant to Chief Engineer, CeCo Manufacturing Co., Inc., Providence, R. I.

DO YOU KNOW?

1. The CeCo million dollar factory of 3½ acres is the largest and most modern plant in the world devoted exclusively to the manufacture of radio tubes.

2. CeCo has pioneered in such tube achievements as the B-409, B-406, "G," "H," "K," Hi-Mu, the A.C. Screen Grid 224 tube and the A.C. Pentode.

CeCo Tubes are licensed under patents and applications of Radio Corp. of America and affiliated Companies.

CeCo Radio Tubes

1930

Say You Saw It in QST — It Identifies You and Helps QST
Do You want to be a High Class Radio Operator?

You can be a Clear, Fast Sender, able to work with the best of them. You can be a Rapid, Accurate Receiver, able to copy the fastest amateur or typewriter. The Successful Methods used by the fastest and highest paid Radio-men are taught to you in

The Candler System of High-Speed Telegraphing

It is a Post Course of intensive training for developing Receiving and Sending Speed quickly through Scientific Methods (not trick theories). It trains the Brain, Muscles and Nerves to Co-ordinate in doing fast, accurate work. It develops the power of Concentration; gives you Confidence by making you sure of yourself at all times. No matter what your speed now is, we guarantee to increase it.

In big land stations and on ships at sea are successful operators who have taken and are taking the Candler System of High-Speed Telegraphing. It is a Post Course of intensive training for developing your power of Concentration; gives you Confidence by making you sure of yourself at all times. No matter what your speed now is, we guarantee to increase it.

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The CANDLER SYSTEM CO.
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POWER SUPPLY

All Amateur Stations are now compelled to emit a pure tone signal. This can only be obtained by use of an efficient Power Supply. REL CAN ASSIST YOU WITH YOUR POWER SUPPLY PROBLEMS WRITE FOR LITERATURE

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RELAS W.A. Bousfield, i'tYrk St., Bellerive, Tasmania
RELAS W. A. Bousfield, i'tYrk St., Bellerive, Tasmania

Experimenters' Section
(Continued from page 33)

would be of great interest to many amateurs.

Another thing—if you have an idea which you think ought to work, but which you haven’t the time or facilities to try out, send it in anyhow—someone else may be in a position to try it, and it may turn out to be good. If you have a problem which you can’t solve you will very often find that someone else has found a solution, so if you let us know about it we can often make mention of it and bring forth a lot of responses. In other words, look at the “X” Section as being a clearing house for ideas and helpful kinks, and remember that if you are interested in knowing what the other fellow is doing, he is probably just as much

More Progress on 28 Megacycles
(Continued from page 33)

in the T & R Bulletin. We will present a few items of interest.

G2OD copied W9EF solid on February 2nd
Accuracy Even
to ½ of 1%

The new Durham wire-wound precision resistor can be secured to an accuracy of ½ of 1% . . . made especially for uses where accurate, high value, non-inductive, low distributed capacity resistors are required.

Data sheets of this and other resistors sent gladly upon request. Please mention types and values in which you are interested.
Use Potter Replacement Blocks and By-Pass Units for Service Work

To Give The Old Receiver New Life
This Is The Difference Which The Set Owner Hears

THE POTTER CO.
North Chicago, Illinois
A National Organization at Your Service

BARGAINS

Mottors back poared 110 A.C. variable speed, auto reversible (Sohony old burner type) has over one thousand uses, a very good buy ........................................... $7.00

Resistor, vitreous, screw base, 600 ohm to 2000 ohm ... $1.50

Resistance, variable 200 ohm 1.5 amp. .......................... 1.00

Rheostats vitreous, variable Ward Leonard, 500 ohm, 2 to 1.5 amp 35 tap field reg. type ..................................... 5.00

Rheostat, vitreous, variable, Ward Leonard, 6 ohm 15-3 amp, bat. charge type .................................................. 3.50

Resistors, vitreous Ward Leonard, with leads, use sizes per doz. ... 1.50

Relay 2 and 5 kw, (110 or 120 volt) 1/4 silver contacts ...... 7.50

Relay West, Elec. low voltage, 1 upper and 3 lower platinum point screws, 3 contact arms ..................................... 5.00

Extra platinum contact screws or arms .................. 15.00

Amplifier, W.R. Radiophone, L.W. 926 .............................. 22.50

Heterodyne, Signal Corps, type B.C. 101, 1000 to 3000 meters with detector .......................................................... 15.00

Receiver, Type 122, 175-175 meters, especially recommended for "standing" for coastal Broadcast stations as required by Dept. of Commerce .......................... 50.00

Air compressors, kellogg, Model T, 11/2 cu. ft. per min. weight 6 lbs., 600 R.P.M, 125-lb. Requires 1/4 b.p. .... 3.00

Motor generator, R & M, 110 D.C.-15 b.p., 2 kw., 30 volt ............................ 125.00

MANHATTAN ELECTRIC BARGAIN HOUSE
DEPT. Q, 105 FULTON ST., NEW YORK

while BRS250 reported the same station with extreme fading! On February 9th G5WK heard only W2IN and ZS4M whereas BRS250 heard six W stations and ZS4M. These incidents are mentioned to show that accurate and complete reports on signals are necessary. Locations separated by only a short distance may alter reception remarkably. It seems from perusal of reports that barometric conditions enter into the scheme of things on 28 mc. Therefore it would not be amiss to keep close tabs on barometric pressure and general atmospheric conditions.

NKF is logged in England on both 28 and 32.8 mc. G5YK reports the signals from this station r10 on the latter frequency. In general there appears to be a great deal of interest in the British Isles on 28 mc.

From an early report in the T & R Bulletin we are reprinting the W and VE stations that were worked or heard (during the tests) in the British Isles and Europe. (Stars denote number of extra times reported.)

W1BUD, W1ZL***, W1CWM**, W1CPB
W2IN*********, W2AQB*********,
W3NM***, W2BGM*********,
W2AQN**
W2FF, W3CKL, W3AQI**
W1AKT*
W6BAX*
W8DJV*********, W8APD*, W8ADM*********,
W8SS***, W8APB*
W9EXW*********, W9ZBG, W9DGK, W9EQV,
W9BYG**, W9AZZ*********,
W9EF**********
W9BBA***************

Atlantic Division Convention
Erie, Pa., June 27-28

FELLOWS, here's what the Erie Amateur Radio Club is planning for you during the two day convention to be held at Erie, Pa., June 27th and 28th. The convention proper will be held in the Hotel Lawrence with many side lines to attend. Speakers you read about and wished that you could bear will talk on subjects close to the hearts of the amateurs; moving pictures, illustrations, demonstrations and visitations will be the order of the day. On Friday, the 27th June, the gang will have the privilege of visiting Presque Isle State Park (this park is not a shill grabber) where there will be swimming in Lake Erie, boating, sports, walks, talks and a fish luncheon. The Radio Inspector will be present to give license examinations. A.R.R.L. Headquarters are sending F. E. Handy, the Communications Manager and A. L. Buddlong, Assistant Secretary (the same Bud of PRR fame).

The best of it all fellows is the price — only $4.00 for the two days, but if you send in your reservation by June 17th, the price will be $3.50.

Send in your reservation to Raymond Wagner, Secretary Erie Amateur Radio Club, 707 East Fifth Street, Erie, Pa.
### Bargains

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammeter, Weston No. 267, Double reading 0-4-50 Volts each</td>
<td>$6.50</td>
</tr>
<tr>
<td>Generator, airplane, Signal corps, with shaft, can be used as motor, 12 volt 7.5 amp, 5000 R.P.M.</td>
<td>$15.00</td>
</tr>
<tr>
<td>Generators, 12 volt 60 amp, has automatic controls</td>
<td>$15.00</td>
</tr>
<tr>
<td>West. Elec. Dynamotor, C.W. 927, two D.C. 33/50 volt dynamotors in noiseless hangar. Used in parallel gives 220 volts, 300 amp., 1000 foot miles, 700 volt supply, suitable for transmitters and receivers. New low price.</td>
<td>$20.00</td>
</tr>
<tr>
<td>West. Elec. switchboard control panel for above dynamotors, includes all parts for complete induction system, etc.</td>
<td>$8.00</td>
</tr>
<tr>
<td>Ammeter, Weston No. 425 thompson-couple 0-2 amp. used on large bakelite base with D.P. 6 volt voltage switch.</td>
<td>$7.50</td>
</tr>
<tr>
<td>Ammeter, Weston No. 267, 0-75 volts, each</td>
<td>$6.50</td>
</tr>
<tr>
<td>Voltmeters, Westinghouse, 0-150, surface mount, b. com.</td>
<td>$10.00</td>
</tr>
<tr>
<td>Milliammeters, Westinghouse, type, C.A. 0-500, zero adjustment, flush mounting.</td>
<td>$5.00</td>
</tr>
<tr>
<td>Voltmeters, Weston, type, C.A. 0-25, zero adjustment, flush mounting.</td>
<td>$10.00</td>
</tr>
<tr>
<td>Motor generator, Crocker Wheeler or Holtzer Cabot, 110 D.C. 100 A.C., 500 watt, 500 cycle. Ball bearing.</td>
<td>$7.50</td>
</tr>
<tr>
<td>Complete line 500 cycle motor generators from 3 to 5 K.W. Brand new.</td>
<td>$50.00</td>
</tr>
<tr>
<td>Transformers, General Electric, 125 to 2500, with center tap, 60 cycle, 200 volt.</td>
<td>$7.50</td>
</tr>
<tr>
<td>Transformers, Simon, 220 to 11,500 closed core, 3/4 K.W., 500 cycle, &quot;piano&quot; secondary.</td>
<td>$5.00</td>
</tr>
<tr>
<td>Transformer, Ameron, oil immersed, 1 K.W., 500 cycle, 220/8000 volt.</td>
<td>$10.00</td>
</tr>
<tr>
<td>Condenser, Dubilier, mica, volts 40,000, capacity 0.0012.</td>
<td>$1.00</td>
</tr>
<tr>
<td>Condenser, Dubilier, mica, volts 12,000, capacity 0.004.</td>
<td>$1.00</td>
</tr>
<tr>
<td>Condenser, Western Electric, 104F same as C.W. 304F, 1 mfd. 1000 volt A.C.</td>
<td>$30.00</td>
</tr>
<tr>
<td>Condenser, Western Electric, 21 A.A., 0.08 mfd.</td>
<td>$30.00</td>
</tr>
<tr>
<td>Condenser, Wheeler Cabot, 2200 ohms, D.C. slightly used.</td>
<td>$5.00</td>
</tr>
<tr>
<td>Headphone, Army, with strap, 120 ohm.</td>
<td>$1.50</td>
</tr>
<tr>
<td>Headphone, Radio School, leather headband, 75 ohm.</td>
<td>$1.50</td>
</tr>
<tr>
<td>Headphones, Western Electric- No. 194W same as C.W. 834, 2200 ohms.</td>
<td>$2.50</td>
</tr>
<tr>
<td>Electraphone Transmitter unit, J26W.</td>
<td>$10.00</td>
</tr>
<tr>
<td>Headphone, Army, with strap, 120 ohm.</td>
<td>$1.50</td>
</tr>
<tr>
<td>Headphone, Radio School, leather headband, 75 ohm.</td>
<td>$1.50</td>
</tr>
<tr>
<td>Buzzers, Western Electric, Extra quality, high frequency.</td>
<td>$1.50</td>
</tr>
<tr>
<td>Receivers, Western Electric, type 1200, 1000-10,000,000 meters.</td>
<td>$50.00</td>
</tr>
<tr>
<td>Receivers, S.E. 153 and L.P. 500.</td>
<td>$100.00</td>
</tr>
</tbody>
</table>

**Army and Navy Radio Surplus**

**BARGAINS**

**Largest Radio and Electric Supply House in U.S., specializing on Army and Navy Surplus.**

**Write us your specific requirements.**

**Shipments quick.**

**Personal checks, C.O.D. and government orders accepted.**

**We believe that those who serve their country deserve the best.**

**We are your source for quality radio and electrical equipment.**

**Get your quality equipment at our reduced prices.**

**Our services are limited to those who qualify.**

**We offer a wide range of products to meet your needs.**

**Call us today for your free catalog.**

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

**Manhattan Electric Bargain House, Dept. Q, 105-7 Fulton St., New York City**
Spongex-rubber kneeling pads (price twenty-five cents in the so-called five-and-ten store) make good shock absorbers for transmitters and receivers. The traffic hound who copies on a "mill" can also use one to advantage to reduce local QRM — W5AZV.

An opening winding in an audio transformer can often be repaired by applying a fairly high voltage across its terminals momentarily. W5AZV suggests using about 500 volts, either a.c. or d.c., and the open circuit will usually be repaired in less than five seconds. The voltage must be high enough to jump the gap in the winding, and the resulting arc welds the ends together.

Strays

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 first quarter of 1930 is published for the information of the membership.

R. B. WARNER, Secretary.

STATEMENT OF REVENUE AND EXPENSES FOR THE THREE MONTHS ENDED MARCH 31, 1930

REVENUE

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertising sales, QST</td>
<td>$18,084.85</td>
</tr>
<tr>
<td>Newdealer sales</td>
<td>11,037.84</td>
</tr>
<tr>
<td>Advertising sales, Handbook</td>
<td>1,765.00</td>
</tr>
<tr>
<td>Handbook sales</td>
<td>7,374.79</td>
</tr>
<tr>
<td>Membership dues</td>
<td>12,319.40</td>
</tr>
<tr>
<td>Miscellaneous receipts</td>
<td>1,013.60</td>
</tr>
<tr>
<td>Emblems</td>
<td>173.50</td>
</tr>
<tr>
<td>Interest earned</td>
<td>233.95</td>
</tr>
<tr>
<td>Cash discounts earned</td>
<td>280.57</td>
</tr>
<tr>
<td>Total</td>
<td>$52,063.59</td>
</tr>
</tbody>
</table>

Deduct:

- Returns and allowances: $3,270.38
  - Less portion charged to reserve for newdealer returns: 127.36

Cash discount on sales: 326.25
Exchange and collection charges: 31.35

Net revenue: $48,532.97

EXPENSES

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication expenses, QST</td>
<td>$12,939.32</td>
</tr>
<tr>
<td>Publication expenses, Handbook</td>
<td>4,385.63</td>
</tr>
<tr>
<td>Beginners' Booklet expenses</td>
<td>1,084.85</td>
</tr>
<tr>
<td>Salaries</td>
<td>15,328.01</td>
</tr>
<tr>
<td>Forwarding expenses</td>
<td>982.36</td>
</tr>
<tr>
<td>Telephone, telegraph and postage</td>
<td>1,388.63</td>
</tr>
<tr>
<td>Office supplies and general expenses</td>
<td>750.69</td>
</tr>
<tr>
<td>Rent, light and heat</td>
<td>960.13</td>
</tr>
<tr>
<td>Traveling expenses</td>
<td>876.09</td>
</tr>
<tr>
<td>Depreciation of furniture and equipment</td>
<td>404.18</td>
</tr>
<tr>
<td>Communications Department expenses</td>
<td>60.57</td>
</tr>
<tr>
<td>Headquarters Station expenses</td>
<td>122.98</td>
</tr>
<tr>
<td>Bad debts written off</td>
<td>37.22</td>
</tr>
<tr>
<td>Total expenses</td>
<td>$42,160.26</td>
</tr>
</tbody>
</table>

Net gain from operations: $6,372.71

Build Your Own Multi-Range Volt-ammeter

The Super Akra-Ohm wire-wound Resistors and Shunts afford an inexpensive way to build an accurate Multi-Range Volt-ammeter as shown in the above diagram. They are carefully designed to insure an accuracy of 1 per cent and a constant permanency of calibration. Their use is highly recommended for Laboratory Standards, High Voltage Transformers, Telephone Equipment, and Television Amplifiers, Grid and Plate Resistors, etc.

Sponge-rubber kneeling pads (price twenty-five cents in the so-called five-and-ten store) make good shock absorbers for transmitters and receivers. The traffic hound who copies on a "mill" can also use one to advantage to reduce local QRM — W5AZV.
The Allen-Bradley plant, private substation and electric furnace building face upon four streets, assuring daylight in all departments.

There's a Big Plant and 25 Years of Resistor Experience
back of the huge production and uniform quality of Bradleyunits

When radio was popularized, a few years ago, the Allen-Bradley organization had already achieved distinction as producers of electric controlling apparatus and resistors. To meet the demand, at that time, for a reliable filament rheostat, millions of Bradleystats were sold to radio manufacturers and amateur set builders.

Today, Allen-Bradley Fixed Resistors—Bradleyunits—are used by the world's largest set builders.

Floor after floor of automatic machinery and precision testing equipment, under the supervision of skilled engineers, produce Bradleyunits in stupendous volume. Such facilities are your best insurance of a continuous supply of reliable resistors to meet your specifications.

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

Allen-Bradley Resistors
Produced by the makers of Allen-Bradley Control Apparatus
Your A.R.R.L. EMBLEM

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, \( \frac{1}{2} \)" high, supplied in lapel button or pin-back style. The personal emblem has come to be known as the sign of a good amateur. It identifies you — in the radio store, at the radio club, on the street, traveling — you can spot an amateur by it. Wear your emblem, OM, and take your proper place in the radio fraternity. Either style emblem, $1.00, postpaid.

THE AUTOMOBILE EMBLEM. 5 x 2\( \frac{1}{2} \)"; heavily enameled in yellow and black on sheet metal, holes top and bottom, 50c each, postpaid.

THE EMBLEM CUT. A mounted printing electrotype, the same size as the personal emblem, for use by Members on amateur printed matter, letterheads, cards, etc. $1.00 each, postpaid.

THE "JUMBO" EMBLEM. How about the shack wall or that 100-foot tower? Think of the attention this big yellow-and-black enamel metal emblem will get! 19 x \( 8\frac{1}{4} \)"; same style as Automobile Emblem. $1.25 each, postpaid.

The American Radio Relay League
Hartford, Conn.

I.A.R.U. News

(Continued from page 84)

We regret that we have been unable to secure any picture suitable for reproduction in the department this month. Several have come in, but they all possess some inherent defect which makes it impossible to use them here. So many good and interesting photos are too dark, or too small, or are not of the glossy type, and as a result cannot be used.

We solicit pictures of all sorts; stations, operators, officials of I.A.R.U. sections; anything and everything of general interest to the readers of this department. If they are suitable they are almost certain to be used.

BELGIUM SECTION

By Mr. Paul de Neek, President of the Roseau Belge

On the two active bands, the DX conditions were much better this month and good records were made.

On the 14-me. band in the beginning of February the best hours for DX were certainly from 0700 to 0830 G.M.T. and from 1400 to 1700 G.M.T. Midday work gave good results with Australia, India, New Zealand, and some U. S. districts.

The following contacts were made: ON4BC worked ZL and W stations in the early morning. In order to have good juice when he got up to punch the key, he made a very pleasant use of his alarm clock! A few hours before time came to get out of bed, a special contact would switch on a relay and put his batteries on charge. HII ON4FP continues his good DX work with VU and ZL stations, being received R8 by Z55S. ON4HA worked W, FR, and CT2. ON4UX is received R4 by VK5HG.

On inside aerials, the following contacts were made: ON4WC worked ZL and W stations in the early morning. In order to have good juice when he got up to punch the key, he made a very pleasant use of his alarm clock! A few hours before time came to get out of bed, a special contact would switch on a relay and put his batteries on charge. HII ON4FP continues his good DX work with VU and ZL stations, being received R8 by Z55S. ON4HA worked W, FR, and CT2. ON4UX is received R4 by VK5HG.

ON on phone ON4KIR is R8 at 11SS at Napoli, Italy. ON4HI had his good modulation received R7 in the Balerais Island (Atlantic). ON4GK had his phone received in OH, HB, P, SP, and Sicily (Italy.) ON4HY worked the North African coast on phone, being received R9. He uses an m.o.p.a. of 60 watts, a Zep aerial, and a modulation system known as the "Beauvais." ON4FT would be very glad to sked with all hams for working from his auxiliary sailing yacht "Tenacity," which will be on with the call letters XON4FT, during the beginning of next June. Every QSO will be acknowledged with a good photo of the ship. Wave: 14,000-ke. band (upper part), d.c. note, m.o.p.a. set. ON4JJ worked his DX phone tests on 14,000 ke. working Brazil, India, and Australia, being received on the loudspeaker on several occasions. On code he worked
Leeds Listening MONITOR

For checking your note, its stability and whether D.C. or not. THE ONLY SURE CHECK. Gives you an accurate idea as to what your signal sounds like to the other fellow. The Leeds Monitor is enclosed in an aluminum shield, 3" x 6" x 12" overall. Completely shielded, with batteries self-contained. Supplied with A & B. Batteries, but without 11 V.

Special 190 tube .................................. $15.00

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

Size of tubing

<table>
<thead>
<tr>
<th>Inside Dia.</th>
<th>3/16&quot;</th>
<th>1/4&quot;</th>
<th>5/32&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 1/8&quot;</td>
<td>0c</td>
<td>10c</td>
<td>15c</td>
</tr>
<tr>
<td>2 3/8&quot;</td>
<td>0c</td>
<td>10c</td>
<td>15c</td>
</tr>
<tr>
<td>3 1/8&quot;</td>
<td>10c</td>
<td>12c</td>
<td>15c</td>
</tr>
</tbody>
</table>

Prices per turn

Thordarson B-Eliminator Transformer .......... $1.65
Thordarson 150 watt Transformer ............. $3.95
Leeds 50 watt socket specially priced. See previous issue of QST for details.

Leeds Microphone STANDS

Beautiful copper oxidized finish. Very sturdy construction. Artistically designed, effective appearance.

Desk Type. Price .......... $4.75
Floor Type. Price ......... $9.75
Adjustable to 7 feet

NEON GLOW LAMPS

Super Sensitive. For wave meter and other uses; candelabra base. 1½ watt, ¾ inch diameter. ½ inch long over all. Special ................................ $1.75
Porcelain base socket for above .................................. 10c

Aluminum shield cans and panels of every description to order.

Leeds Filament TRANSFORMERS

All primary windings for 115 volts, 50-60 cycles. Extra heavy construction, will stand considerable overload. Heavy end casings.

Type - L.F. 30 — Secondary 7½ volts centre tapped; capacity 80 watts.

L.F. 80 — secondary 12 volts, centre tapped; capacity 80 watts. Price ...................... $5.50
L.F. 175 — secondary 12 volts, centre tapped; capacity 175 watts. Price ................. $9.75
L.F. 25 — secondary 2½ volts, capacity 10 amperes. Price ............... $7.80

Leeds 50 watt socket specially priced. See previous issue of QST for details.

Leeds 90 watt socket specially priced. See previous issue of QST for details.

Leeds 150 watt socket specially priced. See previous issue of QST for details.

DUBILIER HIGH VOLTAGE FILTER CONDENSER

4 MFD. D.C. Working Voltage 600 V

These Filter Condensers are designed for use in filter circuits in Transmitters, and all high Voltage Socket power devices and Power Packs.

TYPE PL 571
List Price $7.45

SPECIAL $2.25

THORDARSON DOUBLE FILTER CHOKES

CONTAINS TWO 10 HENRY 250 MILL CHOKES

Heavy duty, rugged double Filter Reactor for Filter Circuits in Transmitters, Power Amplifiers, "B" Eliminators and various other purposes. Each Choke has a 2000 Volt Insulation and the D.C. resistance of each Choke is 108.5 ohms. When connected in series this Filter Reactor has a capacity of 30 henries in 250 millis. When connected in parallel 18 henries with 500 millis carrying capacity.

MODEL T-2488
List Price $19.50

SPECIAL $6.25

LEEDS RADIO LABORATORIES

Precision Custom Built Short Wave Receivers and Transmitters

This department under the supervision of the Short Wave Specialist Jerome Gross. We design, construct and advise on any material for the "Ham" Broadcasting station or laboratory. Write Jerry Gross for advice on any of your problems.

PLEASE PRINT YOUR NAME AND ADDRESS PLAINLY TO AVOID DELAY

WRITE FOR SPECIAL PRICE LIST

MAIL ORDERS FILLED SAME DAY

10% Cash Must Accompany All C.0.D. Orders

Say You Saw It in QST — It Identifies You and Helps QST
Two New Contacts for You

Our Catalog brings simplified Resistance Computing Tables. Write us for it and ask too for a description of the New HH Contact.

Our Cata/lug brings simplified Resistance Computing Tables. Write us for it and ask too for a description of the New HH Contact.

RESISTORS

Hardwick, Hindle, Inc.
218 Emmet St. Newark, N. J.

HAMS! WE PAY THE POSTAGE

218 Chestnut St. Harrisburg, Pa.

COMPLETE STOCK OF HAM SUPPLIES

Lowest Prices — Write for Literature


HILET

Announces new line of adjustable gap Glimar Choke Coils with the same dollar value that made our transformers popular throughout the world.

22 BY $12.00, 504, 160 MA, 22 lb.
$12.00, 304-320 MA, 23 lb.
$14.00, 34-400 MA, 23 lb.
$16.00, 500 MA.

Transformers — 500 watt, 1900-15000 each side.
$15.00, 250 watt, 75-750-1000 each side.
$10.50, 150 watt 325-375 each side.
$9.00, Filament any voltage, tapped reactivity $6.50. Specials to order. Prices are mounted with leads. For De line model with fuse and terminals add $1.50.

Name Plates for transmitters, panels engraved to order, $2.00. Heats, 75c. Write for specifications.

One Day delivery

HILET ENGINEERING CO., Orange, N. J.

the habitual DX, and made his first contact with Japan.

Up to now the following records are listed at the R.B.:

ON4FT, WAC — 73 countries worked.
ON4RO and ON4UU, WAC — 70 countries worked.
ON4FP and ON4RS, WAC — 68 countries worked.
ON4ZZ, WAC — 63 countries worked.
ON4HP and ON4JJ, WAC — 51 countries worked.

Last Sunday, March 9th, the hams of the Re­seau Belge met in a splendid ham fest, beginning in the morning by a visit to the laboratories of the control Center of the Union Internationale de Radiophone, conducted by Mr. Braillard, the world known radiotrician, President of the Union. Mr. Braillard presided over our lunch and our general annual meeting of the afternoon. The evening before, Mr. Braillard gave us a very interesting and vivid lecture on the actual technic of short wave radiophone stations. We had the very great honor and pleasure of enlisting Mr. Robert Goldschmidt, the radio pioneer, and Mr. Braillard as members of honor of our society. At the end of our banquet, a big cake of almonds and honey representing a super-bet with loop aerial and controls, was presented Mr. Braillard as acknowledgment of his good work in ruling the congested European ether in the matter of broadcasting and introducing the splendid stability which is now the principal quality of our broadcasting stations.

Please, my foreign friends, do not forget to enlist yourselves for our July next big International Amateur Congress in Antwerp, Liège, and Brussels. Don’t miss this good opportunity to visit your Belgian radio friends.

BRITISH SECTION

By J. Claricoats, G6CL, Hon. Sec. R.S.G.B. & B.E.R.U.

The chief matter of interest to record during March is the successful manner in which the 28-mc. band was used. On behalf of the council of the R.S.G.B. I wish to thank very cordially all those overseas amateurs who assisted our Contact Bureau stations in their efforts to probe the mysteries surrounding the semi-ultra high frequencies.

The premier 28-mc. contact with Rhodesia (BC2BH) was made by G6CLl on March 2nd; this station was also heard in Brazil on the same day. Many successful QSO’s were made with SUsRs but except for March 9th North American’s were badly received.

The Powditch Trophies will be presented to the winners of these tests at the next R.S.G.B. Convention.

On 7 and 14 mc. there was no outstanding work accomplished.

The W.B.E. certificate is now being issued and has been awarded to many British & Colonial
Easy to Get into this BIG Money Making Work

Good Jobs Right at Your Finger Tips
WHEN YOU ARE R.T.I. TRAINED IN RADIO-TELEVISION-TALKING PICTURES

Big Pay Jobs! Spare Time Prosper! A Fine Business of Your Own! They're all open to you and other live wire men who answer the call of Radio. The fastest growing industry in the world needs more trained men. And now come Television-Talking Movies—the magic sisters of Radio. Will you answer this call? Will you get ready for a big pay job? Now and step into a Bigger One later on? You can do it EASILY now.

R. T. I. Home Training Puts You in This Big Money Field

Radio alone, pays over 200 Million Dollars a year in wages in Broadcasting, Manufacturing, Sales, Service, Commercial Stations and on Board the big sea going ships and many more men are needed. Television and Talking Movies open up other vast fields of money-making opportunities for ambitious men.

Get into this great business that is live, new and up-to-date, where trained service men easily earn $40 to $50 per week, and trained men with experience can make $75 a week, and up.

Easy To Learn At Home—In Spare Time

Learning Radio the R.T.I. way with F. H. Schell, the “Ace of Radio” behind you is EASY, INTERESTING, really Fun. Only a few spare hours are needed and lack of education or experience won't bother you a bit. We furnish all necessary teaching and working apparatus and start you off on practical work you’ll enjoy—show you how to do the jobs that pay real money and which are going begging now for want of competent men to fill them.

R.T.I. TRAINS YOU AT HOME FOR A GOOD JOB OR A PROFITABLE PART TIME OR FULL TIME BUSINESS OF YOUR OWN

Investigate—Send For R.T.I. Book Now

Don’t waste a minute. Find out what the great Radio industry, which has grown faster than the Automobile and Motion Picture business, has to offer you. Find out what you can do with Radio-Television-Talking Pictures—will give it to you, because it’s easy, practical, and in a few short months you can be all through—ready to step into a good paying job or start a business of your own. A Big Job—Big Money—A Big Future. There is no other business in the world like it.

Amazingly Quick Results

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amateurs who have worked some part of the British Empire in each Continent. (Note North and South America count as one continent.)

Arrangements are being made to interest the Boy Scouts of the world in amateur radio; a scheme has been prepared whereby our members form pivotal stations for training purposes. Any suggestions from overseas will be appreciated.

The B.E.R.U., continues to extend and if present plans mature an All Red Empire Route will shortly be in operation for the passage of experimental messages, and we dare to hope later, the passage of loyal greetings to our Patron — H.R.H. The Prince of Wales.

To the many overseas amateurs who read these notes we would emphasize that we are at all times pleased to receive applications for membership into R.S.G.B. or B.E.R.U. and we shall be glad to forward to all such interested persons a copy of our monthly bulletin. Our address is 53 Victoria Street, London, S.W.1.

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GERMAN NOTES

By Dr. Curt Lamm, D4AFA.

It is with the greatest pleasure that we are able to report that amateurs in Austria are to get their licenses without further delay. Up to now, the following are officially licensed: U01UJZ, U01TN, U01NF, U01JN, U06GR. Some more are to follow shortly. On this occasion, the territory of Austria has been divided into different districts, which will be numbered subsequently. A detailed report on this will follow in our next report.

D4UAH, Victor Gramiah of Munich, has succeeded in establishing contact with W2BG on 28 mc. QRK mutually varied from R1-R7. D4UAH was using 15 watts.

During the last period covered by this report, conditions on 14 mc. seemed very favorable. Many of the D’s hooked up during evening hours with our fellow amateurs in the United States, amongst them D4CC, D4XN, D4ADE. In daylight good conditions for VK and ZL traffic were observed, and D4XN established many QSO’s with that part of the globe.

On 20 mc. conditions were fair in early February. D4EZ of Stasken near Berlin reports much DX, and D4GJ of Beuthen got in touch with SU8WY on 1.5 watts. QRK R5.

A few OM’s were busy on 3.5 mc., among them D4KZA of Berlin, D4ADV of Breslau and HB9MQ in Northern Switzerland. We hope that some more stations will QSY to 3.5 mc. in order to reduce QRM on 7 mc.

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DUTCH NOTES

By H. Pomes, Assistant Traffic Manager, N.V.I.R.

On the 3500-kc. band European communication increases and many hams seem to find out all over again that this narrow channel can be used
SAMSON POWER BLOCKS
No. 713

DELIVERS 180 VOLS D. C. CURRENT AT 120 MILLS

In addition supplies Filament Current for UX-280 and two UX 171 A Tubes. Also contains two chokes. All being necessary to build up a power pack is Filter Condensers and Resistors.

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This Thordarson Power Transformer delivers A, B and C current to two UX-250 or 210 Power tubes and ‘A’ current to a Receiver.

Delivers full wave rectification using two UX-281 Rectifying tubes. Has two 7 1/2 Volt Center-Tapped Filament Windings for the two UX-250 or 281 Power tubes and also two 7 1/2 Center-Tapped Filament Windings for two UX-281 Rectifying tubes.

The A. C. Voltage Plate Winding is 1200 Volts Center-Tapped at approximately 150 Milliampere.

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This Thordarson Power Transformer delivers A, B and C current to one UX-250 or 281 Power tube and ‘A’ current to a Receiver.

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The A. C. Voltage Plate Winding is 1125 Volt Center-Tapped at approximately 150 Milliampere.

SPECIAL: $4.50

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FILTER CHOKE S, 30 Henries—110 Mills, D. C. resistance 400 Ohms, mfd. by Chicago Transformer Corporation . . Special $2.25

250 Watts

275 Watts
for both 'phone and code work with low power at relative big distances.

On 7000 kc, good continental communication was possible during daylight, but with many 'phone stations it is the old story. After sunset only a few stations may be heard and no good QSO’s were made. Only on March 7, 8, 9, 10, were fine DX stations heard, and these were in many cases worked.

The 14,000-kc, band offered many occasions for working all continents, especially on the dates mentioned above; on other days no stations could be logged after sunset. Usually VK and ZL may be heard early in the morning; after 1400 G.C.T. many stations in Asia were worked; from 1700 to 1900 G.C.T. South African stations come in FB. Then, under favorable conditions, American stations are very loud till midnight. We can state with great certainty that a western wind and higher temperature bring in more stations during the night than an eastern wind together with a lower temperature.

PA0DW still belongs to our star stations and worked all continents several times.

From the 28,000-kc. band we can only report that a few American stations were logged during the tests organized by the R.S.G.B.

Our annual meeting was held on March 16th in Utrecht. A new committee was elected. Our new President is Mr. J. Corver, one of the outstanding figures in Dutch amateur radio. Further, a beginning was made with cooperation between the N.V.W.R., the oldest radio society in our country, and the N.V.L.R., the Dutch I.A.R.U. Section. When a final solution of this problem shall have been effected, we shall announce it in these notes.

Of course, the day was ended in a real hamfest; the greater part of the Dutch hams had dinner together, and proved that Old Father Ham Spirit has many children among them!

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**Norwegian Section**

*By G. H. Petersen, LA1D*

During March most Norwegian hams have been active with European contacts, and generally report fair conditions. There seems to be a tendency to make medium-distance rag-chewing contacts on very low power in preference to DX-hunting. LA1G reports, however, ZL and VK fine 0700-0830 G.C.T., and W, ZS, ZT, 1700-2000 and has done a lot of work on 14 mc.

LA2K is using a portable 3-watt transmitter on week end trips signing XLZ2K, and would welcome reports.

LA1J, our most active Bergen station, working on 14 mc, is mighty proud of having QSO’ed the fair and famous SP3YL, having even been promised her photo! He reports very variable conditions.

At headquarters we are preparing for the general meeting which is to be held in Oslo early in August. We expect a good representation of active Norwegian hams, and any foreign OM who may
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PORTUGAL
We are very glad to learn from Eugenio de Avillez, CTlBE, that the Rede dos Emissores Portuguesas has been recognized by the Portuguese government as representing the amateurs of Portugal, and has received an invitation to nominate one of its members for membership in the council of T.S.F. It will be recalled that this active amateur organization is to be voted upon in the June Calendar of the I.A.R.U. for affiliation with the Union.

It is gratifying to note this triumph, and we extend our congratulations and best wishes for the future.

The WAC list is being held over until next month.

Getting that D.C. Plate Supply
(Continued from page 16)

Rectifiers, Hot-Cathode Mercury-Vapor
Electrolytic Condensers and a High Voltage Rectifier, page 31, March '30.
A New Type of Rectifier Tube for Amateur Use, page 21, February '29.

Rectifiers, Mercury-Arc
Three Phase High-Voltage Rectifier, page 37, February '30.
Mercury Arc Rectifiers, page 8, August '26.
Mercury Arc Rectifiers, page 21, January '25.

Filters
ABC of Filter Design, page 34, April '30.
Electrolytic Condensers and a High-Voltage Rectifier, page 31, March '30.
Filter Circuits, page 43, August '28.
Picking the Right Filter Condenser, page 37, October '28.
*Final Capacity in Two-Section Filter, page 36, February '28.
*Middle Capacity in Two-Section Filter, page 27, May '28.
*The First Filter Condenser, page 33, September '27.
Electrolytic Filter Condenser, page 55, April '27.
Ford Coil Filter, page 67, April '27.
Rectifiers and Filters, page 29, February '25.
Smoothing Circuits for Half-Wave Rectification, page 33, August '25.
D.C. Filters, page 52, September '25.
Filters and the Motor Generator, page 64, December '25.

Mercury Arc Rectifiers, page 21, January '25.
Radio Amateur's Handbook, Chapter VII.
You Don’t Need a Can Opener to Spread the Ham Bands on the “Bearcat”!

Throw away your jig-saw, your bolt-cutter and the little hatchet! Using the set as is, you can spread the crowded ham bands all over the dial by a twist of the wrist on the new S-M 737 Shortwave Bearcat.

Nothing up the “Bearcat’s” sleeve, either—it’s a little midget condenser, built right in, that does the job. And that isn’t all—there’s a built-in power supply, one-dial tuning, a real gang condenser and a screen-grid circuit with two s. g. tubes!

There is no longer any reason for not having a short-wave set comparable to a broadcast receiver.

Yet there’s nothing on the 737 just because it’s “pretty.” Perfect battleship shielding—that’s the starting point. Then there are two double-shielded tuned circuits, a regenerative non-radiating detector, and a powerful ‘45 second audio stage. Eight specially designed plug-in coils (included in list price) cover from 16.6 to 200 meters—all foreign and American short-wave broadcasting as well as the ham bands. Four extra coils ($5.50 list) cover the American broadcast band.

Treat yourself to the best—if there’s any chance of getting Prague, you’ll do it with a “Bearcat.”

And it isn’t expensive—complete with built-in power supply, wired, licensed, in cabinet as illustrated, the list price is only $139.60, subject to usual trade discount.

Which means 737’s are going to be as scarce as “Dodos” for a long time to come! Better get your order in to your jobber now.

A Real Auto Receiver!

The new S-M 770 “Playfellow” is an auto receiver that’s built not only to stand the gaff but to give real “console model” reception.

It’s small (12” long by 7½” high and 6½” deep), sensitive (5 microvolts per meter), screen-grid (three s. g. tubes including detector), and has a standard S-M 810 illuminated drum-dial—a pocket edition of the finest receiver, specially designed for its job.

There’s no cutting of cowl or instrument panel to install it. It is readily attached to the car bulkhead under the cowl to the right of the driver’s seat.

Only tests can prove an auto receiver—and the “Playfellow” has consistently brought in distant programs over test runs made on hundreds of miles of rough, back-country roads.

Priced complete, except for tubes and speakers, $79.50, List. Parts are standard. Priced at $61.40 List.

S-M 870 Automotive-Magnetic Speaker (9½” square and only 4½” deep) gives the maximum output of a 71A tube. List price, $15.00.

771 Auto Receiver accessories include all necessary installation equipment except tubes and batteries. List price, $16.50.
Advanced Transmitter Design

(Continued from page 28)

under the circuit conditions in this transmitter but no promise is offered that they might be satisfactory with tube capacities in shunt (in parallel-feed circuits).

Chokes are shown in the key leads as well as in the d.c. grid and plate-feed circuits. The leads to the key happened to be of the right length to pick up some r.f. in the electric field about the transmitter but the chokes knocked it out of the keying circuit very effectively. If there is no evidence of r.f. in the keying circuit, these chokes may be omitted. Incidentally, a frequency meter (tuned to the frequency of the transmitter) with a flashlight bulb as an indicator makes a handy gadget for hunting out r.f. in the various circuits where there isn't supposed to be any r.f. If the bulb glows when the coil is held near the suspected lead there is r.f. flowing in that circuit.

A condenser to minimize sparking at the key contacts is connected across the key-jack in the transmitter. It is an old Faraday UC-1015 with the three sections connected in parallel to give a capacity of .0012 µfd. A better arrangement would be one of the key-thump filters described in the Handbook: a 0.5-µfd condenser with a resistor of several hundred ohms in series, connected across the key, should be more effective. If bothersome key-clicks turn up, use your favorite thump eliminator — just as on any other transmitter.

All connections in r.f. circuits (indicated by the heavy lines in Fig. 4) are made with copper tubing excepting the stranded grid and plate leads from the Type '52 tubes. The copper tubing is ¼-inch in diameter except the ½-inch tubing connecting the grid coil to the grid tuning condenser. Other connections are made with No. 14 stranded with rubber insulation and No. 14 bare bus-wire. The filament- and plate-supply connections are made to binding posts on a terminal strip at the back. The open-circuit jack for connecting the key is also mounted on this terminal strip.

The tuning of the transmitter is exactly like that of any other tuned-grid tuned-plate outfit, and the same procedure should be followed. The best operating adjustment will be that at which the grid tuning condenser is set at a slightly higher capacity than the one which gives minimum plate current. The tuning of r.p.t. transmitters is exceptionally well analyzed in H. A. Robinson's article "Operating Characteristics of Vacuum Tube Oscillators," in November, 1929, QST. (Kilocycles to meters that half the gang didn't read the story because it looked "too technical" — and passed up an opportunity to find out just what makes a r.p.t. transmitter tick.)

As with any self-excited transmitter, the antenna-coupling circuit should be tuned to a frequency slightly lower than that of the transmitter, the antenna current being about 20% less than the maximum obtainable. The monitor should be used always as what George Grammer calls the "final authority," and the transmitter...
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The Bandbox Superhet
(Continued from page 20)
screw-driver from a piece of round fiber or wooden dowel (do not use metal) to fit the screw heads on the neutralizing condensers.

Place No. 3 coil in the detector and No. 2 oscillator coil in the oscillator. Turn on the set and adjust detector and oscillator tuning condensers for maximum volume, with the volume control turned up about half way. Now take the fiber screw driver and adjust all three neutralizing condensers to maximum volume. Be sure the c.w. switch is off while doing this. If you find that you can hear a broadcast station all over the oscillator dial, readjust the neutralizing condensers again after loosening them up about one full turn. When the i.f. stages are tuned to resonance, tune in some short wave broadcast station such as W2XE and make the final adjustment of r.f. tuning. Always remember that when you change the i.f. condensers you throw off the dial settings on the oscillator tuning condenser because you change the intermediate frequency.

There is not much more to say about this set. As to results, it will operate a loudspeaker on any short wave 'phone station being heard in this country and I am sure that anyone who builds this type of super will never be sorry for the time and money spent. I have been a radio amateur and set builder for 15 years and have used all kinds of sets but have never had one that would duplicate the performance of the Bandbox Superhet.

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 Angus Elected Central Division Director

IN a special election just held, the Central Division has chosen Mr. D. J. Angus, W9CYQ of Indianapolis, as its Director for the unexpired remainder of the term of the late Mr. Clyde E. Darr. The term ends January 1, 1931. Voting was as follows:

Angus, D. J. 876 votes
Prazak, R. T. 74
Sellers, R. C. 66
Spiller, A. G. 228
Stark, C. S. 119
Wise, Dallas 106

Mr. Angus’ amateur experience extends back some fifteen years, well before the war. He is our Section Communications Manager for Indiana, past President of the Indianapolis Engineers Club, a Lieutenant-Commander in the U. S. Naval Reserve, and a member of the A. I. E. E. A business man of mature years, he is treasurer and chief engineer of the Esterline-Angus Co., in which capacity he has done much traveling that has brought him in contact with amateurs and clubs around his division. The Central Division is to be congratulated upon its choice.

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1 in. square sections, requiring 4 to 4½ in. of your specified frequency, supplied promptly at the following prices:

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15 up-to-date set diagrams, 8½ x 11 leave perforated, $2.50.

Please include postage.

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W3CJ finds that his spare receiver coils are handy for shifting dead spots on his tuner. The coils are wound on tube bases, and an extra socket is connected in the antenna lead so that when a spare coil is plugged in, it acts as a loading coil, thus shifting the resonance point of the antenna.

W9CBK has a tuning condenser with plug-in rotor plates, while WSXG puts the stator plates on plugs. The only thing we lack is a coil with plug-in turns or a tube with a plug-in filament.

From the March issue of Factory and Industrial Management: “An editor must have his mail. So when ours failed to put in appearance the other morning, we were moved to find out why. We found out...”

Good will of this sort is worth having. Nearly every amateur can do something to help build it.

W1ALJ thinks he should be awarded some sort of medal. He didn’t drop a single nut or screw when building his new receiver!
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- Experiments on Ultra-High Frequencies
- S-W Stations of the World
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In short here’s the book that describes, illustrates and explains everything about S-W’s — that gives you the complete and latest data. And it’s yours WITHOUT COST!

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RADIO NEWS has practically twice as many readers as any other radio magazine. But there are still a few of you radio men who don’t realize what you are missing.

Do you know that, besides covering every other phase of Radio, RADIO NEWS publishes many exclusive S-W features every month. Every issue keeps you posted on the latest S-W receiving circuits, up-to-the-minute S-W Broadcast Call Lists, S-W Receiver and Transmitter Designs, News from the Amateurs, latest improvements in Portables, etc., etc. You absolutely need RADIO NEWS to keep abreast of all S-W developments.

Big Cash Saving — Gift FREE!

That’s why, although we will sell thousands of these SHORT WAVE MANUALS for a substantial price, for a limited time you may have a copy ENTIRELY FREE as an inducement to try RADIO NEWS.

To introduce RADIO NEWS to you, we will send you the next Eleven Big Numbers almost a full year subscription for only $2 — and will ship you the new 1930 SHORT WAVE MANUAL, postpaid, entirely FREE! You save 75c on the newsstand price of RADIO NEWS and get this invaluable S-W volume WITHOUT COST! Risk nothing. Mail coupon TODAY!

The NEW RADIO NEWS, Dept. 312, 381 Fourth Avenue, New York, N. Y.

Gentlemen: Send me, ENTIRELY FREE, postpaid, the new 1930 SHORT WAVE MANUAL, and enter my subscription for the next Eleven Big Issues of RADIO NEWS at only $2 which I enclose (regular newsstand price $2.75). I understand you will cheerfully refund me $2 and I may keep the S-W MANUAL if I am not more than satisfied.

Name ..................................................
Address ..........................................
City and State ..................................
Are you a Serviceman [ ] Engineer [ ] Dealer [ ] Experimenter [ ]

The Most Fascinating Radio Book of the Year!

FREE with the NEW RADIO NEWS

Say You Saw It in QST — It Identifies You and Helps QST
**You Can’t Duplicate Guesses**

The Audimeter

An audibility gauge for the amateur. Do you always give the same R5? What about on two audio tubes during a noisy spell? This little panel-mounting Audimeter gives the right reading and the same one on two A.F. as on one tube, during QRN and QRM, and will repeat itself. You can’t duplicate guesses. Irreproducible guesses if recently accurate reports are to be made. It not only cuts the guessing but it makes guesses absurd because the price is too low to justify anybody’s being satisfied with a guess. Calibrated with 5 arbitrary points and with the half-points marked. Has a handsome aluminum dial, in single-hole mount and a pointer-knob gives the indications. Serves also as volume control. Get the story — for the guesser is going out of date in amateur radio. Write today or order. Price $2.80 to the amateur.

The Hy-7


The Voltma

High-resistance (1000 ohms per volt) voltmeter and any milliammeter range you want combined. Low price. 1500v. and 500 ma. combination $9.75. Name combination and get quotation or write for information.

Jossell, Weston, Cardwell, Electroac, Sangesa, Tobe, Thordarson, Yostley, National, Frost, Point, Signal, Hommerland, Claremont, etc. at amateur prices. And we help — we answer questions.

**HATRY & YOUNG**

119 Ann St. Phone 5-2733

HARTFORD-CONNECTICUT-U.S.A.

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**Doings at Headquarters**

Some changes have been made in the personnel at headquarters since the last “Doings” were published. Included is the arrival of Mr. Clinton B. DeSoto, W9KL, from Middleton, Wisconsin, who has hooked up with us in the capacity of Assistant to the Secretary, which title Mr. A. L. Budlong relinquishes to become Assistant Secretary.

Mrs. Winston Abbott, née Dorothy Menk, none other than DEM of Communications Department fame, has a permanent schedule now. The wedding was held April 12th with FEH and EV among those present.

W1N8Z has changed location again. The station is located now in the State Armory at Hartford.

Nearly every member of the Hq. Staff dropped in at the New England Division Convention in late April at Worcester, Mass., at one time or another. The week before the convention Fred Schnell, former Traffic Manager, was the guest of K. B. Warner. “FS” had his golf outfit in tow, Nuff said!

D. H. Houghton, QST’s Circulation Manager, has left for a three weeks’ business tour of the east, and middle west, checking up on QST distribution. Ralph Beaudin is holding down the department in Dave’s absence.

F. E. Handy is attending the Midwest Division Convention.

How the mighty have fallen! We cannot keep the news any longer. James Joseph Lamb, Technical Editor of QST, was married on May 5th to Miss Josephine Gleason in Hartford. The couple left for the great open spaces following the wedding and Mr. Lamb is booked to turn up at the Midwest Division Convention.

Considerable interest is being shown at Hq. in the coming 28-mc. tests in June.

---

**Silent Keys**

It is with deep regret that we record the passing of these amateurs:

- Ernest R. Hood, Cambridge, Mass., W1AOW
- George G. Goode, Centerview, Mo., W9GBT
- Charles S. Taylor, Buffalo, N. Y., W8PJ
- Carl E. Trube, Youngers, N. Y., Ex-2BK
- LeRoy A. Dey, Osborne, Kan., W9CNT

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**Strays**

PAOOOOOOOOOF is reported in a recent list of cards heard. We’ll bet that station doesn’t sign very often! Or maybe the reporter’s typewriter stuttered.
The Jewell Pattern 68 Radio Frequency Ammeter, shown above, is the ideal instrument for measuring the radio frequency current in the tank circuit.

The latest Federal Radio Commission ruling specifies that amateur operators must use adequately filtered direct current power supply, or arrangements to produce equivalent effects. Furthermore, licensees must keep an accurate log of operations, noting time, station called, input power to last stage, and frequency. To meet these requirements of the Radio Commission, accurate and reliable instruments are essential to measure plate voltage and current, as well as filament voltage and the radio frequency current in the tank circuit.

Jewell Amateur Instruments in cases of molded bakelite are ideal for this service. Their accuracy and reliability, combined with rugged construction and a design that prevents their being affected by alternating current influences, have long made them leaders in this field.

The Jewell Amateur Department will gladly help you select instruments of the correct ranges. Just write in, giving complete data on your circuit.

The Pattern 78 A.C. Voltmeter is renowned for its ability to stand up under hard operating conditions, maintaining consistent accuracy. The movement of this instrument has given outstanding service on Jewell Radio Set Analyzers. This is the correct instrument to use for checking filament volts, and many operators find a Pattern 78 Ammeter indispensable for checking filament current.

Jewell Electrical Instrument Co.,
1643 C. Walnut Street, Chicago, Ill.
Please forward time computation chart and complete data on Jewell instruments for amateur operators.

Name: ........................................
Address: .....................................
Call Number: .................................
"ADEQUATELY FILTERED"*

Adequately Filtered

~ IS

FILTERED

* New and stricter amateur regulations specify an "adequately filtered.

For releases on this subject see the earliest days of experimenting.

Today, with an enlarged plant and new equipment, Tobe is prepared to

offer you the best condenser ever.

A New

Fused-Metallic

Individually bridge-calibrated.

Tungsten-nickel-chromium-coated.

Unchanging with age.

Resistance values engineered, not

screted.

Plate lawyer.

Fits standard mountings.

Heavy internal fused-metallic contact.

Recommended for Loftin-White direct-coupled

circuits.

For meter-multiplier work an exceptionally ac-
curate resistor, calibrated to within one half of

one percent will be furnished at three times the

regular list price.

Type Capacity Voltage Price

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* Made up on special order - two weeks delivery.

Every Transmitting Amateur Uses These Forms

MEMBER'S CORRESPONDENCE STATIONERY

One color (black) heading now being used at greatly reduced cost to members.

Write your radio letters on League stationery — it identifies you.

Lithographed on 8½ x 11 heavy bond paper.

100 sheets ......................... $1.00

250 sheets ......................... $1.00

500 sheets ......................... $1.75

Postage Included

Message Delivery Cards

Neatest, simplest way to deliver a message to a near-by town. On U. S. stamped postals 2c each. On plain cards (for Canada, etc.) 1c each, postpaid.

AMERICAN RADIO RELAY LEAGUE

1711 Park Street

Hartford, Conn., U. S. A.

Say You Saw It in QST — It Identifies You and Helps QST
Vitrohm Stabilizing Resistors

When the plate potential of radio transmitters is supplied by filtering rectified A. C. it is common practice to connect a stabilizing resistor across the output of the plate supply.

The advantages are:

1. Protects the filter condensers from high peak voltages, which lengthens their life.
2. Steadies the note.
3. Tends to eliminate chirps.
4. Discharges condensers when key is open.

Send for circular 507, describing Vitrohm Resistors for radio. It will be sent without charge upon request.

You will find in this circular Vitrohm Resistors to meet every radio requirement.

Output Voltage | Total Resistance | Vitrohm Resistors
--- | --- | ---
250 | 25,000 ohms | 1—Cat. 507-65
550 | 50,000 ohms | 1—Cat. 507-68
1000 | 50,000 ohms | 2—Cat. 507-65 in series
1500 | 60,000 ohms | 3—Cat. 507-5 in series
2000 | 80,000 ohms | 4—Cat. 507-5 in series

WARD LEONARD ELECTRIC CO.
Mount Vernon, New York

QST Oscillating Crystals

AMATEUR BANDS:

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

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

1715 to 2000 Kc band, ....... $15.00 (unmounted)
3000 to 4000 Kc band, ....... $20.00 (unmounted)
7000 to 13000 Kc band, ....... $40.00 (unmounted)

BROADCAST BAND:

Power crystals ground in the 550–1500 Kc band accurate to plus or minus 500 cycles of your specified frequency fully mounted for $55.00. In ordering please specify type tube, plate voltage and operating temperature. All crystals absolutely guaranteed regards to output and frequency and delivery can be made within two days after receipt of your order.

CONSTANT TEMPERATURE HEATER UNITS:

We can supply heater units guaranteed to keep the temperature of the crystals constant to better than a tenth of 1 degree centigrade for $190.00. Two matched crystals, ground to your assigned frequency in the 550–1500 Kc band with the heater unit complete $240.00. More detailed description of this unit sent upon request.

ATTENTION AIRCRAFT AND COMMERCIAL RADIO CORPORATIONS:

We invite your inquiries regards your crystal needs for Radio use. We will be glad to quote special prices for POWER crystals in quantity lots. We have been grinding power crystals for over seven years, being pioneers in this specialized field, we feel we can be of real service to you. We can grind power crystals to your specified frequency accurate to plus or minus 0.05%. All crystals guaranteed and prompt deliveries can be made. A trial will convince you.

SCIENTIFIC RADIO SERVICE

"THE CRYSTAL SPECIALISTS"

P. O. Box 86 Dept. P-12 Mount Rainier, Maryland

Say You Saw It in QST — It Identifies You and Helps QST
NEW GOVERNMENT REGULATIONS!

"Adequately filtered D.C. power supply or arrangements to produce equivalent effects must be used."

(Copied from Official Broadcast NR.138, April 4.)

One sure way to comply with these new regulations is to put an ESCO Motor-Generator behind your transmitter. They are not expensive and they give you "More Miles per watt."

Write for bulletin 237G, listing over 500 combinations. If you haven't already received your copy of Filter Facts write for it today — its yours for the asking.

Type MG200, 2 bearing motor-generator set

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

A Special Condenser, for Short-Waves Only

**Heavy plates rigidly mounted.** Logging stays constant.

**Constant Impedance Pigtail.**

Exceedingly compact; back of panel spare only 2" x 1 1/4" x 2".

Underside of Frame drilled and tapped for baseboard mounting.

THE NATIONAL SE 100 SHORT-WAVE CONDENSER

Furnished with or without National Velvet-Vernier Dial

Equip your Short-Wave receivers with this new condenser. Not a broadcast job, cut down, but specially made for the one special purpose of Short-Wave work. A fitting companion to the Premier Short-Wave Dial, the National Velvet-Vernier.

National Company Inc.
Engineers and Manufacturers
61 Sherman St., Malden, Mass.
GUARANTEED MERCHANDISE
AT SENSATIONAL PRICES
MONEY RETURNED IF NOT SATISFIED
PARACO FILTER CONDENSERS at 65% off list price. Brand new Transmitting Filter Condensers: 1000 Volt DC Working (Continues) 1 Mfd. $1.10, 2 Mfd. $2.10, 3 Mfd. $3.10, 4 Mfd. $4.10, 6 Mfd. $6.95, 10 Mfd. $11.65, 15 Mfd. $17.50, 20 Mfd. $24.50. Mfd. -- $4.85, 8 Mfd. -- $6.95, 2000 Volt DC Working: 1 Mfd. -- $3.80, 2 Mfd. -- $5.50. PARACO Mica plate and mica block condensers. 000, 001, or .0005 Mfd. 750 Volt DC Working. -- $1.00. 1500 Volt -- $2.35. Special 002 Mfd. 115 Volt. $1.85, 220 Volt. $2.75, 330 Volt. $3.50, 440 Volt. $4.50. Mica type. A quantity of these units may be series-parallel for any desired capacity and voltage. Special 002 Mfd., $2.50. Twenty for $10.00. U.S. Tool 11 plate SILF variable condensers. Easily cut down. Low-loss. -- $1.00. Two for $1.75.

PARACO POWER TRANSFORMERS. A neat job in a compound-dipped case. Fine for Transmitter, Amplifier, or Eliminator. Gives 750 volts and two 1½ volt center-tapped. 155 Watt. 2½ lb. -- $3.10. Two will give 750 volts and four 1½ volts. All center-tapped. SPECIAL. Two for $3.95. SPECIAL RCA POWER TRANSFORMER. Designed for use with UV-870 in primary to keep voltage steady (A resistor may be used in place of the tube.) Gives 7½, 7½, and 1100 Volts. All center-tapped. 175 Watts. 1 lb. Priced to sell fast. -- $5.95. Metal cased Filament Transformers. Well constructed. 75 Watts. 1½ and 2½ Volts -- $2.95. 7½ Volts -- $2.80. 7½ Center-tapped -- $3.75. 1½ CT and 1½ -- $2.25. 7½ CT and 1½ CT -- $4.75. 10 Volts -- $1.25. 10 CT -- $3.75. Power Pack transformers. 100 Watts. Gives 1½ and 2½ Volts and 5, 5, and 650 volts center-tapped -- $8.10. Unmounted 650 Volt, 50 watt Filament Transformers, properly rewound for any filament voltage -- $1.40. Two for $2.60. RCA Audio transformers -- $1.35. Output transformers -- $1.45. Guaranteed. 110 Day. Home owners, 90-Day Replacement. A Guarantee that really means something. UX-210 -- $1.95. UX-281 -- $2.95. UX-282 -- $3.75. UX-283 -- $4.75. Good price. (Remember before shipping, no free replacement.) UX-210 -- $2.10. UX-281 -- $2.50. Other types in list.


HAM-ADS
(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their pursuit of the art.
(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters be used which would tend to make one advertisement stand out from the others. (3) The Ham-Ad rate is 15c per word, except as noted in paragraphs (4) to (8) below.
(4) Remittance in full must accompany copy. No cash or contract discount or agency commission will be allowed.
(5) Closing date for Ham-Ads is the 25th of the second month preceding publication date.
(6) A special rate of 10c per word will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of bona fide surplus equipment owned, used and sold by an individual or apparatus offered for exchange or advertising inquiring for special equipment, by a member of the American Radio Relay League takes the 10c rate. An attempt to deal in apparatus in quantity for profit, even if by an individual, is non-commercial and takes the 15c rate. Provisions of paragraphs (1), (2), (4) and (5) apply to all advertising in this column comprising of which rate may apply.

PLATE power for your set, the very heart of its performance. For quietness, DX ability, life-long permanence, absolute dependability, lowest ultimate cost, no other plate source even approaches the achievement of an Edison steel alkaline storage battery. Built painstakingly; every detail inspected, filament and plate transformers for the new SW2 rectifier, complete plate power units. Rectifier Engineering Service, radio WSMIL, 4837 Rockwood Road, Cleveland, Ohio. Special rectifier aluminum, $1.35. Lead, $1.00 square foot. Elements 1 x 4 15 cents, 1 x 6 16 cents pair. All prepaid. Best silicon transformer steel cut to order, 25-25 cents pound. Postage extra. George Schultz, Calumet, Mich.
For sale — to settle an estate, Weston model 438 a.c. voltmeter 0-300, new condition, $22.50. Roller Smith type GSD-DC, 300 volts, 500 milliamperes, $8.75 each. Rare condition, $17. George H. Smith, Charleroi, Pa.

CRYSTALS — lowest prices on real high quality crystals. Write W6EBV.

SELL — complete station, from fonies to monitor, all standard parts, $60. Picture on request. WQAQ, Box 225, Weatherford, Tex.

SELL — new W.E. 211E fifty-wid socket, used eight hours, $12. WOAC.


FULL-wave Tungar rectifiers (Weatherhouse), 2 amperes; only one. 50 cents each, or both, $7.35. Also one .00025 new Cardwell transmitting condenser. Want wavemeter monitor or what offered. All replies answered. Emil Dargee, W1JGAS, Ord, Nebr.

CRYSTALS — lowest-priced on real high quality crystals. Write W6EY.


NEW Morton Electric Co. motor generator sets, wholesale prices. Hanson, 4842 Rice St., Chicago, III.

ESCO generators, 32 volt d.c. drive, output 1000 volts d.c., 1.27 mill. $60. Used, $30. About eight other Exco types. Crocker Wheeler 275 volt d.c., $6. Used, $5. Send for list. R. Wood, 40-20 102nd St., Corona, N. Y.

BARGAINS in quality merchandise. Everything new and guaranteed to your satisfaction. C.O.D. orders accepted, Columbus, Ohio. Voltage — 275 volt, $1.40; 2 mil, $2.50; 4 mil, $3.80; 8 mil, $6.45; 2000 v. d.c. — Working — 1 mil, $8.95; 2 mil, $10.55. Power filter elements, $10 each. 2000 volt, 100 Henrie, special, $17.55. Quality tubes: UX228S, $2.25; UX228S, $2.95; UX290S, $1.45. Special unmounted filter condensers, — 500 volt d.c., $30 each; UX255S, $3.50. Send for $2.60, six for $1.35, eight for $4.50, twelve for $6.00, 1 mil, four for $1.55, eight for $2.90, sixteen for $4.30. R.C.A. Power (heatstat, heavy duty, 500 watts. More Bargains, Send for list. Columbus Specialty Co., 1038 Longwood Ave., N. Y. C.

I have two 250-watt-screen-grid power tubes for sale at a reasonable price. Write E. Ewing, Jr., 29 S. LaSalle St., Chicago, Ill.

SPECIAL new Thoradan R210 compacts, $3.25, postage and insurance extra, per set of 10. A complete line of power supplies and special equipment. Bulletin available. Fontaine Engineering Co., 100 Avenue I, Brooklyn, N. Y.

SYNCHRONOUS motors for television 1/2 h.p. frames, 110 volt, 250 watt, $5.60. Write for catalog. W8DII, 22 West 73 Terrace, Kansas City, Mo.

TRANSFORMER specials, 110 volt, 90 cycle. Mounted and guaranteed. 150 watt 600-650, 750, $7; 600-500-500, $7.45; $1.40. 250 watt, 500 each side, 770, $10. 500, 1000 each side, 14.50. Filament transformers, 1000-volt insulation center tapped 75 watt, 770, $1.00 volt, $3.10 volt, $3.12 volt, $3.24 volt, $3.50, 150 watt, 10 volt, 500 each side, 750, $8.95 volt, $12.15 volt, $12.45 volt, $13.50. 30H 111 85 m.a. double choke, $1.75. 30H 100 m.a. double choke, $2.30. 30H 250 m.a. adjustable, $4.00. 30H 500 m.a. adjustable, $4.50. 30H 500 m.a. unmounted, $4.15. Condenser blocks, 450 volt, 2-4-4-1-1, $3.55. Prices are net P.O.B. Electronic Laboratories, 834 N. Rutland Rd., Philadelphia, Pa.

QSIs — plain at $1.00 per hundred. W9BEU, 9082 Windom, St. Louis, Mo.

W2API — call changed to W2ZCC. 1000-watt xtal beam transmitter may be obtained at a better price. W2API, Seaview, N. J.

TYPE 906 seconds (new tube). All characteristics normal. Made to order. Price $2.50. Write for schedule and sale delivery. $5.00 each. E. Ewing, Jr., 29 S. LaSalle St., Chicago, Ill.

WE BUILD anything from a crystal holder to a broadcast station. Send or phone: W6QAD, 169 E. 74th Road, Montclair, N. J. (Street address at night)

TELEVISION — Listen in on announcements from W3XK, 2000 kc., 8 o'clock, E.S.T., or send for literature. Jenkins Laboratories, 1519 Connecticut Ave., Washington, D.C.
DIRECT reading wattmeter type 174 adopted for receiving or
condition and price, K. B. Warner, 1711 Park St., Hartford, Conn.

WANTED - Vol. I of QST, bound or single copies, State
direct and price, E. T. Watson, 149 Mulberry St., Newark,
for sale.

NEW Hitel transmitter panel name plates, also chokes and
transformers. See Hitel advertisement in this issue. Jewell No.
54, at 2000 volt meters, $1000.00 per volt, $14. M. Leitch,
with 8-M audio transformers, $15. James McGill Boyer,

WANTED - Parts for 250-watt transmitter. Tube, meters, condensers,
rectifier, filter. Have you QM? Good condition? Price?
W5HO - Harold A. Hughson, 508 Michigan Ave., Mansi-

QST A SECTION

50 c. straight with copy in followin address form only:

W2JAI - Hackensack Radio Association, Y. M. C. A. Building,
Hackensack, N. J.

W1ADY - R. L. Miller, Jr., 501 Park Ave., Wilson, N. C.

W1KC - Leo Havard, 7106 Hemlock St., Houston, Texas.
W1OR - H. Y. Ballin, 475 Lewis St., Los Angeles, Calif.
W8CO - H. G. Noa, 1240 Beverly Place, Brookline, Pitts-

SUPER-DAVOHM RESISTORS

prefered and specified by ex-

A.R.R.L. sweater emblems should be worn by all League mem-
bers. They are yellow and black 3" x 3 1/2" diamond, felt letters
and embroderied symbol. Only $1.00. Money order or currency
cable to

THE DAEN COMPANY

158 Summit Street, Newark, N. J.

Resistor Specialists

"Standards of Efficiency"

5 to 5 million ohms; guaranteed 1% tolerance
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 this issue. We should like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio. You will have the membership edition of QST delivered at your door each month. A convenient application form is printed below — clip it out and mail it today.

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

AMERICAN RADIO RELAY LEAGUE
Hartford, Conn., U. S. A.

I hereby apply for membership in the American Radio Relay League, and enclose $2.50 ($3 in foreign countries) in payment of one year's dues, $1.25 of which is for a subscription to QST for the same period. Please begin my subscription with the issue. Mail my Certificate of Membership and send QST to the following name and address.

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

Thanks
THE

Amateur's Bookshelf

GOOD TEXTBOOKS and operating manuals should be on every amateur's bookshelf. We have reviewed practically all the books in which the amateur would be interested, and have arranged to handle through the QST Book Department at A.R.R.L. Headquarters those volumes which we believe to be the best of their kind. Take pride in a small but good radio library: buy a few good books and get into the habit of reading them.

Manual of Radio Telegraphy and Telephony, by Commander (now Admiral) S. S. Robison, U. S. N. Published by the Naval Institute. Covers both the theoretical and practical fields. A QST book review on this work stated in part: "Ranks with the very best of all published radio matter. . . . It is perhaps the best radio book that ever came to this desk." Every amateur should own a copy. $8.95 pp., 6¾ x 9. $4.00

Principles of Radio Communication, by Prof. J. H. Morecroft. An elaborate general textbook, and one of the recognized standards on theory for the engineering student. A working knowledge of mathematics is desirable for the reader who expects to get the greatest benefit from this work. 925 pp., 5¼ x 9. $7.50

Elements of Radio Communication, by Prof. J. H. Morecroft. This is a new book by the author of the "Principles" listed above. It is about half the size of the larger work, and the subject is treated in more elementary fashion. Simple algebra is sufficient. An excellent book for the "first-year" student. 269 pp., 170 illustrations. $5.00

Radio Engineering Principles, by Lauer and Brown. While not as voluminous as "Morecroft," this excellent general textbook on radio principles is the favorite of many students. A moderate knowledge of mathematics is desirable. 700 pp., 5½ x 9. $3.50

Experimental Radio, by Prof. R. R. Ramsay. Revised Edition. A splendid book for the experimenter. This is a laboratory manual, describing 128 excellent experiments designed to bring out the principles of radio theory, instruments and measurements. 150 illustrations, 229 pp., 5½ x 7. $2.75

Radio "Theory and Operating," by Mary Texanna Loomis. Although giving a moderate amount of theory, it is essentially a practical handbook for commercial and broadcast operators, and as such ranks among the foremost publications of this sort. Used as a textbook by many radio schools. Revised to include 1929 regulations. A good book for any amateur. 992 pp., 500 illustrations. $3.50

The Radio Manual, by George E. Sterling. Another excellent practical handbook, especially valuable to the commercial and broadcast operator, and covering the principles, methods and apparatus of all phases of radio activity. Includes 1929 regulations. Over 900 pp. $6.00

Radio Telegraphy and Telephony, by Dunham and Drew. Still another work along the lines of a general practical handbook. In size it is approximately the same as the two listed just previously, and the subject matter generally follows along the same lines. A good book in this class. 950 pp., 408 illustrations. $7.50

Practical Radio Telegraphy, by Nilson and Hornung. Written particularly for the student training for a commercial license, and covering theory and apparatus. A practical handbook, 380 pp., 223 illustrations. $3.00

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