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QST is published monthly by The American Radio Relay League, Inc., at Hartford, Conn., U. S. A.

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Subscriptions to QST are sent in United States and Possessions, Canada, and all countries in the American Postal Union, $2.00 per year. Postage outside of American Postal Union, $4.00 per year. Postpaid. Remittances should be by international postal or express money order or bank draft negotiable in the U. S. and for an equivalent amount in U. S. funds, entered as second-class matter May 29, 1919, at the post office at Hartford, Connecticut, under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized September 17, 1924. Additional entry as second-class matter, acceptable at special rate of postage provided for above, at Springfield, Mass., authorized September 17, 1924.

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ADDRESS ALL GENERAL CORRESPONDENCE TO THE EXECUTIVE HEADQUARTERS AT HARTFORD, CONN.
E VERY month Ye Ed sits down to dash off a bit of running comment for this page. As the years roll by it becomes a record of our progress, for in it are recorded the high-lights of our changing status from month to month. Sometimes there is a sermon to preach, sometimes an opportunity to exult over an amateur accomplishment, sometimes a note of warning to sound, sometimes an opportunity to let loose and rollick in the sheer joy of being an amateur. Always there seems that those subjects which are "hottest" in the life of amateur radio at the moment are legitimate topics for editorial review.

To most of amateur radio the most important thing on the hook these days is the Washington Convention of 1927 and the effects which it will have upon amateur radio beginning in 1929. Now, in mid-summer, with half of the time gone by, seems a good moment to take stock of the situation. The world has had the Washington Convention for half a year, in half a year more its provisions go into effect. Already there are numerous signs that a busy radio world is at work adjusting itself to the new requirements. Thousands of changes, from drastic to trivial, are having to be made throughout the vast world-wide structure of radio, but already, bit by bit, things are dropping into their proper notches. It is possible now to get some sort of picture of the changing scene.

As we look it over carefully from the amateur standpoint, we find it quite reassuring. A few months ago we had grave doubts about some of the features which affected us, but no longer. We see now no reason to doubt that we shall be happy next year.

Promptly upon the ratification of the treaty by this country, our Federal Radio Commission started action and a really considerable amount of progress has been made, particularly in the short wave field which interests us. One of its actions in particular needs some explaining.

Our "40-meter" and "20-meter" bands now read 7,000-8,000 Kc. and 14,000-16,000 Kc., respectively. Next year they will read 7,000-7,300 Kc. and 14,000-14,400 Kc., respectively. Of the territory we lose, 7,300-8,000 Kc. and 14,400-16,000 Kc. — what is to become of it? It goes to fixed stations, and it contains some mighty valuable channels. Now it must be understood that all around the world there is a mad race to get commercial short-wave stations established, a race taking on the proportions of a gold rush, for it must be remembered that there are only so many channels available and that priority in the right to use a frequency is to be established only by actually getting on the air and occupying it. These portions of our bands which we lose next year have never been assigned to amateurs in most countries and so are fully available in those countries for commercial occupation. Our country with its tremendous business enterprises is experiencing more of a demand for channels than any other country. If it waits until the end of the year to make assignments in these bands which then automatically become non-amateur bands, it will find them all claim-staked by other nations. What to do? The Commission has adopted what is about the only possible policy in the matter, the immediate issuing of construction permits to commercial firms in this country to occupy frequencies in these portions of our bands. It involves another sacrifice on our part insofar as it means that we will not have the exclusive occupancy of our bands until the end of the year. Twenty-one commercial channels have been assigned in the 7,300-8,000 Kc. territory and twenty-seven channels in the 14,400-16,000 Kc. band. There is one redeeming feature. The stations thus authorized will actually get into operation but slowly, and gradually, during the remaining months of the year. What will happen to us, then, will be to experience a gradually increasing number of interfering stations in "our" bands. It will be almost time for the change-over to the narrowed bands. It seems to us that this process of gradually reducing the effectiveness of our bands by the infiltration of commercial stations during the late months of the year actually may be much better and easier for us than to attempt to work with full width up to midnight of December 31st and immediately thereafter rearrange ourselves in the much narrower territory. There are two points in this for us: we must not now be alarmed when we hear an occasional United States commercial station working in those portions of the bands which will not be ours next year; and amateur rebuilding operations, particularly where they involve crystal con-
control, should be based on a frequency which will be within next year's bands, and thus escape any such interference.

Preparations are going on around the world to move commercial stations that now exist in what will be next year's amateur bands, and because the outside territory is rapidly being occupied by new stations it is to be expected that all the proprietors of stations operating in the 7,000-7,300 and 14,000-14,400 Kc. bands will move as quickly as possible, as these bands must be given exclusively to amateur radio after the end of the year.

One early result to be expected of the assignment of commercial stations within the territory we are soon to lose is the movement of non-amateur "amateur" stations now operating in the low-frequency portions of our bands, to channels now designated as commercial and thus clear of our next year's bands—and under commercial licenses, too, not amateur!

It has been decided that our "30-meter" and "160-meter" bands, which it is internationally agreed may be shared with mobile and fixed services, will in this country be available throughout their extent to amateurs and will not be shared with commercial mobile and fixed services. This means that we will share these bands only with Army mobile stations and Naval aircraft. This is the same arrangement which we have had in effect for several years and which has caused no inconvenience to amateurs. There are, incidentally, sixteen channels in our "30-meter" band that will be used by naval aircraft, but at sea under circumstances where we may expect their operation to have but little effect on this most important band.

There are numerous other little signs of the activity of readjustment. Amateur calls are gradually being changed to accordance with an international plan. The British government is discussing the wavelengths to be made available to British amateurs. The Australian government is reported to be considering the continuation of the authority to Australian amateurs to use the 33-meter wave because Australia is so far away from congested localities that international interference would not result. Our government is considering a power reduction for American amateurs so that our occasional off-wave operation will be less likely to produce interference of commercial field strength. There is much discussion in amateur circles about the necessity of soliciting some regulations relating to the type of power supply which amateurs should use next year, so as to secure at least the abolition of the hated "raw a.c."

Some months ago we proposed a scheme for sub-dividing the "40-meter" and "20-meter" international amateur bands between various groups of nations, in the thought that such a plan was essential if international communication was to go on. We presented it as a suggestion for discussion. There seems to be considerable sentiment to the effect that such a plan is not essential, and it seems to us that any such optimism is a most healthy and wholesome sign. We ourselves are not yet prepared to adopt this view, and to us it still seems that some such cooperative plan is extremely desirable, and that the precision we must attain next year will make it something quite possible of realization.

The growing sentiment seems to be, though, that we could well leave these bands internationally free-for-all, and that in a short time the natural readjustment of amateurs amongst various bands and the natural dividing of their operating hours by differences in time will result in a satisfactory situation. We don't know—we want to think it over some more.

Technically there is much to report. We were quite worried about this situation a few months ago. It seemed to us that the 1929 requirements were so severe that many stations would have to be junked and very expensive rebuilding undertaken. A few months of hard work on the problem now indicate that it will be possible to improve apparatus easily. That is a tremendous relief. For example, we are very proud to be able to present in this issue an excellent article on the simple changes that may be made in self-excited transmitters to make them serviceable under 1929 conditions, and another article relating the construction of a simple gadget which may be affixed to an autodyne receiver and which, if the transmitters put forth "1929" signals, will give 1929 selectivity in reception. We feel very happy about this, for the self-excited oscillator is our simplest transmitter and the autodyne is our simplest receiver, both being in use in by far the majority of the amateur stations of the world. It may be said, in fact, that the presentation of these two articles constitutes one entirely adequate answer to the problem raised by the necessity for having better transmitters and better receivers in 1929. Of course we do not stop there. The A.R.R.L. Technical Development Program is now in full swing and is moving on to higher-powered transmitters, transmitters better than those which attain the results described in this month's article, the development of more selective receivers, the evolution of satisfactory amateur frequency-meters, the development of ten meters, etc. We now have every confidence that the technical difficulties will be overcome and that we are going to have just as much success and enjoyment from operation in 1929 as ever before—perhaps a lot

(Concluded on Page 19)
Overhauling the Transmitter for 1929
Some Modifications Which Permit Substantial Advances in Self-Excited Circuit Performance.

By Ross A. Hull*

IN any undertaking, I suppose, half the battle, or at least an appreciable fraction of it, is in the determination of a method of attack—the drafting of a procedure and a policy. Anyway, in the instance of the A.R.R.L. Technical Development Program we found this to be true.

There was, for example, the apparently simple question of whether the present-day self-excited circuits were worthy of any consideration. Of the several scores of possible fields of endeavor, we thought, there is at least one which we can delete. Hartleys, Colpitts and Tuned-grid tuned-plates have been in general use throughout the world for years, and amateurs, experimenters and scientists have sought con-

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the air to-morrow there would be about five truly constant frequency and unmodulated signals left. Most certainly, we decided, the self-excited circuits are the bunk. They have had six or seven years in which to prove their worth and in all that time they have succeeded in making a variety of horrible noises; let's forget them and break into some brand new territory.

But, as we have said at the start, de-

“Why, we might spend a month on the problem,” said Perry Briggs, 1BGF (who was destined to do the study) “and then we might find that they always will mean swinging, chirping, rattles and mush!”

Little did we think at the time that it would be possible to make the statement that we now can make with complete confidence—that all standard self excited circuits can produce signals that will comply with any reasonable standard set for 1929 if only they are built and operated intelligently. But there is a lot hanging to those last four words. There is in fact this entire story.

TRANSMITTERS UNDER A MICROSCOPE

The first requirement in the study undertaken was, of course, a means of examining the performance of any type of transmitter in precise detail. It would not serve, we realized, to put the various transmitters on the air and ask QRS? QSB? QSSS? and then decide from the various FB’s and QSA’s received in reply that 1929 was a cinch. Instead, we had to provide for some electrical microscope through which we could examine and reduce to black and white the actual performance of any transmitter under any conceivable set of conditions. The most useful apparatus used in this work was an enlarged and modified version of the “Growler” (a shielded oscillator). Built within a large copper wash-boiler this oscillator was pro-

decisions on such matters comprise at least a fraction of the battle—and even fractions of battles cannot be dismissed so simply. It is true, we reflected on second thought, that by far the majority of present-day amateur transmitters are built around self-excited circuits; it is true that such circuits have been the very foundation of world-wide amateur radio communication; it is true that the scrapping of self-excited circuits would mean the scrapping of about 90% of existing amateur transmitters. Is not, then, the self-excited circuit perhaps one of the biggest things in amateur radio we wised. Is it not deserving of the most detailed study and investigation possible, in the attempt to preserve it, even though it has done its work in such a noisy fashion throughout the years?—And so was written into the program of activities, at the head of what is now an elaborate document, a Problem One—“The Study of Present Day Self-Excited Circuits—The Possibilities, if any, of Their Use in 1929”.

ONE OF THE “1928 TYPE” TRANSMITTERS RESPONSIBLE FOR SOME OF THE CURVES ON THESE PAGES

As an example of the use of long condenser leads and clips the arrangement is one to be avoided. The wide separation of the tube, the condensers and the coils does not permit the short stiff leads which are to play such an important part in obtaining a “1929” performance.

provided, in addition to the usual tuning control, with a vernier straight line frequency condenser giving a full scale tuning range
of about 28 Ke. The output of the oscillator was fed through a three-stage resistance-coupled audio-frequency amplifier to a loud speaker of high quality, so giving some hope of a reasonably flat audio frequency response curve. To provide for quantitative observation the oscillator was calibrated roughly on the major tuning dial and with a certain degree of precision on the vernier. The calibration curve for the latter control, incidentally, was obtained by automatically doubly checked as the work proceeded. A third and even a fourth check was made possible by detuning the oscillators to musical octaves (2000 and 3000 cycles) as well as by 1000 cycles. Possessed with a "musical ear" and considerable patience, we thought, the amateur could well calibrate his 1929 frequency meter in this manner from one known point on the scale.

The purpose in providing and calibrating a vernier of this type was to supply a means of observing the swing or drift in the frequency output of any transmitter due to prearranged variations in plate voltage, filament voltage or antenna constants, and to measure it down to about 100 cycles. Fortunately, the "Boiler" proved highly satisfactory for this work, and during some hundreds of comparisons of circuits, transmitters and constants, it was run almost continuously for several weeks.

THE "BEST" CIRCUIT

A detailed study of the data obtained revealed in all its brilliance the fact (which we had so long thought true) that all standard self-excited circuits, irrespective of how carefully designed and built they may be, are equally and any time capable of producing truly wretched signals. And, conversely, that all such circuits, when correctly arranged and tuned, can be made to produce signals that are veritably above criticism. Along with this we can insist with limitless assurance that the performance of the various standard circuits actually is equivalent — that the Tuned-grid tuned-plate cannot be said to be "better" than the Hartley or the Hartley "better" than the Colpitts unless detailed qualifications be included in the statement. Which is, after all, merely a reiteration of QST's claim of all the years—that "that circuit is best with which you are most familiar."

THE TUNING BUSINESS

And now, in all humility, let us ask to be pardoned if we appear excessively frank in the statement of some further deductions resulting from the study. We are con-
vinced, for instance, that if all amateur operators of the world, without any changes in their equipment, were to be displaced by a new generation of amateurs having a clear understanding of transmitter tuning, before it ran into another station. It is not surprising that amateurs have been careful of everything except their signal, that with certain obvious exceptions the correct tuning of a transmitter was the result of accident rather than design. In 1929, as we have already suggested, it will not be essential for all transmitters to be rebuilt. It will, however, without the slightest doubt, be absolutely necessary for all amateurs to make it their business to learn the finer points of transmitter tuning; to learn exactly how to make their signals conform with the high standard to be required in 1929 and to provide the means of checking, within the station, the character of the signal being transmitted. For the success or failure of amateur radio in the future is to depend chiefly upon the personal element—the men behind the keys.

and the desire to put their knowledge into effect, completely satisfactory operation in the 1929 amateur bands would be inevitable. In short, and more abruptly, the chief ailments of present day amateur radio are the men pushing the keys. They have built their power supplies with one thing in mind—voltage; they have tuned their transmitters with just a single thought—antenna current—they have pounded out their CQ’s for but one purpose—DX; and the signal, the very foundation of the whole game, has been left to splutter, wobble, creep and rattle across great slices of the bands because of some dizzy FB’s and QSA’s given, in most cases, with about as much sincerity as the pleasantries passed across the counter by a grocer’s clerk to his customers. Whew!

Of course, there is not the slightest question that the condition has been a natural one. The amateur bands have been wide and it was not a tragedy if one station did swamp a couple of hundred kilocycles. The off-wave operation has been a relatively minor offense, for the fields beyond the fence were almost vacant. Further, a creepy-wobbly signal has been readable because it usually could wobble a long way

THE "1929" SIGNAL

At this stage it would be well perhaps to outline the specification of what is now considered to be the desirable 1929 signal, drawn up after close study of the requirements and since checked by experiment to determine its complete practicability. It should be understood that this specification does not cover the most desirable signal but rather that signal, attainable with even the most modest equipment that will permit its owner to identify himself as a sincere dyed-in-the-wool radio amateur.

![Graph](https://via.placeholder.com/150)

**FIG. 3. INDICATING THE FREQUENCY CHANGES RESULTING FROM ANTENNA DETUNING IN A TYPICAL HARTLEY CIRCUIT**

A change from "two-inch" to "four-inch" coupling in this case shows an avoidance of the "double resonance hump", with an insignificant sacrifice of antenna current, and a vast improvement in the frequency change. The necessity of detuning the antenna in one particular direction is shown clearly in these curves.

![Graph](https://via.placeholder.com/150)

**FIG. 4. SOME SIMILARLY POOR PERFORMANCE OBTAINED WITH FOUR DIFFERENT CIRCUITS**

Selected average curves obtained with poorly adjusted Tuned-grid tuned-plate Hartleys, Colpitts and Ultradion circuits are shown.

The 1929 signal, in the first place, must be entirely within the limits of the band. Then, its frequency "flutter" due to ir-
regularities of plate supply must not exceed about 1/30 of 1% (approximately 250 cycles at 40 meters). We'll say more on that later. In addition, the frequency of the signal must be relatively constant. The signal must not “shimmy” as the antenna vibrates, it should not “chirp” as it is keyed, nor can it “creep” appreciably as the line voltage fluctuates or the tube heats. In short, the frequency of the first dot transmitted should be within 1/10 of 1% (about 750 cycles at 40 meters) of the hundredth dot, even if the plate has reddened or the line voltage drifted in the meantime. And at the end of a few hours of operation the frequency should not have strayed much farther.

MEASURING PERFORMANCE

An examination of these requirements showed clearly that we could, in our laboratory, even with the limited facilities, determine just when a transmitter came up to the specification, and, if it did not, by just how much it failed. And so, at the outset, we built a transmitter with the closest possible electrical resemblance to the average low-powered amateur transmitter of the present day in order that we could plot in black and white the exact amounts by which it missed the mark under a variety of conditions.

Right here we must delve into a discussion of notes with the hope of clearing up some of the widespread misunderstanding which exists. First let us state that there are three distinct groups into which all notes can be divided. They are (a) the “pure d.c.” produced by a transmitter emitting a single frequency (which incidentally is an extremely uncommon and rather undesirable note). (b) The “musical” note, resulting from a signal which is modulated by plate supply ripple in amplitude only (good crystal control transmitters with rippled plate supplies give them). And (c) the “mush” note, which is the outcome of a signal both “fluttered” in frequency and modulated in amplitude by the plate supply.

The important point is that note “a”—the “pure d.c.”, occupies the least possible amount of territory, with note “b” coming next and occupying slightly more territory on account of the side-bands resulting from the modulation. Note “c”, however, though obtained from the same plate supply that gave note “b”, can well occupy ten times the territory, for the output “frequency” of the transmitter is buzzing across a whole band of frequencies.

Our first interest, therefore, was an actual measurement of the frequency change due to changes in plate voltage—that undesirable characteristic of self-excited transmitters which causes the frequency to “flutter” with any “ripple” in the plate supply.

Considerable difficulty was experienced in plotting the curves shown in Figure 1 for the reason that they were planned to

![A Rear View of the "1929 Type" Low-Powered Hartley](image-url)
represent only the frequency changes caused by variation of plate voltage and not the further changes due to resulting plate temperature variations. Though a high degree of accuracy was not found possible, the curves nevertheless were sufficiently representative of average performance to be of great value. From Figure 1 it can be seen that the average transmitter, tuned in the average manner, and operated on the 7,000-7,500 Kc. ("40-meter") band, can have its output varied by at least 18 Kc. with a change in plate voltage from 100 to 500. In the "self-rectified" or "raw a.c. supplied" transmitter this means that during each half cycle, as the voltage climbs to maximum and drops to zero, the frequency swishes back and forth across a band of more than 18 Kc! Is it any wonder that so many signals are just splutters, blotting out wide sections of the band? Among the curves are some representing the performance of all the standard circuits and from this and other families of similar curves it has been shown definitely that similarly horrible performance can be obtained from all the circuits without difficulty. What is more interesting, however, is that the enormous improvement indicated by a comparison of curves "A" and "B" can be attained in any of the circuits merely by careful tuning—a

FIG. 6. IN WHICH IS SHOWN THE IMPROVEMENT RESULTING FROM THE USE OF A HIGH-C PLATE CIRCUIT

The antenna-tuning-vs.-frequency curves of the simple "1929-type" Hartley taken within two values of antenna coupling. Aside from their value in indicating the probable frequency response to antenna swaying, these and similar curves in Figs. 2, 3, 4 and 5 were found to be splendidly representative of the merit, in most other respects, of the circuits giving them. They were taken in large numbers and given detailed consideration for this reason.

reduction of the frequency "flutter" from 18,000 cycles to 600 cycles! With each curve the constants of the circuit were noted and from study of the conditions and the resulting curves a tuning procedure was evolved. But more of that anon.

FIG. 7. DEMONSTRATING WHY "D.C." NOTES ARE NOT DIFFICULT TO OBTAIN WITH A HIGH-C PLATE CIRCUIT AND CORRECT TUNING

The "1929-type" transmitter under these particular conditions changed its frequency only 400 cycles when the plate supply was dropped 400 volts. Frequency "flutter" due to plate supply ripple was therefore extremely slight and a "d.c." note was obtained readily.

Signals Wrecked by Antenna Tuning

Early in this work it became evident that one of the chief factors was antenna coupling and tuning. It was found that the performance changed radically as the antenna was tuned to resonance and beyond it, and that there were certain adjustments on one side of resonance or the other at which the desirable conditions were obtained. This check on previous observations led to a most detailed study on the influence of antenna coupling and tuning—a study which provided a most magnificent check on all our previous deductions. In a series of some scores of curves the antenna tuning was varied and plotted against the output frequency. At the same time antenna current was noted at each adjustment of antenna tuning and the resonance curve so obtained plotted on the same sheet. The process was then repeated at several values of antenna coupling to provide at least reasonably complete data for every circuit and transmitter under every practical combination of constants. Several typical curves obtained in this manner with a standard Hartley transmitter are shown in Figure 2. The values of antenna coupling are indicated in inches but it should be pointed out that, except under the particular conditions represented, these values are entirely meaningless. For us to say that your coupling should be 2 inches would be as futile as for us to suggest that you should use 30 degrees of a condenser when we did not know its maximum capacity. The precise measure of coupling (the "coefficient of coupling") involves considerations of the inductance of the two circuits and their mutual inductance and it was merely the impracticality of using this measure

that led us to employ inches for comparative work.

THE EFFECT OF COUPLING

The important though elementary fact to be found illustrated in these curves is that as the coupling is reduced the frequency change due to variations in antenna tuning is steadily lowered. Two extreme examples indicated by curves "A" and "B" show that a reduction in coupling from 2" to 5", though only resulting in a 5% drop in antenna current provided at least a 57% improvement in frequency stability. Carried to a still greater extreme, and at the expense of about half the antenna current, a condition could be obtained (Curves "C") where an improvement of about 92% resulted. It may seem strange that these and succeeding similar curves are taken so seriously and given so much consideration and for this reason it might be explained that aside from indicating the responsiveness of the circuit to movements of the antenna they were found to be surprisingly representative of the merit of the particular transmitter from all other aspects. Without a single exception the adjustments and constants which provided the best antenna-tuning-vas.-frequency-change curve also provided the best plate-voltage-vas.-frequency curve and the best performance in general. And a more recent detailed theoretical study has shown that this should have been the case.

A point of considerable interest and of the greatest importance is illustrated on the curves of Figure 2 representing the performance of a Hartford at two less extreme values of antenna coupling. Curves "A" in this case represent those of a typical amateur transmitter in which the antenna coupling is excessive. Two points of maximum antenna current are found and relatively serious frequency change is indicated. Curves "B" represent the conditions with a desirable value of coupling, showing a single point of maximum antenna current (not appreciably lower than that of "A") and a much improved frequency characteristic. The important point, however, is that a resonance occurs least at the steepest point of the frequency curve and that at this point the frequency stability under operating conditions probably will be at its lowest value. Further, it can be seen that whereas detuning of the antenna to a higher wavelength than the oscillator will mean operation on a flatter portion of the frequency curve, detuning in the opposite direction could result in operation right at a sharp peak of the frequency curve (the upper peak of curve "A" for instance) and the possibility of a stable frequency so be made equally remote. In actual practice it was found that not only was the stability much improved when the antenna was tuned to a higher wavelength (in this particular case) than the oscillator but also the note was vastly better. The latter condition resulting, of course, from an improved plate voltage vs. frequency curve. When the antenna was tuned to the points "e" and "d", under these conditions, the note was a pure "d.c." When it was tuned to points "e" or "f" (the antenna current being the same in each case) the note was heavily modulated and worthy only of the term "rae". At certain

[Diagram]

FIG. 3. THE SIMPLIFIED HARTLEY CIRCUIT OF THE "1228 TYPE" TRANSMITTER

A-Thermocouple ammeter 0-1 amps.
C1=600 µfd. receiver type variable condenser.
C2=600 µfd. receiver type variable condenser of good quality.
C3=500 µfd. fixed condensers.
C4=250 µfd. fixed condensers.
C5=2000 fd. fixed condensers.
R1=10,000 ohms. grid leak.
R2=50, 100 or 200 ohms fixed resistors or Christmas-tree lamps.
RHC—180 turns of No. 30 gauge D.C.C. wire on 1" diameter wooden rod.
L1 and L2 for the various bands are described under the photograph of them.

values of antenna coupling this effect became much less marked, and at other values the "d.c." note was obtained on the reverse side of resonance. In quite the majority of runs, however, it was found essential to detune on one particular side of resonance in order to obtain the best note and the maximum frequency stability.

A COMPARISON OF CIRCUITS

Having made some preliminary studies of different circuits in regard to the variations of frequency caused by changes in plate voltage, and having been impressed by the similarity of their performance, a detailed comparison was undertaken at this stage. The various circuits were set up and in turn they were adjusted carefully to give their best performance. Then by tuning everything to resonance and by providing excessive grid excitation and antenna coupling they were each adjusted to give a series of poor performances. Scores of curves drawn from the data so obtained proved conclusively that the Hartley,
Tuned-grid tuned-plate, Colpitts and Ultraed all were capable of producing equally poor frequency stability and note, and on the other hand, when they were adjusted correctly, that their maximum performance was definitely of the same order. In Figure 4 is reproduced a family of typically poor curves for the standard circuits. In all cases they represent similar input power and, as can be seen from the resonance curves, similar antenna current. Figure 5 is a selection of the best curves obtained with each circuit, input and output powers being held to the same value in each case. The latter curves, aside from their interest as proof that standard circuits are similar in their performance, were of great value to us in providing a statement of the best possible results that could be expected from present day self-excited amateur transmitters. With these curves we could make accurate comparisons of the improved performance resulting from modifications and refinements and so determine rapidly and definitely the relative merits of the various arrangements. The curves representing the performance of the “Transmitter With a 1929 Performance” are reproduced in Figures 6 & 7 to provide just such a comparison. From these curves it will be seen that the simple—yet crude—rigger illustrated in the photographs is capable of performing quite creditably. It has a frequency change when correctly tuned of but 6 Kc. as the antenna circuit is passed entirely through resonance. It will encounter a sudden 400-volt change of plate voltage and swing its frequency approximately 400 cycles. In consequence when operated from rectified and reasonably well filtered a.c. the “flutter” will be negligible and the output in consequence “musical”. In fact, even when supplied from the unfiltered product of a motor-generator it is capable of turning out a note that can hardly be described as other than “d.c.” Always providing, of course, that it is tuned with extreme care in the manner to be outlined.

And the circuit of this transmitter, disappointing though it may be, is nothing more than a simplified Hartley! Through all the work we had looked forward to the possibility of being able to insist that 1929 will not necessarily mean more complex or more expensive apparatus and even if we do anticipate some “raspberries” over the crudity of our sample transmitter we cannot disguise our pleasure at being able to state just that.

HIGH-C CIRCUITS

The feature of the transmitter which is directly responsible for its rather unusual performance is the plate oscillatory circuit, which is so proportioned as to have a preponderous of capacity. Such a circuit, having a low inductance-capacity ratio (to be described as a High-C circuit) has characteristics which make its use in the self-excited transmitter very desirable. A change from the inductance-capacity ratios in general present use to those indicated in Figure 8, for instance, resulted in a splendid improvement in the Antenna Tuning vs. Frequency curve (compare Figures 5 and 6); a distinct advance in the Plate Voltage vs. Frequency characteristic (compare Figures 1 and 7); and a corresponding improvement in the note. Of course, some minor disadvantages are involved.

In such High-C circuits, as the inductance is reduced and the capacity correspondingly increased, the circulating current mounts rapidly. Even with the UX-210 in the circuit of Figure 8, the radio-frequency current flowing through the plate coil and its condenser is of the order of 5 amperes, while with the larger
COIL AND CONDENSER VALUES

Of equal importance to the coil and condenser are the connections between them. Spindly leads between the coil and condenser with clips on them for adjustment of turns can cause a heavy loss of output power, even in a 7.5-watt transmitter, and usually will result in a greater loss of stability than the High-C circuit could hope to give. In the higher-powered transmitter the resistance of such leads and clips can well cause the circuit to be entirely inoperative. A successful High-C plate circuit will require the use of ¼" copper tubing (or strip of similar surface area) for the coils of the transmitter of 50 watts or less, and at least ½" tubing or its equivalent for the higher powers. Then it will be necessary to determine the correct number of turns experimentally in order that the end turns may be screwed directly to the condenser terminals or to connecting strips. One satisfactory arrangement is that shown in the "close-up" of the transmitter. In this case "wing nuts" were fitted to the machine screws holding the inductance in order to facilitate changes from one band to another. In the case of the filament lead and other leads in the transmitter the currents are no higher than in the usual transmitter and consequently it is necessary to exercise only the ordinary care. The one redeeming feature of the "tank" condenser problem is that the voltages developed across the High-C circuit are much lower than in the circuits of the usual constants. For this reason good receiver-type condensers are satisfactory for transmitters operating with plate voltages of 1000 or less, while nothing more than "double spacing" should be necessary for transmitters employing the UX-882 or UV-204-A. It might be explained at this point that much higher capacities than those indicated in Figure 8 can be used if only heavy enough inductances and good enough condensers are used. Experiment with inductance-capacity ratios involving capacities as high as 1000 μfd's. at 7100 and 14000 Kc. has indicated, however, that with the usual equipment available readily at the present time the losses involved with ratios higher than that used in the transmitter illustrated are out of proportion to the increase in frequency stability afforded by them.

REBUILDING THE PLATE CIRCUIT

The modification of any present-day self-excited transmitter for operation with a High-C plate circuit is not a matter which should mean either appreciable expense or difficulty. In the transmitter used for work on all or several wave bands, a condenser of 500 μfd's. is suggested. For a transmitter which is to be operated exclusively on the 14,000-14,400 Kc. ("20-meter") and the 28,000-30,000 Kc. (10 meter) bands, a maximum capacity of 300 μfd's. should serve effectively. In the transmitter employing 1000 plate volts or less, a good receiver-type condenser should be satisfactory but it is suggested that it should not be considered above suspicion if trouble develops. In one of the experimental transmitters, fitted with a condenser of splendid reputation and operating with a single UX-210, a few hours of steady operation resulted in an invisible insulation breakdown which had the effect of reducing the output by about 50% and which caused the note to become a complete "hash". Under these conditions, obviously, all the careful tuning possible was of no avail. Another condenser of the same type, operated under similar conditions for several hours as a check, disappointed us by performing perfectly.

For the higher powered transmitters the use of two good transmitting condensers in parallel to give the suggested capacity values would serve but experimental work in progress at the moment (to be detailed in a future article) would seem to indicate the desirability of using an air-dielectric fixed condenser for the plate circuit, a small vernier being fitted for tuning. When
variable condensers are used, it must be remembered that the mere inclusion of a 500 µfd. size condenser in the set does not result in a High-C circuit unless the coils are so proportioned as to give the necessary frequency at the upper end of the condenser scale. For the 28,000-Kc. band the coil should be of such a size that about 200 µfd.s. of the condenser are used; for the 14,000-Kc. band about 300 µfd.s; for the 7,000-Kc. band about 400 µfd.s; for problem of plate supply. At the same time, in view of the hundreds of thousands of words which have been written on the subject in QST and the Handbook, it is not thought necessary to give circuits or constructional details. If the transmitter is to be given any chance to perform in 1929 fashion, it is needless to say that the supply, if not generator or battery d.c. must be rectified and in some way filtered a.c. Further, the battery, generator, transformers, rectifiers and chokes must be capable of supplying or handling much greater currents than they will be asked to pass in actual operation, for if this is not so, the handicap of poor regulation will surely make the attainment of a 1929 signal more difficult.

There is also the same old problem of keying. Key clicks and sparking contacts will continue to be important, even if the transmitter is re-arranged and correctly tuned. In this case also, the incorporation of methods and the observation of precautions described in many QST articles and the Handbook will be necessary. A matter which will be of even greater importance with the 1929 self-excited transmitter is the elimination of antenna swaying and the vibration of the set or any of its radio frequency wiring. The modified arrangement and correct tuning admittedly will reduce the effect of these variations on the frequency but at the same time the character of the note will be so improved that these variations will be much more noticeable.

With a 1928 transmitter in which the plate supply ripple "utters" its frequency over a band of 15 or 20 Kcs., the effect of a swinging antenna or a vibrating lead is to a considerable extent lost in the mess. With an otherwise steady and "pure d.c." signal, however, any such weakness will protrude in all its infamy.

THE ESSENTIALS OF TUNING

And now, since the highlights of transmitter tuning have been so broadly scattered throughout this rambly screeed, let us collect them in a simple statement of good procedure.

When the transmitter has been assembled, or re-assembled; when the antenna and its leads or feeders have been tightened or in some other way prevented from swaying; when it has been found that all leads or coils, and the transmitter itself, cannot vibrate; when the coils have been adjusted to give the desired frequency with the necessary value of capacity—then, and not until then, should the grid excitation be adjusted to give a plate current of about half the rated value with the antenna coil removed. In the Hartley this will mean adjustment of the filament clip in steps of about half an inch at a time, keeping mind,
for a rough guide, that the ratio of turns between the grid and filament clip and the turns between the plate and filament clip will be somewhere between 1 to 4 or 5. In the Tuned-grid tuned plate it will mean tuning of the grid circuit and the plate circuit and adjustment of the grid clip shown in Figure 9.

At this stage, when it is known definitely that the frequency is within the band, the antenna coil can be connected and coupled loosely to the plate coil. And loose coupling for the particular coils used in the Hartley transmitter illustrated is obtained with a spacing of not less than five or six inches. When the antenna has been tuned and the coupling increased to give the maximum antenna current, the value of that current should be noted mentally as something to avoid as one would the plague. Without delay the antenna coupling should be backed off until a point is reached at which the maximum current is about 85% of the previous value. And this reading should be recorded as something to be avoided with equivalent enthusiasm. At this stage the use of a “growler” (a shielded oscillator fitted with ‘phones) or a receiver tuned to a weak harmonic becomes essential, for only by listening to the signal within the station is it practical to decide on which side of resonance the antenna is to be tuned to give the best note. Under practically all conditions, the correct adjustment will be obtained when the antenna is tuned to a lower frequency (a higher wavelength) than the oscillator but a comparison of the signal obtained in this way with that obtained on the other side of resonance will immediately indicate the desirable side. All that then remains is to detune the antenna on that side in order to give an antenna current of about 75% of the 85% peak value. And this is the antenna current which should never be exceeded if the transmitter is to perform in the true 1929 manner.

After a final check of the frequency, CQ’s may now be pounded out in limited quantities and a QRK may be asked with a certain amount of confidence. If the reader has followed this story and put its suggestions into effect, he can expect a favorable report. It is conceivable, in fact, that the signal will inspire the answer “You have a 1929 signal, O.M.” And, if he has previously listened to it himself in his own “Growler”, he will know that he is entitled to believe it.

[As an extension of the subject of self-excited transmitters, the constructional considerations involved in the modification of higher-powered transmitters will be discussed in the September QST.—Editor.]

Editorials

(Continued from Page 8)

more, because more of us are going to be knowing what we are doing than ever before! If we may throw in a free advertisement for the old mag, don’t miss QST—we’re going to have lots of hot stuff.

And so, taking things by and large, we feel a lot better. Everything looks pretty. In fact we insist upon being optimistic as anything. And in winding up this scried for the month we want to point out that a great deal of the activity around the world in the way of readjustment attests a recognition of the established position of amateur radio which is based upon the strength we have secured by virtue of being written into the international treaty as one of the classes of stations that always shall be provided for. Believe us, that is good! It looks to us like it may turn out that, having developed our technique to where we may operate happily in our limited facilities, it was really a blessing to us that this international conference came along and resulted in our international status being so definitely established. All we want to say is that any ham who wants to sell his station because “this is the last year of amateur radio” is just plumb foolish!

K. B. W.

Strays

The Radio Corp. station WIK, a useful marker in the vicinity of our “20-meter” band, was changed in frequency on June 24th to a new assignment at 13930 kc. (approximately 21.54 meters). A new B.C.A. station, WOP, is approaching completion and will be heard soon on 13900 kc.

SDPL, having read the recent newspaper report that Congress had changed the postal rate to permit other than government postal cards to be mailed with one cent postage, claims that this should surely result in QSL activity returning to normal.

The Headquarters Office of the Ninth District, Department of Commerce Radio Division, recently moved from the Federal Building to new quarters. Communications to the Supervisor of Radio in that district should now be addressed to 2022 The Engineering Building, Chicago, Ill.
Concerning Lunar Effects on Electromagnetic Waves

By Greenleaf W. Pickard

Reading the recent article by Mr. C. E. Paulson, entitled "Lunar Effects on Electromagnetic Waves," my first feeling was one of regret that the readings were not continued over a much longer period. For it can readily be shown that a cause and effect relation cannot be established by observations over so short an interval as thirty days, which is only one cycle of the alleged cause. The moon's synodic period or lunar month is approximately 29.5 days, and differs but little from the period of solar rotation. It has already been established that one cause of reception changes is solar activity, which appears to center on certain areas of the sun's surface, which remain fixed in heliographic latitude and longitude for months and even years, and which usually contain sunspots. These active areas therefore rotate with the sun, and cross the central solar meridian at intervals of approximately 27.3 days. If on a particular day the full moon coincided with the earthward presentation of an active solar area, then a lunar month later full moon would come 2.5 days after the representation of the active area, and finally, in about 6.75 lunar months, or 199 days, full moon and active solar area would be in opposition. If both sun and moon cause reception changes, a minimum of over six months' observations would be required to disentangle the effects. I personally would wish at least two years' reception data before deciding that a lunar effect existed. As a matter of fact, I have before me over two years of continuous observations of night reception in the broadcast band, and in these data I find no lunar effect, although they show a high correlation with solar activity and terrestrial magnetism.

Unfortunately, I am not aware that anyone has yet taken systematic observations of 2XAF, or in fact of any particular high frequency transmitter, over a sufficient period to show the presence or absence of lunar effect, as a thing distinct from solar and magnetic elements. Although Mr. Paulson's single month of observations cannot in itself prove anything one way or the other, nevertheless it may be of interest to compare this with magnetic and solar activity, and also with another variety of night reception. In the figure, I have first replotted his graph of 2XAF (which had rather uneven time abscissa in the original) and under it I have placed in descending order the diurnal range of the earth's horizontal magnetic field as measured at Cheltenham, Maryland, the Wolfer Provisional Sunspot Numbers and night reception at Newton Centre, Massachusetts, from WBBM at Chicago. The four curves appear to march together; if this be so, why give the moon any credit?

It is more difficult to discuss the purely physical side of the lunar hypothesis. But it might be well to call attention to the fact that full moonlight has less than one hundred thousandth the intensity of sunlight, and is in addition but feebly polarized. This earth receives more polarized light in a day from the blue sky than it gets in years of moonlight. Even the solar corona (which is shining all the time, eclipse or no eclipse) is a stronger source of polarized light than the moon. And on grounds which are hard to summarize briefly, I do not think that moonlight, regardless of intensity or degree of polarization, can have any measurable effect upon radio transmission. Two sets of electromagnetic waves may pass simultaneously through the same space, but each is transmitted just as if the other did not exist. The only known way in which one radiation, such as light, may affect the transmission of another radiation, such as radio waves, is by producing a change in the medium, such as ionization. Sunlight does this for our atmosphere, and the effect is pronounced; moonlight at most would produce one thousandth of one per cent. of the solar effect.
Following the "Southern Cross" to Brisbane

By J. Walter Frates*

Following in the tragic path of Captain Bill Erwin and Alvin Eichwaldt in the ill-fated "Dallas Spirit," the flight of the "Southern Cross," KHAB, from the Oakland Airport to Brisbane, Australia, across the untraveled airways of the broad Pacific, was not only the greatest feat in the history of aviation but also the final proof of the great value of short-wave radio communication for aviation and a great triumph for the amateur radio operators in all countries bordering on the Pacific.

Where the "Dallas Spirit," by its tragic tail-spin, left a question as to the reliability of short-wave radio for exceptionally long distances, the "Southern Cross" continued and left not the slightest doubt; nor as to the ability of amateur operators and their equipment to hold them in constant hearing.

When commercial and "non-amateur" stations had either long since given up the ghost or were having difficulties on the Pacific Coast, amateurs in San Francisco and Oakland were still listening to the steady drone of the transmitter and comfortably copying positions until KHAB reported itself beyond the Loyalty Islands and within a few hundred miles of Brisbane, where daylight intervened and the burden of communication was taken up entirely by the enthusiastic Australian and New Zealand amateurs, some of whom had been copying the signals since the first night out of Oakland.

Although they received tremendously important and valuable assistance from commercial stations in the United States, Hawaii and Australia, Kingsford-Smith, Ulm, Captain Lyons and James Warner owe a debt of gratitude to that indomitable fraternity which is amateur radio, for they found that where there are land and people there is not always a commercial station but there is always an amateur. On that long breath-taking hop from Kausi in the Hawaiians to Suva in the Fijis, when daylight placed a limit to the range of the transmitter, lonely amateur operators at cable stations in some of the smaller isles watched over them and let the world know of their progress and well-being. Among these was Fanning Island 1AJ;

*KHAB carried three transmitters, a short-wave tuned-plate tuned-grid, made by Ralph Heintz, 6XBB, of San Francisco, a duplicate of the ones carried by the "Dallas Spirit" and by Captain Sir George Wilkins on his polar hop, and the same one the "Southern Cross" used on its endurance flights; a 600-meter rig; and an auxiliary distress arrangement. The short-wave transmitter was used mostly, although Warner, the operator, went to 600 at various times to get bearings from passing ships and shore stations. The short-wave transmitter utilized a 50-watt tube and was powered by wind-driven generators on the wings. It operated on 33.5 meters and the key was kept closed when the operator was not sending. Radio beacons were received on the plane but Warner had difficulty with them at various times.

San Francisco Bay amateurs made great plans to cover the flight on the night before the hop.
"Just stick by us," Smithy and Warner told us over the phone. "We'll try to make it interesting for you of the A.R.R.L.” And they did.

As it passed out the Golden Gate, the "Southern Cross" QSO’ed 6ARD, a "non-amateur" station operated by the "San Francisco Examiner." Later it called 6AM and other coast amateurs but failed to hook. Throughout the day a steady watch was maintained from San Francisco and Oakland. 6IP and 6CZR copied the plane from 50T, furnishing information to the general public. 6CKC, 6BFU, and 6JS did likewise for an Oakland newspaper. 6RJ furnished dope to a broadcasting station. 6ALX and 6CGM assisted the other A.R.R.L. operators. 6AHB was also part of the listening staff, as was 6EDK. In San Francisco 6ARD attended to the wants of its proprietors, and 6KW kept a watch for a press association.

Amateur operators did not copy messages addressed to 6ARD, the "San Francisco Examiner," or personal messages, in spite of the fact that they were sent "QST 6ARD de KHAB" and that it was an emergency case in which the general public was interested. In the early evening, after about an hour on 600 meters, KHAB returned on short waves and Warner sent a broadcast to all amateurs informing them that the "San Francisco Examiner" would prosecute all those giving out messages addressed to 6ARD, under previous contracts. Some time later the men on the plane must have realized the injustice of this and of their danger if every amateur shut off his receiver, for, with the statement, "the world deserves to know what is going on with the "Southern Cross", they began to send information about the progress of the flight under a general Q.S.T. non-addressed. The incident brought up an interesting question as to whether an SOS would be considered by the "Examiner" as its personal property, and, if every amateur shut off his set and 6ARD could not receive the distress call, whether previous contracts would benefit the airmen following its transmission.

From the twilight hours of the first evening, a constant watch was maintained at 6CZR by the writer and 6IP, with the assistance of 6EDK, 6AHH, 6BDO, and Earle Ennis, writer and experimenter, until the plane passed the Loyalty Islands and daylight put an end to further work. Khab's signal strength varied from R4 to R7 and 8 during the entire flight. The greatest signal strength was recorded when the plane was nearing Honolulu and the sun was shining brightly on the Pacific Coast. The note was rougher than that of the "Dallas Spirit," particularly on the Kauai-Suva hop when the plane struck bad weather and Smithy maneuvered it with inhuman skill to 10,000 feet. Bad swinging was also noticed. Reports from wire services in San Francisco indicated that amateur reports were being treated as "non-amateur" stations, Navy radio and the commercial companies. Some of the latter lost the signals entirely. However, 6KW continued to work the press for San Francisco for the press services and the plane’s signals still drone into 6CZR.

Hawaiian amateurs also did excellent work. OH6CJL, who was one of the men who worked on the Dole flight skeds, reported in to the 6CZR operators through 6DBM of San Francisco that he was copying the plane easily and would stand-by. He was asked to QST the arrival on 19 meters but the signals did not get across OH6DUD, Wheeler Field, also agreed to QST on 20 meters, as did oh6ADH, who handled a lot of traffic for the aviators after their arrival at Wheeler. Other Hawaiians cooperated.

In Alaska a number of amateurs were asked to QRX for the plane’s signals and did so, among them na6ZZE at Bristol Bay and na7LY. Seventh-District amateurs scored at various times by furnishing perfect copy when copy in the Sixth District was patchy. A Seventh-District amateur did all operators a favor when he got into communication with a Nicaraguan station on the plane’s wave and asked him to QRT as he was QRMING the signals.

9CKF in South Dakota, inveterate of long-distance sked man, got his information on the progress of the flight from oh6HG and other Aussies and Zedders who were watching over the welfare of the Aussie air men in their daring jump across the awe-inspiring waste of the Pacific. 6CIS and 6CBS of Sacramento followed the progress of the plane from 6CIS, but were bothered with QRM.

Amateur stations in Australia, New Zealand, Japan, and China and other points were heard calling the plane at intervals during the flight, but failed to hook like the Americans and the Hawaiians, caused in all probability, by the fact that Warner was too busy with his own work to bother about QSO’s and that he was not hearing well on account of motor and generator QRM.

In the not-far-distant future when aerial fleets will be making transcontinental and transoceanic passenger and freight flights and will carry on their radio communication on a short-wave band similar to the marine work on 600 meters, a great deal of the credit for the work will be due to the pioneering efforts of the amateur, who devoted his time and equipment unselfishly for the advancement of the art and without a pecuniary interest.
**Acoustic Wave Filters and Audio Frequency Selectivity**  

*By R. B. Bourne*  

One of the greatest worries confronting the transmitting amateur is the great mutual interference which it is feared will obtain in the narrow bands next year. One of our crying needs, therefore, is a method for securing greater selectivity than we have ever known. The inherent principles of heterodyne reception are such as to produce interference in the telephones from any signals within an audible frequency difference from the desired signal, and we know no way of overcoming this fundamental difficulty by ordinary radio-frequency means. Electric band-pass filters may be used at "intermediate" or at audio frequencies to cut out unwanted signals. Their use at intermediate frequencies offers promise but of course involves the use of the superheterodyne. At audio frequencies the electric filter is quite expensive, bulky, and very likely to have considerable losses. This article describes another device to accomplish the same end—an acoustic band-pass filter. It is beautifully effective if the received signal is what it should be—and what it must be to survive next year. The filter described may be built by any amateur at trifling expense. It should be a part of every amateur's preparation to meet 1929 conditions. Its use will guarantee, we believe, the successful employment of the autodyne receiver next year. Taken in conjunction with Mr. Hull's article in this issue on transmitter adjustment, we feel encouraged to prophesy successful operation in 1929 with equipment differing but little from that of to-day.—Editor.

**THE** need for greatly increased selectivity in e.w. receivers becomes apparent immediately that serious thought is given to the problems confronting the transmitting amateur. In order to use satisfactorily the narrowed amateur transmission bands to be in effect at the first of next year, we must be able to crowd into those bands not only all the stations now operating within them but also foreign stations as well. It is with this nice problem in mind that the writer presents this paper.

Let me say at the start, however, that the success of the devices to be described in the following pages is bound up irrevocably with and is dependent entirely upon vital improvements in transmitters. As will be pointed out shortly, our transmitters to utilize effectively the possible selectivity in receivers, will have to have a steady, pure wave. Just how steady and how pure this will have to be will be shown. Crystal-controlled d.c.-plate-supply transmitters will, of course, be ideal.

To get a picture of the selectivity obtainable by the use of acoustic wave filters in conjunction with a good autodyne receiver, consider a receiver operating at say 7000 kcs. (40 meters), using a 50-mufd. tuning condenser. Imagine we are receiving a signal from a local oscillator, B-battery supply and rigidly constructed. The note is pure and steady. We can probably tune this signal in and out again on the other side of zero beat in say three degrees of our tuning condenser dial. This means that 1.5 degrees are used in changing the beat note from zero to say 10,000 cycles. Now suppose we have a vernier tuning condenser of such size that this range of 0 to 10,000 cycles is made to extend from zero to 100 degrees on the dial of the vernier. Acoustic wave filters can easily be made which will pass a band of audio frequencies of any desired width and with one particular filter in mind, our steady d.c. signal would be heard over but three degrees of the vernier dial! This would seem to indicate that some thirty other signals could

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be present in the range of the vernier, but it should be pointed out that, with the ordinary autodyne, a beat note of given pitch can be heard in two places on the tuning dial, so perhaps it would be more conservative to say that the selectivity has been increased to such an extent that fifteen times as many stations can be accommodated in a given band as at present. Such selectivity is undoubtedly desirable. It is useful, however, only if practically all

the energy of the beat note is concentrated within the limits of the pass-band of the filter. The acoustic wave filter makes possible the reception of an R8 signal in the presence of an R8 signal differing in frequency only 100 cycles.

Consider Fig. 1. This shows the frequency spectrum of a steady but impure note plotted against intensity. Such a note is produced by the average indifferent plate supply. In case the frequency of the transmitter is wobbling, as well, Fig. 1 represents an instantaneous set of values which shift around as the transmitter wave shifts. With no filter in the audio end of the receiver, all these components register upon the ear, generally with the effect sometimes called “noise.” Many of the components do not contribute to the “audibility” of the signal, since their effect is masked by other and more intense components. A considerable percentage of the energy sent out is thus unavailable, in any case, for the production of maximum signal strength. If, now, an audio-frequency filter is inserted in the output, so as to attenuate all frequencies excepting a very narrow band, we see, still referring to Fig. 1, that a large percentage of the total energy present is cut out and the net effect on the ear is a signal very much reduced in intensity, sounding not at all like the unfiltered signal. Only those components of the complex audio frequency which lie within the pass-band of the filter will get through. The shaded area represents the unavailable energy.

The solution of this difficulty immediately suggests itself. Let us put as much as possible of our energy in one frequency lump and tune our receiver so that this frequency falls within the pass-band of the filter. Then we will have a state of things such as is shown in Fig. 2. Here, our pure note, excepting a few weak harmonics, is all nicely concentrated, and comes through the filter unattenuated. Excepting for slight resistance losses, which increase with the frequency, filters can be made to have zero attenuation within the pass-band.

Granting a pure wave, the filter will still be useless unless the beat note can be held within the pass-band of the filter. A “chirpy” note will swing across the band and only parts of the transmission can be heard. With both the impure note and the swinging and wobbling note, the apparent selectivity is not a bit improved since, with the former, we may tune into any set of components, there being several, and with the latter, we may catch the note on any part of its swing. The note must be pure and it must be steady. If perfect steadiness is not practical, then we may widen the width of the pass-band, to allow the note to do a little swinging. The selectivity will suffer, of course, in proportion to the increased width of the pass-band.

What filters can be employed to accomplish these results? Either electrical or acoustic wave filters. The former, to be effective for our purpose, turn out to be expensive and cumbersome. Acoustic wave filters may be readily built by anyone capable of doing mechanical work such as is usually associated with the construction of a good receiver.

Many amateurs, when the word “filter” is mentioned, visualize a 30-henry choke coil and a condenser with as many microfarads as the pocket-book can afford. Electric wave filters, which were invented by Campbell, are structures which have negligible transmission loss over a definite range or ranges of frequencies and have an appreciable transmission loss at all other frequencies. Such structures generally take the form of recurrent similar networks comprising series and shunt elements. The theory

supposes either an infinite number of similar sections in cascade or a finite number of sections terminated in a structure the impedance of which is equal to the characteristic impedance of the filter. From three to five sections are generally sufficient to give all the attenuation desired for frequencies it is desired to suppress. Terminating or inaugurating a filter improperly gives rise to reflection effects which disturb the operation of the structure. A filter is therefore designed to work out of and into a certain impedance.

Probably the simplest and most familiar filter is the "low-pass" type which passes currents from zero frequency (d.c.) up to a certain frequency called the "cut-off" frequency, and attenuates currents of all frequencies. A "band-pass" filter readily passes currents of all frequencies lying within the upper and lower limits of the band and bars all others.

G. W. Stewart made a series of studies of the acoustic wave filter as an analogue of the electric wave filter. His theory assumed lumped constants and no progressive wave motion within the device. This means that the dimensions of the series and shunt elements comprising the filter are small, say a tenth, compared to the wavelength. With a given physical structure, the dimensions of which are small compared to the wavelength of the sound dealt with, it is easy to see that this important relation soon fails to hold if the frequency increases very much. In other words, it is impossible to build an acoustic filter which is the exact analogue of its electrical counterpart because the constants—inductance and capacity—cease to be "lumped" and become distributed. A combination of electric lines would seem to resemble the acoustic filter. The theory underlying the principles of the acoustic wave filter employing distributed constants has been dealt with by Mason and is beyond the scope of this paper. In reality, the low-pass filter, in the acoustic case, is a multi-band-pass filter, wherein several groups of frequencies come through.

For our purpose the "lumped constant" filter theory will serve well enough, since, with the band-pass filter to be described, the next and higher transmission band occurs at a sufficiently high frequency to be of little importance and the observed and calculated values of the main band agree within the limits of observation (5%).

A picture of acoustic inductance and capacitance may be obtained by considering a bottle-like resonator. Again, assuming the dimensions of the resonator to be small compared to the wavelength of the sound, let us see what happens when an incident sound wave is impressed upon the neck of the resonator. The small plug of air in the neck moves back and forth more or less as a whole, suffering little or no compression. The motion of this short column of air compresses and rarefies the air within the closed cavity. The compression is accomplished with little motion. Here, then, we have acoustic inductance in the neck and acoustic capacity in the closed cavity. We would expect such a system to oscillate when excited by a current of air blown across the mouth of the neck, and furthermore to oscillate at a frequency determined by the inductance of the neck and the capacity of the cavity. It does. A resonator exposed to a sound wave of its resonant frequency amplifies the intensity in the neck of the resonator.


A short tube open at both ends, then, acts as an inductance, while a small closed cavity acts as a capacitance, "short" and "small" being used in a comparative sense. We may have an acoustic inductance without appreciable capacity but not a capacity without inductance, since even a hole of the smallest conceivable length presents some inductance. By properly choosing an arrangement of tubes and cavities, we can build an acoustic wave filter with predetermined characteristics, insofar as the limits of theory permit.

We have now to establish the necessary formulae for acoustic inductance and capacity. Their derivation will not be given and we write simply:

**Acoustic Inductance**

\[ L = \frac{1}{\omega} \frac{\pi}{s} \]

where \( l \) = length of tube (inches),
\( \omega \) = density of air,
\( S \) = cross sectional area of tube (sq. in.).

**Acoustic Capacity**

\[ C = \frac{V}{a^2 \omega} \]

where \( V \) = volume (cu. in.),
\( a \) = velocity of sound (18,600 in. /sec. at room temperature).

It happens that, in the formulae encountered, \( \omega \) cancels out so we need not worry about its value. This also means that barometric pressure does not affect the values of the cut-off frequencies. We introduce another term "conductivity", which is useful in simplifying formulas.

**Conductivity**

\[ K = \frac{\pi S}{L} \]

and is equal to the diameter of a round hole in a thin plate, where that form of coupling to a cavity is used. The length \( l \) of a tube must be corrected for the flaring out effect at the end of the tube and we use this correction \( \frac{\pi R}{2} \) where \( R \) is the radius of the tube. In the case of tubes as side branches, we measure the length of the tube starting from the center of the main channel tube and not from its edge. No end correction, of course, applied to a tube closed at one end.

Fig. 3 shows an electrical low-pass filter of four sections (T type) and its acoustic counterpart. We choose this type of low-pass filter rather than the simpler one in which there is no inductance in series with the shunt capacity since, if we try to make an acoustic capacity without an inductance in series with it, the question arises as to whether the capacity is in shunt or in series with the main channel inductance. Furthermore, this type of filter gives a sharper cut-off than one consisting of series inductions and shunt capacities.

Since these are low-pass filters the lower cut-off frequency \( f \) = \( 0 \). For the electric filter the higher cut-off frequency is \( f \).

\[ f_{1} = \frac{1}{2\pi} \sqrt{C_{2} \left( L_{1} + L_{2} \right)} \]

and for the acoustic filter

\[ f_{2} = \frac{\alpha}{2\pi} \sqrt{\frac{E_{1}}{V_{x}} \left( 1 + \frac{1}{R_{2}} \right)} \]

which formula is directly obtainable from the electric case by substituting the acoustic values therein.

While we may use a low-pass filter having a cut-off at say 500 cycles, with considerable success, a band-pass filter is more desirable. For the latter, we choose a network which is readily reproducible in the acoustic form. Fig. 4 shows both the electrical and acoustic filters. In this case, we have attenuation from 0 up to \( f \) = \( f \) on up, there being no attenuation within the range \( f \) = \( f \).

For the electric filter, we have

\[ f_{1} = \frac{1}{2\pi} \sqrt{C_{3} \left( L_{1} + L_{2} \right)} \]

\[ f_{2} = \frac{1}{2\pi} \sqrt{C_{3} \left( L_{1} L_{2} + L_{1} L_{2} + L_{2} L_{3} \right)} \]

and for the acoustic filter

\[ f_{1} = \frac{\alpha}{2\pi} \sqrt{\frac{1}{V_{x} \left( 1 + \frac{1}{R_{2}} \right)}} \]
Inspecting these formulae, we see that both \( f_1 \) and \( f_2 \) vary inversely as the square root of the volume of the chamber \( V_s \). This means that we may shift the location of the pass-band by varying the length of the tubular chamber \( V_s \) as with a piston-like plug. Fig. 5 shows a plot of these two frequencies versus the length \( l \), for the filter shown.

For the benefit of those interested, the appendix contains the derivation of some of these formulae. We will, at this point, go through the calculations involved in designing the particular band-pass filter shown in the illustration.

We chose, as a suitable size, brass tubing \( \frac{3}{8} \)" outside diameter and \( \frac{5}{16} \)" inside diameter. For the Volume \( V_s \), we use brass tubing \( 1 \frac{3}{16} \)" inside diameter. We make \( l_4 \), the diameter in the main channel from section to section, 1.25 inches. \( S_4 = \frac{.077}{3}. \) sq. in. \( R_4 = \frac{.166}{3}. \) in. \( l_4 = 2.25 \) in.

\[
K_4 = \frac{S_4}{l_4} = \frac{.077}{2.25} = .0615
\]

\[
K_2 = \frac{S_2}{l_2} = \frac{.077}{\frac{78 + \frac{\pi}{2} \cdot \frac{.156}{2}}{16}} = \frac{.077}{78 + 245 + 188} = .0635
\]

\[
K_3 = \frac{S_3}{l_3} = \frac{.077}{\frac{.0615 \cdot \frac{.156}{2}}{2}} = .0745
\]

\[
V_3 = \pi \left( \frac{\frac{3}{16}}{2} \right)^2 X l_3 = 2.5 \text{ cu.in.}
\]

\[
\frac{d}{2 \pi} = \frac{130 \times 12}{2 \pi} = 2160
\]

Substituting, we have

\[
f_1 = 2160 \sqrt{2.5 \left( \frac{.085}{1.0745} + 1 \right)} = 2160 \sqrt{73} = 253 \text{ cycles/sec.}
\]

\[
f_2 = 2160 \sqrt{\frac{.0635}{2.5} \left[ 1 + \frac{4 \times .0615}{.0635} - 1 \right]} = 2160 \sqrt{0.0249} = 239 \text{ cycles/sec.}
\]

The observed values for \( f_1 \) and \( f_2 \) are 245 and 235 cycles, respectively, a close agreement.

In designing a filter of this type, the lower cut-off frequency may be assumed and the side-branch system designed for it, since the distance between sections in the main line does not affect this value. Once the dimensions of the side branches are fixed, the upper cut-off may be determined by assuming the dimensions of the main channel. It simplifies the calculations to use the same size of tubing for the main channel as is used for the tubes involved in the side-branches. Of course many other arrangements of elements are possible, and the reader, using the information contained herein and in the Appendix, may design any type of filter, being always careful not to exceed the limits imposed by the theory.

For our terminating impedance, we use the resistance of the rubber tube of the listening device, in this case a Dictaphone head-set. This will attenuate some of the higher frequencies, as well, so that the over-all effect is about as it should be. Since the filter is made in five sections, the maximum total attenuation in the stop-bands is very high, of the order of 60 TU. TU is the abbreviation for "transmission unit" and the number of TU's by which two power levels \( W_t \) and \( W_s \) are said to differ is given by the relation.

\[
N_{TT} = 10 \log_{10} \frac{W_t}{W_s}
\]

On this basis, 60 TU represents a loss in the ratio of a million to one, or an intensity ratio of a thousand to one. Within the transmitted band there will be some attenuation due to friction in the filter and in the stethoscope tubes. To make up for this, an additional stage of audio-frequency amplification is recommended.

The acoustic wave filter is not in any way presented as a static eliminator, but it will be noticed by those using the device that there is a material reduction in noise. Since the audio-frequency components of noise cover practically all frequencies, some of them will lie within the pass-bands of the filter.

The filter is inserted between a single telephone receiver and the stethoscope. If a loudspeaker is to be used after the filter, the whole arrangement must be sound-proofed by placing in a suitable box of ample dimensions; otherwise, sounds emerging from the open tubes of the side branches will affect the apparent performance.
CONSTRUCTING THE FILTER SHOWN

The band-pass filter described previously is very easily built, the only tools required being a hack-saw, files, hand drill, soldering iron, vise and possibly tin-snips. No lathe work is necessary. A blow-torch may be used.

Fig. 8 shows a sketch of the first section of the filter. All sections being similar, the work is greatly simplified. Saw off a piece of the \( \frac{7}{8} \)-in. tubing 7\( \frac{1}{4} \) in. long and place in a vise. Starting 1\( \frac{1}{4} \) inches from one end, make prick-punch marks every 1\( \frac{1}{4} \) inches. These locate the holes through the main tube. Using a 5/16th-in. drill, taking care to keep it at right angles to the axis of the main tube, drill right through. We now have the main tube complete, with two lines of holes.

We next make all the side-branch tubes. These are done one at a time. File the end of a long piece of tubing stock to fit the main tube. This is readily done with a 5/16-inch rat-tail file. When the fit is accomplished, saw off and trim five such pieces, measuring 0.6 in. from the bottom of the groove to the end. Make five others 0.78 in. long, measured from the bottom of the groove. Making the side tubes in this manner reduces the possible wastage, since it is difficult to file a groove to fit and to dimensions at the same time.

Next, we solder the side tubes to the main tube, taking one of each size for the pair. The three tubes are soldered at the junction point simultaneously by holding in the vise, the jaws of the latter embracing the flat ends of the side tubes. Take care that no undue amount of solder runs into the main channel. When both tubes are in place, their axes should coincide. Proceeding in the same manner, solder on all the pairs of side tubes, protecting the soldered ones from the heat by wrapping with a wet cloth. On account of the diameter of the cavity used, it is necessary to stagger the adjacent sections as shown in the photograph of the filter. Adjacent tubes on one side of the main tube thus will be alternately short and long.

Now cut out five discs of thin brass, 1\( \frac{1}{2} \) inch in diameter, and drill a 5/16-inch hole in the center. Solder one of these to each of the flat ends of the five 0.6-inch side tubes. Cut out five more discs with no hole to be used in closing the far end of the tube forming the volume \( V \). These cavities are made from 1-3/16 inch inside-diameter brass tubing 2\( \frac{3}{4} \) inches long. Solder these to the five discs previously attached, then solder on the plain discs at the ends of the large tubes, and the job is done.

If a higher range of frequencies is desired for the pass-band, make the length of the large tube \( (l_r) \) less than 2\( \frac{1}{2} \) inches. The relation between these frequencies and the length of the large tube has previously been given.

The filter becomes a low-pass filter if the open tubes be closed. It is an interesting experiment.

APPENDIX:

Referring to Fig. 7, we write, from Kirchoff's Laws,

\[
I_n Z_1 + (I_n - I_{n+1}) Z_2 - (I_{n-1} - I_n) Z_2 = 0
\]

collecting terms

\[
I_n (Z_1 + 2Z_2) - (I_{n+1} + I_{n-1}) Z_2 = 0
\]

\[
\frac{Z_1 + 2Z_2}{Z_2} = \frac{I_{n+1}}{I_n} + \frac{I_{n-1}}{I_n} = \frac{1}{I_{n+1}} + \frac{1}{I_{n-1}} + \frac{I_{n-1}}{I_n}
\]

Now the currents in successive stages change logarithmically, and satisfy the relation

\[
\log \frac{I_n}{I_{n+1}} = P, \text{ or } \frac{I_n}{I_{n+1}} = e^P.
\]

Where \( P \) is the propagation constant and equals by definition \( A + jB \). The real part of this expression, \( A \), is the attenuation constant, while \( B \) denotes the phase shift from section to section.

\[
\therefore \frac{Z_1 + 2Z_2}{Z_2} = \frac{1}{e^P} + e^P = e^P + e^{-P}
\]

\[
1 + \frac{Z_1}{2Z_2} = \frac{e^P + e^{-P}}{2} \equiv \text{Cosh } P
\]
Now Cosh P can never be less than $+1$ nor greater than $-1$. Therefore for values of $1 + \frac{Z_1}{2Z_2}$ which lie between $+1$ and $-1$, $P$ is imaginary and $A = 0$. This means a "pass-band" and no attenuation. Equating,

$$1 + \frac{Z_1}{2Z_2} = +1 \text{ or } \frac{Z_1}{Z_2} = 0$$

$$1 + \frac{Z_1}{2Z_2} = -1 \text{ or } \frac{Z_1}{Z_2} = -4$$

These are the limits of no attenuation. Referring to the band-pass filter of Fig. 4,

$$Z_1 = j\omega L_1 \text{ and } Z_2 = \frac{1}{\frac{j\omega L_1}{Z_2} + \left(1 - \frac{\omega^2}{L_3 C_3}\right)}$$

$$= \frac{j\omega L_2 - j\omega^3 L_3 C_3}{1 - \omega^2 L_3 C_3 - \omega^2 L_2 C_3}$$

$$\frac{Z_1}{Z_2} = \frac{j\omega L_1 - j\omega^3 L_1 L_3 C_3}{j\omega L_2 - j\omega^3 L_2 L_3 C_3}$$

Substituting the acoustic values, we have

$$f_1 = \frac{1}{2\pi} \sqrt{\frac{V_3}{\alpha^2 \rho} \left(\frac{K_2}{K_3} + \frac{K_2}{K_3}\right)} = \frac{a}{2\pi} \sqrt{\frac{V_3}{\left(\frac{1}{K_2} + \frac{1}{K_3}\right)}}$$

Rearranging the expression for $f_z$, we have

$$f_z = \frac{1}{2\pi} \sqrt{\frac{V_3}{\alpha^2 \rho} \left(\frac{K_2}{K_3} + \frac{K_2}{K_3}\right)} = \frac{1}{2\pi} \sqrt{\frac{C_3 L_1}{L_2} \left(\frac{L_3 + L_2}{L_2} + \frac{4L_2 L_3}{L_1}\right)}$$

Substituting in the expression for $f_t$, we have

$$f_t = \frac{1}{2\pi} \sqrt{\frac{V_3}{\alpha^2 \rho} \left(\frac{K_2}{K_3} + \frac{K_2}{K_3}\right)} = \frac{a}{2\pi} \sqrt{\frac{V_3}{\left(\frac{1}{K_2} + \frac{1}{K_3}\right)}}$$

The Jenkins Laboratories, 1519 Connecticut Ave., Washington, D. C., announce a series of television transmissions especially for A.R.R.L. members on each Monday night commencing July 2d. The transmissions begin at 8 P.M., Eastern Standard Time, and continue for one hour. The call is 3XK, the frequency 6420 Kc. (46.73 meters), 15 pictures per second, 48 lines per picture. In each transmission simple subjects will be sent the first five minutes, then more elaborate subjects for five minutes each, followed then by a picture story.

Mr. Jenkins calls the transmissions "broadcast motion pictures". Each subject will be preceded by a code announcement, and each picture will conclude with the word "End", which will mean, of course, to throw the switch back to the loudspeaker for next announcement. For the first several weeks only silhouettes will be transmitted; later halftone pictures will be broadcast. If sufficient interest is shown, transmissions will be increased to twice or three times a week. Amateurs receiving these transmissions are requested to advise the Jenkins Laboratories and A.R.R.L. Headquarters.
Some More About Amateur Television

By Harold P. Westman, Technical Editor

The article that appeared on page 17 of the May, 1928, issue of QST gave a considerable amount of information pertinent to television reception equipment in general and touched to some extent upon the particular transmissions from WGY at Schenectady. Unfortunately, at the time it was written, we had no definite schedules on these transmissions and in spite of a footnote to this effect have received a large number of requests for additional information.

The present schedules from WGY are as follows:

Sunday—10:15 to 10:30 p.m. E.D.S.T.
Tuesday, Thursday and Friday—1:30 to 2:00 p.m. E.D.S.T. At such times as these schedules are run, announcements are made concerning the others and it is very probable that if any change is made in this schedule, those listening in will be informed to that effect. Transmission takes place on two frequencies, the regular broadcast frequency of 790 kc. and a higher frequency two frequencies, the regular broadcast frequency of 790 kc. and a higher frequency two frequencies.

A 24-line picture is sent at the rate of 20 per second in these transmissions which means that if you have constructed a disc with 48 holes you must either cover up each alternate hole or lay that disc aside for use on the Jenkins transmissions mentioned elsewhere in this issue. The scanning disc should revolve at the rate of 1200 r.p.m.

Many seem to be having difficulty in laying out the spiral. There are three prime things to be considered in such a problem: the number of lines per picture, the proportions of the picture, i.e., square or rectangular, and the dimensions of the picture. The first two of these are important and if they are changed will result in inaccuracies in the picture or distortion. If the wrong number of holes is used, the results will be nil, whereas if the proportions are incorrect, the picture will appear to be stretched in one dimension and compressed in the other. From this we see that the number of holes must be correct and that the proportions may vary somewhat. The dimensions can vary considerably, for if the picture is made too large, the effect will be that of using a coarse screen in printing.

We know that there must be 24 holes, the proportions of the picture are approximately square and slight variations will not be extremely damaging. The size of the picture will depend upon the amount of illumination which one gets from the neon tube.

Suppose we want a picture of about 1" by 1". It will not be exactly square because the holes are to be an equal number of degrees of a circle apart rather than an equal linear distance apart. Start out with a disc of about 8 inches in diameter and draw a circle of about seven inches in diameter. Leaving the compass set at the radius of the circle, mark off equal divisions around the circumference of it. The circle will then be divided in six parts. Laying a rule across opposite points, draw lines through the center and across the entire disc. You will have three such lines. The arc of the circle between each adjacent pair of lines must then be subdivided to give three points. This can be done by "cut and try" and should not prove to be very difficult. After drawing straight lines through the opposite points, we have a circle divided into 24 triangular shaped pieces. The dividing lines are spaced an equal number of degrees apart.

The next thing to do is to mount the disc on its hub being sure that it is not mounted off center to the circle already inscribed. A way to check this is to prick-punch the center of the shaft and while it is being rotated by the motor, press the end of a drill against the punch mark. A small amount of metal will be cut off and the drill will find the center of the shaft. Using this as the center, the compass may be used to indicate how far off its proper position the disc may be.

Run the ¼" shaft on which the disc is to be mounted through the hub so disc is to be mounted through the hub so that about an inch of it sticks out of the hub. Tie a piece of light string so that it will not slip around the shaft and with about half a turn around the shaft, make a loop in the end that will accommodate a lead pencil. The point of the pencil can then be made to trace a spiral as it is revolved around the shaft. The cord will be shorter after each full revolution by an amount approximately equal to the circumference of the shaft. If the disc is of metal and self supporting, the pencil can be held still and the disc and shaft revolved under it. This should result in greater accuracy as the inclination of the pencil can be made more constant. If the pencil is moved, see that it is as near to being perpendicular to the face of the disc as it can be held.

Now, measure the distance between two adjacent lines of the spiral with the com-

(Concluded on Page 58)
Army-Amateur Activity in the Philippines

The Story of op1HR

As originator of the plan of affiliation between the Signal Corps of the U. S. Army and the transmitting amateur, and as the Army-Amateur Liaison Agent during the first ten months of the Army-Amateur activities, Captain Tom C. Rives will long be remembered by League members. Though now stationed at Fort William McKinley, in the Philippine Islands, Captain Rives maintains the same interest in amateur work as this article, prepared by him with the cooperation of Captain Robert A. Willard and Lieut. G. A. Bicher, clearly indicates.—Editor.

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MATBUR Radio Station op1HR is owned and operated by the 12th Signal Company, Philippine Scouts, United States Army. The station was built and put into commission in March, 1925, by Lieutenant H. P. Roberts, Signal Corps, United States Army, and since that time has been operating with splendid success.

The station is located on top of what is known as Signal Hill in the Army Post of Fort William McKinley, Rizal, P. L. and is approximately five miles southeast of the city of Manila. The operating “shack” is at one end of what was originally built for a gun shed. The walls and floor are of rough planking and the whole place is open to any favorable or unfavorable breezes that may blow. During the typhoon season, when QRT usually is terrific, the rain and wind travel almost horizontally and it is naturally difficult to keep the station in any degree of dryness. The temperature, however, does not vary a great deal in these parts and is generally about eighty degrees in the shade.

Shortly after the station was installed, a daily schedule (Sundays excepted) was started with 6BJX, Ernest Knoch, Los Angeles, Calif., and this schedule was kept practically without interruptions until December, 1927, at which time Knoch informed us that due to business and ill health he was forced to give up the schedule. This was a sad blow to us as we had formed many pleasant associations with him. However, he is certainly to be complimented on the regularity with which he kept his schedules. During a 26-month period he handled approximately 8,000 messages averaging 25 words each—and he lost many hours sleep to do this for there is quite a time difference between the two stations and the schedule started at ten thirty at night Manila time. The following is quoted from a letter from the Commanding Officer, 12th Signal Company (P.S), to Ernest Knoch: “If the officers of this Garrison and others who take advantage of your courtesy ever owed anyone a debt of gratitude, they certainly owe it to you. You probably don’t realize what it means to us over here to be able to get messages to the United States and obtain replies in a fraction of the time it takes by mail—speaking not only for myself but for all the others over here we certainly appreciate the service you are rendering us.”

In December, 1927, when 6BJX gave up his schedule, over six hundred messages accumulated on the book. Finally 6AMM, Bruce Stone, San Jose, Calif., stepped in and said he would take the traffic. By the third week in January the hook was clear and we have been able to keep it that way ever since. Most of these messages were Christmas greetings from the American personnel doing their bit in the islands. Many a mother’s heart was gladdened by these messages and if the recording angel is on the job one more amateur will have a cushion seat when he arrives in Heaven.

The messages handled are not normally the “greetings by radio” variety but are mostly honest-to-goodness messages that the Army personnel here send back to their relatives and friends in the United States. Op1HR also handles quite a few messages from low powered stations all over the

*Published by approval of the War Department.
islands and has regular schedules with stations in China and Hawaii. At the present

**OPIHR AT FORT WILLIAM MCKINLEY IN THE PHILIPPINES**

The operating table from which the T.G.T.P. transmitter is remotely controlled—two DX power switch control rod. Capt. Willard, Commanding Officer, 12th Signal Co., is standing behind Sgt. Balbuena.

OPIHR handles the weather reports between the observatories in Shanghai and Manila.

All messages originating at OPIHR are rigidly censored by the Commanding Officer of the 12th Signal Company to see that no message of a business or commercial na-

ture, that may be construed as competing with commercial radio companies, is transmitted. This brings up points of an extremely tantalizing nature when the censorship of OPIHR is applied to the relay traffic from other amateur stations.

OPIHR is an Official Relay Station of the A.R.R.L. and is a member of the WAC Club. As an emergency station (WUCD) in the Philippine Department Net, it works with such detachments of United States troops as are sent out on special missions throughout the islands. In case of emergency it can be operated by remote control from Fort Santiago (Department Headquarters), being directly connected by land line telephone and telegraph lines. For all this work two fifty-watt tubes in a tuned-grid tuned-plate circuit are used. The receiver is the conventional two-tube autodyne. The normal wavelength used is 39 meters.

All the members of the organization interested in the station are Filipinos with the exception of the commissioned officers, who are Americans. The present Commanding Officer, 12th Signal Company, is Captain Robert A. Willard, Signal Corps, United States Army. George A. Bicher, 2nd Lt., SC, U.S. Army, is the Officer in charge of the station.

The station is open every day from 4:00 p.m. (Manila Time) until midnight. Most of the traffic goes to the United States and, due to the regular schedules kept by such stations as 6BJX and 6AMM, there is little difficulty in clearing the hook. Approximately four hundred messages, averaging twenty-five words each, are handled each month.

Some More About Amateur Television

(Continued from Page 30)

pass or pair of dividers and locate an arc of the spiral between two of the radius lines that is the same length. Using the outermost point as the first hole, mark off the other 23 points along the spiral working towards the center.

If a metal disc is used, the holes can be drilled with a small drill. Holes should be just large enough to overlap and the size will be equal to the height of the picture divided by the number of holes. In this case it amounts to .036" and a No. 60 drill which is the smallest easily procurable and .040" in diameter should be used. If a hand drill is used, cut off the smooth shank of the drill so that it can be mounted in the chuck with only about 1/4" or 3/8" extending. This will save drills as it is very easy to snap them when they are so thin and extend very far out of the chuck.

From the information given above, it should be possible to lay out most any sort of a scanning disc and provided the work is carefully done, the results should be gratifying.
The 1928 International Relay Party

By Louis R. Huber*

When the logs are checked, the messages are counted, and the tallies have been set down. The Award Committee, in all its solemnity, has yielded the Wouff-Hong and the Rettysnitch, and has adjourned. The International Relay Contest of February, 1928, is all done—but the shouting.

"The guests are met, the feast is set—
May'st hear the merry din"

. . . Who won? 1ASF did, with a fifty-watt transmitter and no extra operators. He shouted the loudest, in those two glorious weeks last winter, in spite of the fact that a steam shovel nearly wrecked his transmitting antenna mast. There's no need to wish him more power by way of congratulation; in the first place, he doesn't need it, and in the second, he'll have it, just as soon as he chooses the Grand Prize.

Canadian 1AR led Canada, and by the rules gets Grand Prize number two. Among the next twenty-five, all of whom are United States amateurs, every district is represented. Some mighty fine prizes will go to the fellows in "the high twenty-five".

There are several interesting aspects of the contest which should be pointed out. In the first place, everyone enjoyed it tremendously, or else we can't believe the reports that were turned in. We're so impressed with the fun that the contest afforded that we believe the prizes are a secondary matter. Perhaps the idea was best expressed by R. M. Brown, of n0GREN, who said: "You may disqualify me for something I have not done or have done (though I have done my best to do everything as it should be) but you will not be able to take away the enjoyment I have had, and for that I thank you".

Another aspect which most surely is of great importance is the amount of good will and acquaintance stirred up between this continent and other lands. Why, bless us, if we don't think that working five "new" countries is not as good or better, in the line of diplomacy, than sending a delegation to the League of Nations. And it actually costs less!

A number of WAC certificates were awarded as a result of the contest. The number of QSL cards handled at headquarters for foreigners and NU-NC amateurs was tremendous.

Special mention must be given to 1ASF on the score of being the only NU or NC station to work Sweden, 6DHS takes the honor for being the only one to work Argentine. 2AOL had Egypt all to himself; and 1KH took the Netherlands.

Now let's say a word about the participants outside the "nu" and "nc" classification. Their logs. . . . and their message files!! Some of these are works of art; they deserve encomiums into some fine museum. British 6BY turned in a beautiful report that counts up to the figure of 573. He leads all others in Great Britain and elsewhere by hundreds. Second to him comes Belgian 4AU, with 486 points. Porto Rican 4SA is third with a score of 405. Australian 7CW comes fourth with 399; and New Zealand 3AR lands near our own level with 328. In each foreign country where an amateur took part, the station with the highest score will receive a prize.

Among the gleeful shouts of the prize-winners will be mingled weeping and the gnashing of the teeth of those who made so bold as to operate off-wave. 1IC might have been sixth in the United States, but he thought the grass across the fence grew greener. 2CRB might have been eighth, but he, too, strayed from the straight and narrow path. 8AXZ might be sporting some new apparatus as a reward for being fourteenth. 1AXA and 2CUQ were in the "big money", but watchful ears heard; accusing and irrefutable reports came in!! The rest who were disqualified for unfair play, although having scores too low for prizes, are:

1BW, 5KC, 1ALR, 2AVB, 2BFQ, 3AFW, 4EC, 9DPW, and 9AMN. All disqualifications have been made only after concrete and irrefragable proof has been presented. Official Observers' reports played a part; a special watch at 1MK was kept, and in each case the log of the offender was found to check with the accusation. But let us leave the Vale of Tears and gaze upon the calls of those who reached the Promised Land:

1ASF—305 nc1AR—105

| 2ALU—295 | 6AM—166 |
| 2TP—289 | 9EZ—152 |
| 8GZ—285 | 9DRD—149 |
| 1CM—241 | 3TH—148 |
| 4PV—221 | 1WL—156 |
| 9DNG—213 | 1ABA—155 |
| 1HRS—209 | 1AZD—153 |
| 5WE—202 | 7DP—153 |
| 8ARC—201 | 9ARA—131 |
| 4WE—195 | 9CK—125 |
| 4BL—194 | 50L—123 |
| 8KJ—188 | 5AG—122 |

* Assistant to the Communications Manager.
The task of awarding the prizes is a large one. It has only begun at this writing. Choices have to be asked—they must go by mail. The winners highest in the list have the privilege of selecting the prize-group which they like best. We are doing our best to satisfy everyone and to make the awards fit the winners. We ask the prize-winners to have patience.

The list of prizes appeared on pages 33, 34, 35, and 44 of February, 1928, QST. Some very desirable groups have been made up from these donations. They range from twenty dollars up to $350 or more. We are grateful for additional late donations for the contest from the following manufacturers:

Pacific Engineering Laboratory Co. ... $18.00
One set of 10 Peleo short wave receiving coils, including the set for the RF amplifier.
Chicago Radio Apparatus Co., Inc. ... $7.50
One set of Ohi-Rad short wave coils.
Allen-Bradley Co. ... $6.50
One Radiostat variable resistance for transformer primary.

Amateur Calls Changing

OFFICIALLY all Canadian amateur calls now begin with the letters “VE.” Canadian amateur licenses are always dated to expire on the same day, annually—in April, if memory serves. When licenses were reissued this year they bore new calls, consisting of the letters “VE” followed by the numeral and letters of the old call. This is in accordance with a provision of the Washington Convention, obligatory the first of next year. Thus, for example, the station which we always referred to as nC9AL and which was really assigned 9AL for a call and which combined the letters “nc” with two other letters to make an amateur intermediate, is now licensed as VE9AL. Inasmuch as the first two letters indicate nationality, in accordance with a subdivision of the alphabet incorporated in the Washington Convention, the old intermediate “de” is supposed to be used. Canada has acted this early, however, only because present licenses will run until next Spring.

All of us in this country will have our calls changed too. The League has suggested that the calls of amateurs in continental United States begin with the letter “W” and those in distant territories and possessions with the letter “K”. Such distinction is necessary in order to recognize a Hawaiian, an Alaskan, a Porto Rican, etc. This idea we believe will receive favorable consideration in Washington, and in fact it would seem that renewal licenses are now coming back with the letter “W” in front of the call; 1BDI for example is now W1BI. We imagine that it will be the Government’s intention to amend the call on all renewals made from now on, and to change the calls of the rest of us by an order, later in the year, directing the prefixing of a letter ahead of existing calls.

Similar changes must be made by governments in every country by the end of the year. When this is done we say goodbye to the I.A.R.U. intermediates which have served us so faithfully and go back to the old standard intermediate “de”, relic of the days before international DX. It seems to us that in the case of amateurs of two countries which have changed amateur calls so as to indicate nationality, the international intermediate may now be abandoned as an unnecessary encumbrance; “VE9AL de W1BDI” is fully informative. But the retention of the I.A.R.U. intermediates seems essential where the amateur call has not been changed by the government. Thus “SFN de W1BDI” is not explanatory, for SFN may be French, U.S.A., Newfoundland or what-not. To call French SFN it had still better be “SFN ennu W1BDI” until France changes too.

And let’s not have any foolish business of prefixing “W” or “K” to calls until they are individually changed, or a proclamation is issued, by the Government. We must individually sign just what our licenses read until they are officially changed.

—K. E. W.
An Effective Antenna Tuning System

By R. B. Bourne

MOST amateurs pay not the slightest attention to the problem of getting the most out of their receiving antennas. The vast majority of receivers are coupled to the antenna either through a very small condenser or by means of a coil of two or three turns. The degree of coupling is sometimes made variable but in neither case is the antenna tuned, by intention, at least.

What! another control! Yes, but it is not necessary to use it if not wanted. With a given antenna, say 100 feet in length, there will be certain groups of wavelengths for which the antenna is tuned, using either capacitive or inductive coupling. But what of the wavelengths in between? On these, there is a loss of signal strength because resonance potentials and currents are not possible.

In order to take advantage of a tuned receiving antenna, the writer, some three years ago, built into his autodyne receiver an antenna tuning arrangement shown in schematic form in the accompanying drawing. With the switch S open, we have a conventional type of receiver familiar to everyone. C₂ is the antenna coupling condenser of 10 μf, and L₁ C₁ is the usual tuned grid circuit. L₁ C₁ is a wavemeter having a small coil and large condenser, the combination covering from 15 to 50 meters. The coil of this circuit is set at right angles to that of the grid circuit or at such an angle that the coupling between the two is at a minimum. With the switch S open, L₁ C₁ is a wavemeter loosely coupled to the tuner. This, in itself, justifies its presence in the receiver.

As an antenna tuner, the device is used in the following manner. The signal is tuned in with the switch S open. Closing the switch may have no effect or it may result in the detector stopping oscillating, depending on whether the wavemeter happens to be tuned correctly and depending also upon the wavelength. For certain wavelengths, tuning the wavemeter circuit has little or no effect on the signal. For others, however, the effect of properly adjusting the complete set is rather remarkable. Assuming we are on a wavelength the reception of signals on which can be improved, we find, upon varying C₁, that for a certain range of capacities, the detector stops oscillating, C₁ is set so as to have a value about midway in the “dead” space on its dial. Regeneration is increased until the signal appears again. If the regeneration control affects tuning, a readjustment of C₂ will have to be made. In any case, the coupling between the two LC circuits by means of C₂ is liable to affect the adjustment of the tuning condenser more or less, depending on the size of the coupling condenser. The gain in signal strength obtained in this manner, on waves susceptible to treatment, is worth while, and in some cases will approach the gain obtained by a stage of audio frequency amplification.

Another thing happens simultaneously. With the antenna in tune with the oscillating detector, energy is fed from the latter to the former, resulting in effect in a reduction of antenna resistance. This of course means increased selectivity. If the scheme is used ahead of a stage of r.f. amplification in which there is no reaction between amplifier and detector, only a moderate gain in signal strength is noted, since the effective resistance of the antenna has not been lowered.

Admittedly, there are several implied questions left unanswered, involving the impedance characteristics of coupled parallel tuned circuits, but even though they are not gone into at this time, the scheme outlined above is so effective, so simple and so cheap that it seems well worth while to present it.
28,000 Kilocycles—And How!

By Harold P. Westman, Technical Editor

It is said that "History repeats itself". The one originally making this statement might have had amateur radio in mind, providing there was such a thing as amateur radio. The history of amateur radio has certainly been a cyclic affair.

Not many years ago, we were surprised and, perhaps, shocked to find that our theories regarding transmission were not as accurate as we had supposed. It was found that effective transmission could be had at frequencies of 3,000 kc. in spite of the great attenuation predicted for such "high" frequencies. A few pioneers, may their tribe increase, got vacuum tube transmitters to oscillate at these uncommon frequencies, coupled them to indifferent antennas and actually shamed the 1500 kc. equipment that had had some years in which to develop. And how folks did object to leaving their nice warm beds of accepted theories and "normally behaving" circuits to venture into the cold outdoors of newer realms. And, what would be the humorous part, if it were not so tragic, is far as DX was concerned, it was decidedly superior. But, as in the 3500 kc. work, it was like pulling teeth to get enough stations to operate on that frequency to give it a fair trial and find out that it was worthwhile.

The next frequency to be attacked was 14,000 kc. and there were many who after a short trial announced in letters to us that it was useless as far as amateur operation was concerned. It was not as effective at night as was 7000 kcs. which indicated it to be an inferior frequency for DX work. It was much more erratic in its behavior, signals were harder to copy due to swinging and fading. Antennas seemed too small to be able to have much effect. And yet, 14,000 kc. work is common today. A large number of amateurs use this band exclusively while a still larger number devote their time to operation in these two last named high frequency bands.

In March, the Federal Radio Commission opened the 28,000 to 30,000 kc. band to

THE 28,000 KC. TRANSMITTER AT 1SZ

A 204-A is used in an Armstrong circuit. The plate coil and condenser are at the left and the grid tuning circuit at the right. The blocking condensers, by-pass condensers and grid leak are located behind and under the tube. The antenna was a Zepp employing a half wave vertical radiator, 16 feet long. The two feeders were each 8 feet in length. The receiver was described in the article "A Portable Receiver" appearing in the April, 1928, issue of QST. No contacts were established with the equipment.

that these newer realms became even more comfortable than the older. The tragic part is that it took months, months and months to get even a small minority in the swim. Of course, after a few important landmarks had been pointed out and some momentum gained, it was impossible to keep the rest away from these "high" frequencies. And so 3000 and 3500 kc. work became a fact.

And History did repeat! A considerable time later, 7000 kc. was an accepted frequency for amateur operation. In fact, as general amateur work. Since then, very little has been done by amateurs as a whole but, fortunately, it is not true that all amateurs sat back and waited for the other fellow to do it. There are probably between two and three dozen actively interested in the problem and it cannot be said that they have not made progress. They have done well considering the number of persons involved and the possibility that transmissions at this frequency may be at their best under conditions which we do not now associate with good operation.
Contrary to the opinions of many, it does not take special arrangements, equipment not available to amateurs or a superior understanding of radio to get a transmitter and receiver to operate at this frequency. The types of tubes used by these pioneers include 210's, 203-A's, 204-A's & 852's, and the circuit arrangements, Hartley, Armstrong, Colpitts, Ultra-audion and Mo-Pa. There seems to be as much diversity of opinion as to what constitutes the "best" Armstrong circuits that it was not doing as well as it might, particularly in regard to frequency stability which seemed to be poor on frequencies above 24,000 Kc.

The 203-A was swapped for an 852 and as might be expected the difficulties encountered were considerably reduced. The split-coil Hartley, single-coil Hartley Colpitts, Armstrong and Meissner circuits were tried. The split-coil Hartley and Colpitts were by far the best, the Armstrong a good third and the Hartley and Meissner circuits a very bad fourth and fifth. Some of the "five-meter circuits" were tried but did not perform nearly as well as the three better circuits mentioned above.

The split-coil Hartley was finally adopted because it could be tuned more easily without the tube going out of oscillation than could the Colpitts. With it, it is possible to rotate the grid tuning condenser over the entire range from 27,000 to 36,000 kc. independent of the plate condenser and still keep the tube oscillating.

Filament and center tap choke should be used and care should be taken to obtain those of proper value as they can easily cause poor performance. Coupling between the two coils was not found to be critical.

Three types of antennas were tried, a 4 1/2-wave horizontal voltage feed Hertz, 11 feet off the ground, a 3 1/2-wave bent antenna consisting of a vertical wire 22.5 feet long and a horizontal wire 22.5 feet long and a vertical half-wave Zeppelin. All of these systems were fairly well in the clear.

Due to the scarcity of reports, very little positive information was obtained regarding the 4 1/2- and 3 1/2-wave systems. However, reports on the 1 1/2-wave Zepp were far more encouraging and signals were reported as being much louder and less bothered with fading than with the other two. It is interesting to know that when using the vertical antenna for the first time, good reports on signals were obtained from SF8CT and EG2BRG. For two months previous while using the other two systems no reports had ever been received from Europe.

As a check on these antenna systems, the three were interchanged at intervals during contacts with west coast stations. The vertical antenna gave by far the best signals at all times of the day tried and local stations reported signals nearly twice as loud with the vertical antenna as compared to the other systems.

The regular tuner used on the lower frequency bands was first employed but caused trouble due to the tuning effect of the regeneration control condenser, interference caused by automobiles, power leaks, etc., body capacity, lack of selectivity and feed back from phone cords. A tuner similar to the "Traffic Tuner" described in the April,

**FIG. 1. THE SPLIT-COIL HARTLEY CIRCUIT ARRANGEMENT USED BY SALY**

L1—3 turns of 3/4-inch copper tubing, 3 inches in diameter.
L2—2 turns of 3/4-inch copper tubing 3 inches in diameter.
L4—25 turns of No. 20, 1 inch diameter.
L5—40 turns of No. 30 on 1 inch form. Double spacing is used.
C1—600 μfd. variable condenser.
C3—100 μfd. variable condenser.
C4—250 μfd. fixed condenser.
C5—3000 μfd. 3000-volt condenser.
R1—20,000 ohms.

It might be advisable to use series feed to the plate and take some of the work off the plate choke. The high voltage lead would then go to the junction of L1 and C5.

A considerable amount of work has been done by SALY of Rochester, N. Y. He started in with a 208-A and after trying it in the split-coil Hartley, Colpitts and
1927 issue of QST was constructed. The whole set was enclosed in a copper shield as are the batteries for the 199 type tubes employed. Tube base coils are used for all bands and due to their small fields, enclosing them in a shield did not affect the frequency ranges in the slightest. The internal capacities of the dry cell tubes are somewhat less than those of the larger tubes and this allows larger inductances and capacities to be used in the tuning circuit.

8ALY has been in communication with 6UF, 6DVO, 6ANN, 5AUZ and two locals, 8AHK and 8CVO. During March and the early part of April, tests were made practically every week-end but as no reports were received nor any amateur signals heard, it was decided to run tests only on Sundays between 1520 and 2230 G.C.T.

On April 1st, contact was established with 6UF and 6DVO and since then, with the exception of one or two Sundays when no signals could be heard and even the harmonics from local stations were barely distinguishable, communication with the West Coast could be maintained with ease.

Signals from the West Coast start coming through at 1400 and usually fade out around 2230 G.C.T. No great deviation of signal strength was noticed during this period although signals were usually stronger and steadier between 2100 and 2200. Fading was apparent at all times but seldom bad enough to actually interrupt communication. 6UF was worked as many as 5 or 6 times on some Sundays during the test period and no difficulty was had in establishing contacts. The signals usually peaked at 2130 and were at times R3 to R9.

Signals from 5AUZ were not heard very often, they seemed to come through very well between 1930 and 2300 G.C.T. with practically no peaking of signals being noticeable but with fading similar to that noticed on West Coast signals.

The most consistent and steady signal heard was that of HJG who can be heard between 1500 and 2300 G.C.T. never weaker than R3 and with very little fading.

![Figure 3: The Ultra-Audion as used by 5AUZ](image)

The capacity, C3, is used to control feedback. L1—3 turns of copper tubing, spaced 3/4 inch and 31/2 inch in diameter. L2—4 turns same as L1. One end left open. C1—250 μf.d. receiving condenser double spaced. (New about 60 μf.d.)

C2—Faradon .0012 μf.d.

C8—100 μf.d. midget.

R1—15,000 ohms.

RFC—150 turns of No. 20 on broom handle.

WIK is seldom heard and never better than R1. AGC was seldom heard but when the signal was picked up it seemed to fade very little.

2JN

Perhaps when it comes to DX, the palm should go to 2JN of Upper Montclair, N. J., who has been in communication with 8CT four times, who has heard 8CT thirteen times when it was impossible to get in two way contact and who was heard by 8CT six times under similar conditions. He has also received reports from eg2NM, eg5YW and eg2NH. He has been in communication with 2ACN, 2AHO, 2AOL, 2AQB, 2BCI, 2BHA, 2BRB, 2GP, 2NM, 2SY, 2TP, 6ANN and 6UF. He has also been reported by three Second District stations whom he did not work.

2JN is using his regular 14,000 kc. transmitter for the 28,000 kc. work. The circuit is the familiar Hoffman arrangement of the Colpitts and it seems to work very well. An 852 is used with half-wave self-rectification.

The antenna is located in the attic of a two-story house and is about 1.5 feet beneath and parallel to the rafters. It is of the Zeppelin type, the radiating portion being 16 feet long and the feeders; 8 feet in length. The receiver employs a single stage of radio frequency amplification using a
UX-222. 199 type tubes are used for the detector and single stage of audio frequency amplification. This is the receiver used for the lower frequency bands and all that was necessary was to wind smaller coils for this new range. The regular coils were wound on tube bases but this smaller one is air-supported. The tuning range is from 24,000 to 25,000 kilocycles and the adjustment is not much more tricky than on the lower frequencies.

6UF

Another station that has given an excellent account of itself is 6UF at Knowles, Cal. With 100 watts input to a 203-A used as a neutralized power amplifier feeding a vertical Zeppelin antenna, reports were received from 5DQ, 8ALY and 9BNX. The signals were weak and always heard during the morning transmissions. Increasing the length of the feeders from ¾ to ¾ waves made practically no difference in the results. By substituting an 852 for the 203-A, an increase in output was obtained.

The radiating system was then changed so as to use a vertical antenna and horizontal counterpoise each of which were ¾ wave long. This system gave better results than those previously tried.

As a test, the 852 power amplifier was removed and the 210 which had been employed as the master oscillator was used to excite the antenna. With about 25 watts input, 8ALY was worked and he reported the signal as being the loudest ever heard from the west coast on any frequency. The 852 was then tried in place of the 210 and some very fine results were obtained. A goodly number of contacts were made with this arrangement. During the time that 6UF has been operating at this high frequency, communication has been established with 8AHK, 8ALY, 8CSR, 8EX, 6DBO and 2JN. Signals from 2EB, 2NM, 4GH and 8GK were heard in addition to the contacts mentioned above.

The receiver used in the standard affair employing capacitive control of regeneration, it is built on a 5" by 10" aluminum panel and is 6" deep. A 199 is used as the detector tube and a 201-A as the audio amplifier tube. Normally a 500-foot antenna is coupled to it but when there is trouble from a strong power leak near by, or the static is more than attractive, a short indoor antenna is used. No ground or counterpoise is connected and the antenna is tied to one end of the coupling coil, the other end of the coil being free. The direction in which the coil is wound seems to have considerable effect on the strength of the signals and the coil should be reversed to obtain the proper condition. Very tight coupling to the filament end of the grid inductance is necessary. No trouble is experienced due to "dead spots" over the 14, 28 and 56,000 kc. bands. Exceptionally fine signal strength is obtained, a point which all visitors to the station comment upon.

2GP

When 2GP of Richmond Hill, L. I., N.Y. became interested in this new band, he proceeded to cut down the size of the inductances in his 14,000 kc. transmitter and receiver and started in.

The transmitter is a shunt feed Hartley with 1000 volts on the plate of a 203-A which has seen service during the last 2½ years on the other amateur bands. The input is about 200 watts.

The radiating system consists of a 58-foot Hertz with a single wire feeder about 30 feet long tapped about 18 feet from one end of the antenna. This is used against a 60-foot counterpoise resulting in a combination that would be difficult to analyze. The receiver is the one used for the lower frequency bands for which Gross plug-in coils are provided. Capacitive control of regeneration is employed. For 28,000 kc., the secondary coil consists of two turns of No. 14 wire and is about 2" in diameter. The tickler coil is of 1" diameter and consists of 3 turns of the same wire, although d.c.c. is used and the winding is scrambled. G.R. plugs are connected to the ends of the coils and they may be fitted into the regular receptacle used to hold the other coils of the receiver. The tuning condenser is rather large and covers a range of about 23,000 to 30,000 kc. The receiving antenna is about 70 feet long and 25 feet high. It is coupled by a small capacity to the grid of the detector tube, a single stage of audio amplification is used.
With this outfit 2GP worked 2AOL, 2BEV, 2BB, 2BUO, 2EB, 2JN and 2NM. In addition to these stations worked, 2AQB, 2AVG, 2TP and ef8CT were heard and the signals of 2GP reported by ef8CT.

5AUZ

On Sunday morning, April 15th, 5AUZ in El Paso, Texas, decided that he would like to get going on the new band. Single turn inductances were substituted for the 8-turn affairs normally used for plate and grid tuning in the Armstrong circuit doing duty at 7,000 kc. The plate voltage on the 204-A was 1500 and the current about 150 mils. The plate coil showed lots of fire when given the well known “pencil test” and the next thing was to try and get the plate current down by adjusting the grid tuning condenser. However, it was found that there was no effect on either the plate current or the frequency which stayed at about 30,000 kc, regardless of the adjustments of either of the tuning condensers. About this time, a familiar odor was noticed and the blocking condenser was found to be dripping wax. The condenser was supposed to be good for 4 amperes so it was concluded that the circuit was not acting in true Armstrong fashion. A double-spaced Cardwell was substituting and the circuit acted more normally except for the fact that the plate current was still around 150 mils with no antenna connected.

The receiver is the same one used for the 7-and 14,000-kc. bands, employs a single UX-222 and is modeled after the one described by R. B. Bourne in the December, 1927 issue of QST. For the start, the antenna coil was moved over into the detector compartment and a two-turn coil was substituted for the 4-turn grid coil used for 14,000 kc. reception. All of these preparations took approximately 30 minutes. Upon listening in, SALLY was heard working 6UF and 6ANN. Neither of the 6’s could be heard and after these contacts had ended, SALLY was called but did not answer. A long CQ was made to which SALLY responded. A thoroughly satisfactory contact lasting for 30 minutes was made with good signal strength at both ends. Later on, SAHK was worked although the fading was very bad. The regular 7000 kc. antenna was used and the antenna current, at the point where the ammeter was connected, was nil.

Since this work has been done a new transmitter has been constructed for this band, employing a single UX-210 in the ultra-audion circuit. The plate voltage is either 560 a.c. or 450 volts obtained from B batteries. When using the B battery, a slight amount of modulation supplied from an audio oscillator is employed so as to broaden the note for easier copying.

No two-way work has been done using this set but it has been reported several times by stations in the Eighth District. Using two UX-210’s in parallel with a 5000-ohm grid-leak instead of the 15,000 ohm unit used with a single tube, the set will operate at a frequency of 50,000 kc.

When using the r.f. stage of the receiver, tuning becomes rather troublesome as 30,000 kc. signals are hard enough to find with a two control receiver. It has been found, though, that the 222 really gives some amplification at this frequency.

SAX

In Cleveland, Ohio, we find SAX who uses a UX-210 in the Reinartz circuit shown herewith. With this he worked 6UF for about 15 minutes. Both signals were steady and about R6. The contact was re-established about 1 hour later and continued until SAX blew a fuse. Later in the same day, ef8CT was logged about R4 but swinging badly. This was on Sunday, April 1st, and an R6, steady report was received from 6DBO who heard these signals at 7.45 p.m. P.S.T.

One week later contact was established with 6ANN at noon E.S.T. and while signal strengths were good fading was bad. The antenna system is a full-wave Zap with feeders just short of ¼ wave. A shunt condenser is used for tuning the feeders. The system goes straight out the attic window at a height of 32 feet to a 40-foot pole. The radiating portion is 31 feet long.

The tuner used is the same as employed for operation in the other bands. Capacitive control of regeneration is used and the 1500-kc. coil form was called upon to hold the winding of the 25,000-kc. coil. This is a 1” diameter coil of 3 turns of No. 14 antenna wire spaced ¼”. The tickler is 4 turns of No. 22 d.c.wound on 2 fingers and soldered to the proper contacts. Very loose coupling to the antenna is needed in order that the set will oscillate and for this reason a new tuner will probably be built soon.

A crystal-controlled transmitter which was used for 14,000-kc. work has been modified to make it suitable for 28,000 kc. operation. It has not as yet been satisfactorily adjusted and gives about half the output that is obtained from the self excited set. However, it gives what seems from the experience already gained to be more important than power output and that is frequency stability.

5HE

When using an 862 in an ultra-audion circuit, 5HE of San Antonio, Texas, worked 1AQD at 12:30 P.M. and 2:30 P.M.
Northwestern Division Convention

August 31, Sept. 1, Seattle, Washington

ALL ABOARD! for the Hotel Bergonian, Seattle, Washington, where the annual convention of this division will be held on the above dates, under the auspices of the Amateur Radio Club of Seattle.

Everybody is working hard to make this a he convention and the committee in charge extends a cordial invitation to all the radio amateurs in this division. If you attend we will feel repaid for the hard work.

A.R.R.L. Headquarters have promised to send Louis R. Huber, 9DOA, now Assistant to the Communications Manager in Hartford, and from what we hear he is a live wire.

Our program will be so arranged we know everyone will be satisfied. So write and let Ken Casey, 7ACB, 722 No. 74th St., Seattle, Wash., know that you will be present.

Standard Frequency Stations Needed

It is with great regret that the O.W.L.S. Committee has learned that 1XM (Mass. Institute of Technology) will be unable to continue the transmission of Standard Frequency Schedules. Accordingly, volunteers are asked to transmit such schedules on the East Coast. A West Coast volunteer is also wanted. Such stations must have at least two operators trained in technically accurate frequency measurements and one or two assistants. The group or organization behind the transmissions must be well and favorably known to inspire public confidence in their accuracy. Power is not the prime requisite though 250 watts is desirable; a good and distinctive note and absolutely steady frequency are essential. Crystal control is not suitable because of the large number of frequencies to be covered. Transmissions will probably be in the 3.5, 7.0, 14.0, and 20 megacycle bands. Anyone interested please write K.V.R. Lansigh, n6QX, in charge of O.W.L.S.-S.F., Box 731, Hollywood, Calif.

K.V.R.L.
Although many discussions of filter circuits have appeared in print, most of the articles have presented the subject from a practical viewpoint only. This short article is an attempt to throw some light upon the actions taking place within the filter circuit.

The present high grade filter circuit usually consists of two inductances, called choke coils, across which are shunted 3 capacitances. In the majority of cases a double rectifier feeds into the filter circuit. The function of the filter is to attenuate all alternating current components of the complex wave applied to it and pass only the constant component. With the output of a double rectifier (i.e., full wave) feeding into such a filter circuit, the voltage \( E \) applied to the filter is a complex wave which may be expressed analytically by the following formula.

\[
e = \frac{E}{\pi} \sin \theta \cos 2\omega t - \frac{E}{\pi} \sin 4\omega t \tag{1}
\]

Where \( E \) is equal to the maximum value of voltage and \( \omega \), the angular velocity, is equal to 2\( \pi \). The current through the condenser \( C \) (Fig. 1) will then be a complex wave, and for a double rectifier may be represented by the following formula.

\[
i = \frac{E}{\pi} \sin \theta \cos 2\omega t + \frac{E}{\pi} \sin 4\omega t + \frac{E}{\pi} \sin (4\omega t - \pi) + \frac{E}{\pi} \sin 3\omega t + \frac{E}{\pi} \sin (4\omega t + \pi) \tag{2}
\]

Where \( I \) is equal to the maximum value of current. The effective value of current may be determined if it is desired. However, we are interested only in the current through \( C \), during the discharge period, since the function of \( C \) is to store energy during that period the rectifier is passing current and to give up its store of energy during that period the current from the rectifier is zero, assuming that the filter will keep the current constant during that period the rectifier is passing current. From the well known equation for the discharge of a condenser through a load, the size of capacitance to be used to maintain constant, or nearly so, current may be obtained. Given the equation for the discharge current of a condenser equal to the condenser. For \( i \) to remain sensibly constant

\[
-t \frac{E}{\pi R C}
\]

must at all times be nearly equal to 1, or

\[
-t \frac{E}{\pi R C}
\]

must approach zero, since \( t \) is the time during which the condenser is discharging (for a double rectifier is approximately \( \frac{1}{4} \) cycle) the product \( RC \) must be large. Therefore, for a given load resistance \( RC \)

\[
\begin{align*}
\text{From Rectifier} & \quad \mathcal{L}_1 \quad \mathcal{C}_1 \quad \mathcal{L}_2 \quad \mathcal{C}_2 \quad \text{Load} \\
\end{align*}
\]

has a certain minimum value, for constant current. In general, the greater the number of sections to the filter circuit the less

\[
\text{FIG. 1}
\]

may be the capacitance of \( C \) and still obtain a pure direct current output.

A little consideration will show that the discharge current is fixed by the load and not by the size of condenser, therefore, the condenser current does not increase

\[
\text{FIG. 2}
\]

\[
\begin{align*}
\text{CURRENT CHANGE CURVE} \\
\text{FOR} \\
\text{Constant discharge time . . . . . . and different values of capacitance}
\end{align*}
\]

\[
\begin{align*}
0 & \quad 1000 \\
0 & \quad 1000
\end{align*}
\]
with an increase in capacitance. Consider formula 3. With a fixed applied voltage (the maximum voltage applied to the condenser) and fixed load resistance R, varying C only affects the time constant of the

\[ \tau = \frac{1}{2\pi fC} \]

current and has no effect upon the discharge current \[ i \] except to maintain the current during discharge more nearly constant. Figure 2 shows the effect of increasing the value of \( C \), holding the voltage, load resistance, and discharge time varying from 0 to 4 thousands of a second constant. Examination of Figure 2 shows that adding capacitance above 4 \( \mu F \) will charge the current variations only slightly. Figure 3 shows the relation between the current fluctuation and the capacitance \( C \). From an examination of Figure 3 it can be seen that there is little to be gained by the addition of capacitance above 4 to \( F \).

Figure 4 shows an oscillograph of the line voltage \( a \), \( b \) the condenser current, and \( c \) the load current. The condenser is charging during the time \( d \), \( e \), and is discharging through the filter during the time \( of \). It should be noted that the discharge current is sensibly constant during the discharge period. In the oscillogram for Figure 4 the load current has been reversed which gives the appearance of the load current fluctuating opposite to the condenser discharge current.

The capacitance \( C \), in conjunction with inductance \( L \), acts as a filter. The capacitance \( C \) offers a low impedance to the alternating current while the inductance offers a high impedance to the alternating component. The capacitance does not act as a reservoir of electrical energy since it is assumed that at no time does the current and voltage at its terminals drop to zero, hence its sole function is to form in conjunction with inductance \( L \), an attenuating network.

The capacitance of \( C \), and the inductance of \( L \), must be so proportioned that the product of \( W^2L_C \) is always greater than 4. Unless this condition is fulfilled no attenuation will take place. Figure 5 is an oscillograph showing the applied 60-cycle line voltage \( a \), the condenser current through condenser \( C \), and the load current \( c \).

If on applying a filter to connect a rectifier to a load and the voltage fluctuation of the output is too large, additional filter sections may be added. It should be kept in mind that the attenuation factors vary in geometrical progression with the number of sections. In many cases it is cheaper to add sections, than to add to the value of capacitances and inductances.

It is sometimes desirable to determine the percent voltage attenuation for each section of a multi-section filter, or it is desirable to determine the number of sections of a filter to affect a predetermined attenuation. In such cases use may be made of the exponential variation of attenuation. Namely:

\[ i = e^{-ms} \quad \text{eq. 4} \]

Where \( i \) is the alternating current at the terminal section of the filter, \( m \) is equal to the number of filter sections. \( X \) is equal to the attenuation factor which is equal to

\[ X = \cosh^{-1} \left( \frac{\sqrt{2}LC}{1} \right) \quad \text{eq. 5} \]
for a filter in which the resistance of the inductances is neglected and where the resistance of the inductances is considered

\[ x = \sin^{-1}\left\{ \sqrt{\frac{\omega^2 L C}{x^2} \left[ 1 + \frac{R}{\omega L} \left[ 1 + \frac{R}{\omega L} \right] \right]} \right\} \]

It should be noted that the attenuation need be calculated for the fundamental frequency and not for the multiple frequencies, since the attenuation constant is proportional to the square of the frequency. For 60-cycle double rectification, the fundamental frequency is equal to 120.

Figure 6 shows the relation between the number of filter sections and the ratio of final to initial current at the terminal section of the filter. Curve A is a graph showing the variation in the terminal section for different numbers of filter sections. The resistance has been neglected for curve A, while curve B is based on formula (5). In general the simpler formula (5) may be used for all calculations. Knowing the allowable voltage fluctuations at the load terminals, the number of filter sections may be determined. It should be kept in mind that the attenuation is independent of the load current if the inductance of the choke coils remains constant. However, the inductance of the choke coils does not usually remain constant but decreases with an increase in load current.

The voltage fluctuation may be found by means of Ohm's Law, namely:

\[ \Delta e = i z \]

where \( \Delta e \) is the voltage fluctuation, \( i \) is the current flowing in the terminal section of the filter and \( z \) is the impedance of the terminal section which is connected to the load. Or in the usual case, the impedance of the terminal condenser in which case the impedance is equal to

\[ z = \frac{1}{\omega C} \]

where \( \omega \) has the same meaning as before and \( C \) is equal to capacitance in farads.

The condenser \( C_b \) has two functions to perform. In conjunction with \( L_b \) it has to absorb the remaining ripple in the voltage wave and also to act as a source of variable current at a variable frequency to the load. Since a filter has essentially a two-way action (that is, reversing the directions of propagation of the wave does not alter the attenuation of the wave) the load current at variable current and frequency must originate at the terminals of the filter section.

Hence the capacitance is fixed by several considerations among which the more important are: (a) Have a low impedance to the load current; (b) to have sufficient capacitance to deliver the variable power to the load, (c) and to absorb the remaining ripple from the preceding sections. If a radio receiving set is the load, the power demand is then fixed by the audio frequency end of the set, since the a.c. power demand is small on the radio frequency end.

The capacitance of \( C_b \) must be sufficient so that the lower notes do not meet too high in impedance. If the impedance of the condenser is too high and the audio transformers are of high quality, motor boating may occur. This is explained by the fact that the amplifier, being able to pass and amplify the lower notes, the impedance of the condenser then acts as a coupling impedance which couples the output of one stage to the input of the other stage. This explains why motor boating may occur with the substitution of a high grade transformer for a low grade transformer. The remedy is obviously to increase the capacitance of \( C_b \). In general, if condition (a) is met, (b) will also be satisfied at the same time. The size of condenser \( C_b \) to satisfy condition (c) is very easily met, and in most cases will be too small to satisfy conditions (a) and (b).

Figure 7 is an oscillogram which illustrates the function of the condenser \( C_b \) when it is acting as a source of electric

(Continued on Page 47)
Additional Notes on Iron Core Reactances

By D. E. Replogle*

ALTHOUGH the derivation of the design charts for filter reactors, simultaneously carrying direct and alternating current, which appeared in the April issue of QST, may have seemed rather involved, to some readers, the actual case: In the design of a 165-milliampere Raytheon operated power unit for supply filament and plate current for type 222 tubes, filament series connected, it was found that a 30-henry choke was required.

The first point to be considered in the

**DESIGN CHART**
FOR IRON-CORE CHOKE CARRYING BOTH D.C. AND A.C.

1. Westinghouse AW 8% Si Steel
2. Armco Transformer "Special"
3. " " Intermediate Transformer
4. " MA"

All 29 U.S. gage except "MA" which is 0.0172"

L = Inductance in henries
I = D.C. in amps.
V = Volume of core in m³
N = Number of turns
l = Length of magnetic path, inches
a = Air gap, inches.

THE CURVES ARE REALLY CONTINUOUS BUT HAVE BEEN CLIPPED IN HALF TO MAKE THE CHART MORE CONVENIENT IN SIZE
Use the curves on the left side for values between 1.0 and 1.9 and the right hand curves for values between 1.0 and 10.

process of designing a filter choke from the resulting charts is exceedingly simple.

As an example, let us review an actual design of the choke was, naturally, the size of the wire necessary to carry 165 milliamperes without undue heating. This was ascertained from a wire table to be No. 28.1

The size of the window space in the core which was to be used must be found so that the maximum number of turns

1. The Radio Amateur's Handbook has such a table. An allowance of somewhat less than 1000 circular miles per ampere was made in arriving at the size given.—Editor.

(Continued on Page 78)
Rocky Mountain Division Convention
August 24-25, Pueblo, Colorado

The place of assembly for the third annual Rocky Mountain Division Convention is Memorial Hall Council Chambers, located at Main and Grand Sts., Pueblo, Colorado. While our Division is one of the smaller ones our record of attendance is pretty close to 100%. So, we extend to you "hams" in this division and other sections a most cordial invitation to attend our affair, and help keep up our traditions. A.R.R.L. Headquarters is sending the new Assistant to the Communications Manager, Louis R. Huber, 3DOA, as official representative and as he is an old brass pounder you will all feel at home with him. Fellows, let's hear from you. Glen R. Glasscock, 2409 Pine St., Pueblo, Colorado.

Central Division Convention
August 17-18-19, Columbus, Ohio.

The Central Ohio Amateur Association are sponsoring this year's Ohio Section convention and the committee in charge is endeavoring to surpass all previous conventions. Some of the old timers will remember what Columbus staged five years ago. We are going to do our best to make you remember this one.

Mathews of old 9ZN will be with us; R. S. Kruse, formerly of A.R.R.L. Headquarters has promised to be present; Handy and Hebert of A.R.R.L. have been delegated to attend. We are also expecting some one from NKF. Plenty of good entertainment is being planned for the delegates.

A very cordial invitation is extended to all radio amateurs to attend our convention. All activities will take place at the Neil House. F. R. Gibb, Sec. & Treas., 150 Glencoe Road, Columbus, Ohio, will appreciate your advices that you will be present.

Filter Circuits
(Continued from Page 45)

energy to operate the loud speaker of a radio receiving set. Curve (a) is a 60-cycle timing wave, curve (b) is the current through the loud speaker of an oscillating receiving set, and curve c is the condenser current. An examination of the curves show that (b) and (c) have the same shape which means that the loud speaker is obtaining alternating current from the condenser only.

In conclusion, the input condenser acts as a storage of current from the rectifier to maintain current through the filter during the blocking period of the rectifier. The total attenuation of the second condenser (in conjunction with the inductance to act as an attenuating network) is a function of the number of filter sections. The terminating capacitance acts as a reservoir and as such must have a capacitance sufficient to meet the power demands of the load.
Operating Procedure That Gets Results

By Howard C. Storck

Efficiency is the key to satisfaction and success in any amateur radio station. The most efficient equipment is of no value unless we have an efficient operator who follows approved procedure. With certain operators a great deal of good can be accomplished, as well as a good station results are assured. This article is a summation of what has been observed to make for popularity and success in a number of good stations. It goes without saying that the very basic rules of ordinary procedure which govern the Official Relay Stations are the ones to follow.

Equipment for the traffic man is a bunch of good schedules and that means also, having a good wavemeter. There is a huge kick to be gotten out of a key to schedule book. If you don't believe it, try it. Have one wave of each band on a paper band, and the other fellow knows when you are getting a wave, others will know where to look for you, and this helps a lot. Always work on that wave, unless you must, QSY for QRM, and then try and standardize those waves for QSY only. If you have schedules—be courteous. When you have them, keep them—don't discount the other fellow and expect him to overlook it. Always try to have traffic for your schedules when possible. Do your best to originate good traffic. When working schedule and break-in, and the other fellow knows your style of operating. "R-K" is enough to let him know that you got the message OK, and it is plenty snappy. Don't send "R" and then ask for fills. If you desire number ones, fill sometimes, sometimes it is better to ask for QTA of entire text or address as it will save time at both ends. Be accurate—accurate as events. Never give an OK on a message unless you are sure he has it right. Never take traffic unless you know you can do the air in time to move it promptly. Never let a message get the wrong delivery, die at your station. Mail it, if necessary, but send it on its way regardless. If a message has nearly reached its point of destination, do not let the other person send through. Keep your message file for three months at least, and don't forget to report to your SCM if you want to retain your QRS Certificate, whether you have traffic to report or not.

If you don't have schedules, or have traffic to move that your schedules don't handle use the directional CQ. If you CQ for traffic, specify it in some way. A good amateur tries to keep the good air at all times, always tries to contact himself and his station so as to reflect credit upon himself and the League, applies the Golden Rule at all times, always uses discretion in BCL troubles, tries to avoid key-clumps and interference, and NEVER lets a word of your traffic interfere with serious schedules. Use break-in but don't abuse it. It makes amateurs sore to have another station breaking them all the time for your traffic. It is a good wavemeter, accurately calibrated. Keep it so by checking its calibration often. Keep a good log. The log will grow at a rate of the station whether good, bad, or indifferent. These points apply to the operation of a number of classes of stations as well as to the traffic stations.

Next let's look at the man who is on for a good time average, who is making friendly QSOs etc. Plain CQ should mean "ready for anything" for better just TST when no assistance is needed should mean just that, and should not be answered unless the one answering can help. It should not be abused, but used where there is actual need of help by a station far away for word etc. Don't CQ until the other fellow gives up in disgust and passes on. Nineteenth of the CQ hounds surprised at how many have passed them up during a long CQ. Don't call and sign five or six times at beginning and end of every transmission when contact has been made. Never send R or OK unless you mean it, and never QSZ (call asked to QSZ gladly and don't get sore, and don't cover up with "QRM or QAN" when you mean QRS. It is no discredit to ask for QRS, as we seem to think. On the other hand, if you can stand more speed, for heaven's sake say "QRG." On reporting signals, cut out the superfluous dope. "UT RAG R6 solid in Columbus, Ohio" tells the tale unless more is necessary for complete report, then say what you want to do in the fewest possible words. Don't answer a directional CQ unless you want his traffic. Nothing makes a man with traffic more pleased than to CQ East and get an answer from a ham west of him who just wants a report on his signals or to show the rag. Don't use a flock of dots to denote a mistake. Send ... , , , and repeat the entire word, and don't be another's time sending ...... or ...... - - while the other man is talking. Give the other fellow a chance. Use K, AR and SK properly, and when you say SK, mean it, and don't go back another time to try and break waiting for that SK and be calling you. Always thoroughly cover the diaphragm after an SK. You will be glad you did the other fellow a chance, and the one answering will be more than common courtesy. Also don't CQ or call too often. Sign your call letter often. Be sure you are within the limits of the band you are using. On no account trespass on other territory. Remember that the good man suffers with the bad. A very few outlaw stations can "queer the deal" for the rest. Be brutally frank if necessary in giving reports on signals. The other man will appreciate it if he has the right sort. He is the fellow good for him to know the truth. Always QSL the fellow promptly. If you don't QSL first. Many of these points can be applied to other activities on the air. A useful suggestion to foreign stations is that they may differentiate between DX and the United States. This would help immensely. It is exasperating to someone calling DX to call him, and to have newcomers call at some other foreign station. Furthermore it would help immensely if foreign amateurs would refuse to work any station (not X stations outside the U. S. amateur bands).

TRAFFIC BRIEF

N6AD, 'way up in Big Port Walter, Alaska, says that one of his long-wave indentations are making him sore and next for his pot hen. He reports two eags in one day. Gee! Amateur radio surely is stimulating!
Another Bawling Out
By Rufus P. Turner, 1AY

According to the writer, who is occasionally seen in charge of a station, the amateur air force is suffering from a dearth of new stations and operators. This situation is somewhat disturbing, but it is not entirely unexpected. The writer, who has been in the amateur radio business for some time, feels that the situation is the result of carelessness and lack of enthusiasm among the operators. He believes that the air force is suffering from a lack of interest and a failure to recognize the importance of good operating habits.

The writer states that the amateur radio operators are not taking good care of their stations and equipment. Many of them are not following good operating practices, and as a result, the air force is suffering. The writer feels that the operators need to be more careful and to take better care of their equipment. He believes that this will improve the quality of the air force and make it more attractive to new operators.

The writer also mentions that the amateur radio operators need to be more responsible and to take better care of the air force. He feels that they need to be more careful and to follow good operating practices. He believes that this will improve the quality of the air force and make it more attractive to new operators.

The writer concludes by stating that the operators need to be more responsible and to take better care of the air force. He feels that this will improve the quality of the air force and make it more attractive to new operators.
1MK

Vacation time has cut down on the list of schedule-stations for this month. But we won't say that QRNs are to blame, for traffic is handled regularly each night regardless of poor conditions. The following list is up to date. (Eastern Standard Time)

**1AGH (90)** Mon. and Fri., 7:30 p.m. (to be replaced by IKY and A9X)
**1BIG (80)** Mon. and Fri., 7:00 p.m.
**1BQG (80)** Mon. and Fri., 9:00 p.m.
**1BRT (80)** Wed., 7:15 p.m.
**1V2BR (40)** Sun., 9:45 p.m.
**2BHE (80)** Sun., 11:45 a.m.; Mon. and Thurs., 7:15 p.m.
**2CCTM (80)** Mon. and Fri., 7:15 p.m.
**2S2Z (50)** Mon. and Thurs., 7:45 p.m.
**2SP (80)** Mon. and Thurs., 9:45 p.m.
**2XJ1 (80)** Sun., 7:00 p.m.
**41E (80)** Thurs., 11:00 p.m.
**6BWW (40)** Tues., 12:30 a.m.
**6CS (40)** Fri., 12:30 a.m.
**6EY (40)** Wed., 12:30 a.m.
**6UX (40)** Mon., 11:45 p.m.
**6ZD (40)** Wed., 1:30 a.m.
**8AAG (80)** Sun., 11:15 p.m.
**8DED (80)** Tues. and Thurs., 9:15 p.m.
**8S2Z (80)** Sun., 11:00 p.m.; Thurs., 9:00 p.m.
**8VEGAL (80)** Tues. and Fri., 7:15 p.m. (V7EGAL on 52.3 m.)
**90X (80)** Sun. and Thurs., 11:30 p.m.
**9AP (80)** Mon. and Fri., 11:15 p.m.
**9APY (80)** Tues., 9:00 p.m.

All the latest Official and Special Broadcasts are sent from IMK at the following times (E.S.T.):

- **Sunday, Tuesday, and Thursday** at 8:00 p.m. and midnight.
- **Monday and Friday** at 8:00 p.m. and 10:00 p.m.
- **PERIODS OF GENERAL OPERATION** have been arranged in order that everybody may have a chance to work HQ. Usually these general periods follow one of the OBC schedules. Here they are, listed under **FORTY and EIGHTY meters:**

**EIGHTY METERS:**
- 4:00 p.m. on Sun., Mon., Tues., Thurs., and Fri. This general period follows the OBC, which is sent at 8:00 p.m.
- 11:00-11:00 p.m. on Tues. and Thurs.
- 12:00 p.m.—1:00 a.m. or later, on Sun. night (Mon. morn.)
- **FORTY METERS:**
- 10:10—11:00 p.m. on Sun., Mon., and Fri. This general period follows the 10:00 p.m. OBC.
- 12:00 p.m.—1:00 a.m. or later, on the following nights and a.m. of day following: Mon., Tues., Thurs., and Fri. This general period follows an OBC only on the nights of Tues. and Thurs.

If you are not sure by what time, this is 41.38 meters and 88.38 meters. Familiar signals are "RP" of Bob Farmente, "OU" of Louis Huber, "FH" of Ed Handy, and "AH" of A. A. Hebert.

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**100-METER CODE PRACTICE**

The volunteers have sent us their schedules of transmission, which will go into effect as soon as the beginners have been notified. The mimeographed material designed to enable the beginners to get on the right wavelength, should be completed by the time this QST arrives. It will be sent to each beginner who has asked for it. Any new comers who wish to take advantage of these transmissions are invited to write us. Please address "100 Meter Code Practice", Communications Dept., A.R.R.L., 1711 Park St., Hartford, Conn.

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**TRAFFIC BRIEFS**

Uruguayan IBU made the following comment in his report on the International Relay Contest: "Quite all right on Am. on 20 meters, remarkably steady and quite a R5 to R3. FE. QSO are much more easy than on 40 meter, and only have little QRM noticed here. Now Mr. Ford has new built the new Ford car, and for our pleasure he has forgotten the four transmitting coils."

The winners in a lot drawing contest held during the recent A.R.R.L. Convention at the Pennsylvania Hotel, New York City, were given a free flight over Madison Detrosi radio laboratories owned by the Pilot Radio Laboratories, Inc. of Brooklyn, N. Y. The winners, W. H. McClean of Staten Island, Gerard Gerlach of Astoria, and J. B. Knight of Brooklyn, were flown from Curtiss Field, Long Island, to Hartford, Connecticut. The flight was made in exactly fifty minutes, averaging about one hundred miles an hour.

The visiting amateurs were entertained by a tour of Hartford and an inspection of League headquarters. Before the return flight, A. A. Hebert, Treasurer and Field Man of the A.R.R.L., made an air inspection of Hartford in a pilot plane.

Zah Bouc, radio columnist of the New York Sun, was in charge of the plane's radio apparatus during the trip. Weather reports to the plane on route, were transmitted by IMK.

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The Coast Guard Cutter Marion is the boat that has been selected for the Greenland Oceangraphic Expedition, which left Washington about mid-July. The call is NITB. The following periods will be devoted to amateur contacts. On 24 meters; 5 to 8:30 a.m., noon to 12:30 p.m., and 4 to 4:30 p.m. E. S. T. On 38 meters; 8 p.m. to midnight E. S. T. Any traffic handled with NITB may be forwarded by wire collect to Coast Guard Headquarters, Washington, D. C.

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The United States Department of Agriculture is organizing, with the help of 9APY and 9ASE, a monthly test net which functions among several cities in the eastern half of the country, Washington, Atlanta, Chicago, Kansas City, New York City, Pittsburgh, and Detroit are connected by the co-operations of the A.R.R.L. effective local clubs. The purpose of the net is to provide communication when the telegraph lines fall down in the job during storms.

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ns5AW, Whitehorse, Yukon, worked RAO8 at midnight P.S.T., the other night. RAO8 is the Radio Laboratory, University of Vodivock, Idaho. It works on 20 meters every Sunday between 7000 and 8000 Greenwich.

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**Brass Pounders' League**

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<th>Del.</th>
<th>Rel.</th>
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Stations representing every U.S. district except the second and ninth and including also the outstanding stations in Alaska, the Hawaiian and Philippine Islands are listed in our B.P.L. this month in spite of the advent of hot weather and the attractions of the great out-of-doors.

op1HR and enBBOE head the list for outstanding meritorious performance. All these stations are members of Pounders' League are noted for their consistent schedulekeeping and reliable message-handling amateur radio work. Special credit should be given the stations who are running for over one hundred DELIVERIES in the message month: ns5AMM, op1HR, na8CKL, na8ZX. Deliveries and members of the list are.

A total of 200 or more bona fide messages handled and counted in accordance with A.R.R.L. practice or just 50 or more deliveries will put you in our list for the coming month.

Why not make more schedules with the reliable stations you hear and take steps to handle the traffic that will qualify you for B.P.L. membership also.
MORE TEN-METER TESTS

The second series of ten-meter tests will be held AUGUST 14-22, AUGUST 19, and AUGUST 25-26. We hope that every amateur who can possibly do so will get down on this new short-wave band (40.1-71.1 meters) and spend as much time as possible on ten-meters all day long on the dates named. Amateurs everywhere are invited to take part and report results, they negative or otherwise.

All that is necessary to take part is to get on the air, transmitting or receiving both. Information in this and past issues will enable you to get on ten-meters without much difficulty. If you are a new convert to the band of ten-meter experimenters whose results we have reported regularly in past issues.

A number of excellent contacts have been made on ten meters between points a thousand miles apart which indicate that this wavelength can be used for moderate distance work as well as for the transcontinental DX. The ten-meter reports received in the past month will appear (with a report of the August tests if possible) in our next issue.

Traffic reports results to A.R.R.L. Headquarters by August 27 at the latest—just as soon as the last day of tests is over. It will be appreciated if a brief description of your equipment is included with logs and reports. Also we hope that a number will give their results using different types of antennas capable of radiating energy at different angles with the vertical plane. Directions for directional radiation along definite lines from the transmitting station. An antenna with reflector wires mounted in a frame so that the whole business can be rotated would be ideal for this.

Whatever you use, OM, be sure to get in on the August ten-meter tests and let us know what you did. Let's go!

TRAFFIC BRIEFS

When the Marathon Swim was pulled off around Alaska Island, on the west coast, Sam Good, 6BD0, donated the use of two short-wave transmitters, one being located on Neptune Beach (San Diego) and the other aboard a speedboat which followed the leading swimmers. The shore station was given the portable call 6AFZ; and the speedboat station was given the call 6SR. 6BD0 and 6SR manned the shore station, while 6DTM, 6DCZ, and 6BDU went to sea. All went well except that 6DCZ got sea-sick and "spent half of the race looking longingly at the distant shore line." He has since decided not to try for a commercial license as a seagoing brassbounder.

The efforts of all the boys were rewarded with complete success. The crowd on shore enjoyed the "hot" news from the speedboat, while another entirely separate attempt on the part of a newspaper to report the race was a complete failure. The newspaper outfit had hired a professional announcer, some extra entertainers, and had gotten a special limited commercial license. The barge on which their station rested got stuck in the mud; and they spent the afternoon yelling into the mike in vain.

Code was used entirely from the speedboat. 6DTM and 6BDU won congratulations on their steady lists in the presence of a bucking boat and flying spray.

Twenty meters seems to be the solution of summer difficulties for the brassbounder. Don C. Good, of 6AJM, keeps a wonderful schedule with op1AD. In addition to his regular traffic work, he reports working ex. ct, ct, es, co, am, aj, op, up, no, ny, on, or, to, fo, se, sa, co, ne, and nu.

ELECTION NOTICE

To all A.R.R.L. Members residing in the Sections listed below: (The list gives the Sections, closing date for petition for nomination of a Section Manager, the name of the present incumbent and the date of expiration of his term of office.) This notice supersedes previous notice. In a number of cases (*) when no valid nominating petitions have been received from A.R.R.L. Members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set ahead to the dates given herewith. In the absence of nominating petitions from Members of a Section, the present incumbent continues to hold his official position and carry on the work of the Section (†) subject, of course, to the filing of proper nominating petitions and the holding of an election by ballot or as may be necessary. Resignations are indicated by (**).

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<td>Aug. 10</td>
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<td>9BEYN</td>
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<td>H. L. Sheats</td>
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<td>H. E. Veile</td>
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<td>op1AT, Acting</td>
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Newfoundland and Canada

Nominating petitions for Section Managers in Newfoundland and Canada should be addressed to Canadian General Manager, A. H. Keith Russell, V89AL, 5 Mail Building, Toronto, Ont., Canada. To be valid, petitions must be filed with him on or before the closing dates named.

| Newfoundland   | Aug. 28 | Loyd Reid, nclAR | July 15   |
| New Brunswick   | Aug. 28 | T. B. Lacey, nclRI | Aug. 2    |
| Nova Scotia     | Aug. 28 | W. C. Borrett, nclDD | Aug. 2   |
| P. E. I.        | Aug. 28 | F. W. Hrudman, nclBZ | Aug. 2   |
| Ontario         | Aug. 28 | W. C. Scott, nclBZ | Aug. 2    |
| Quebec          | Aug. 28 | Alex Reid, nclBE | Sept. 18  |

QST FOR AUGUST 1926 51
1. You are hereby notified that an election for an A.R.R.L. Section Communications Manager, for the next two-year term of office is about to be held in each of those Sections in accordance with the provisions of By-Laws 2.

   The elections will take place in the different Sections immediately after the closing date for receipt of nominees. Nominations of objects named in different Sections. The Ballots mailed from Headquarters will list the names of all eligible candidates nominated for the position by A.R.R.L. members residing in the Sections concerned.

3. Nominating petitions from the Sections named shall be accepted for the purpose. Five or more A.R.R.L. members residing in any Section have the privilege of nominating any member of the League in their Section as candidate for Section Manager. The following form for nomination.

   (Place and date) Communications Manager, A.R.R.L.

   We, the undersigned members of the A.R.R.L. residing in the Section of the

   Division hereby nominate, as candidate for Section Communications Manager for this Section for the next two-year term of office.

   (Five or more signatures of A.R.R.L. members are required.) The candidate and five or more signers must be League members in good standing and the petition shall be on official League letterhead and address, and station call of the candidate should be included. All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the closing date given for receipt of nominations. There is no limit on the number of petitions that may be filed, but no member shall sign more than one petition for each Section.

4. Members are urged to take initiative in filing petitions for the officials of each Section listed above. In order to be elected you must have a majority beyond one person. Therefore, it is important to you to get the name of your choice in office to carry on the work of the organization in your Section.

   —F. E. Handy, Communications Manager.

ELECTION RESULTS

Valid petitions nominating a Section Manager for the New York City and Long Island Section of the Hudson Division were filed naming but one candidate (R. L. H. Smith of the League) to be the official candidate. No other nominations were received. H. L. Kahl (ARK) was elected by acclamation for the next two-year term of office in this Section.

In the Northern New Jersey Section of the Hudson Division, on the recommendation of the C. W., M. E. Wester, 2W1C, and Mr. Dallas C. Akers, 2BDC, were nominated. Election results: Mr. Akers, 68; M. E. Wester, 82. Mr. Akers will therefore be declared elected.

In the South Dakota Section of the Dakota Division, Mr. Robert Olson, 9DES, and Mr. Dwight M. Pasek, 9K1R, Two candidates were nominated. Election results: Mr. Olson 10: Mr. Pasek, 11. Mr. Pasek has therefore been declared elected.

DIVISIONAL REPORTS

ATLANTIC DIVISION

WESTERN NEW YORK—SCM. C. S. Taylor, W4GRF. This summer many operators made vacations out of the district comes through quite well with SADE keeps up schedules. SAIL has a new 862 tube. SAVS had hard luck with short-circuits going down. SARS is now handling traffic. SAOG is now instructing at Boy Scout camp. SBFG went to the Convention at State College. SBLP states that he had an account of QRN, SBRD is now rebuilding his set. SDBI at WHAM is doing good work on short waves. SBIH delivered a message from an OH station. SCONT worked WNP and has schedules with SAXB and SBPQ. SCONC just put in a new 862 tube, SCONC, QSO, 5 times. He is now on the way to Europe and will be there in September. Stocom is now using an 862 tube and new recto bulbs. SCVJ worked Italy and England. SCYB has schedules with SBWJ, SDBI and SUNT. SCYB has schedules with 6DTP and 8BAU. SDDI says SSBN has a new transmitter at Rochester. SDDL will operate SMD at Canandaigua Lake for the RPL. SMDM handled a message for Hawaiian-African flyers. SDFP says he had a fine time at State College and got through the shooting off fire crackers. SQY is ready for PRR work and traffic. SQY is now on the U.S. B. Reid on a Naval Reserve cruise in Boston. SCAN. 5TH has a new Recto set in operation now, also doing work at Boy Scout camp. SBG1 has gone to his summer home. SCDH has a WAC certificate now. SCDH is the leader for this Section in using the new Recto. He made the RPL in grand style. SQUP has but three messages. SFI will attend Culver Summer school this year, 8UL has the newoperation for appendicitis and will also go to Europe shortly.


WESTERN PENNSYLVANIA—SCM. A. W. McAdoo. SGO—There was a little mixup this month in reporting, some reports coming to me and the office. Mr. Crossley and as I have to leave June 30 for my summer camp, this report is complete. We all want to thank Crossley and his gang of brassoppers for the excellent Convention they put on for the benefit of the Atlantic Division. Do not forget that Anderson, SGI, is still RM and will arrange schedules for you. His address is 416 College Ave, Pittsburg, Pa. A special appeal to Pittsburgh stations is made to get into the traffic game. SCS says he is picking up his skeds and traffic. He has a schedule with SCHO but wants more.

SCFR, on the 20 and 40 meter bands, has been doing some real work. He has been keeping a daily schedule with SB1B handling traffic for the Boy Scout Expedition. SGGG, on the air daily on 6000 meters, SCYF on 1900 meters, SCDP experimenting with airplane and radio. He will try out a set on a plane from Rodgers Field soon. SARC has been keeping a single wire net 100 meters at a time. WAQ has a portable call, SPA. SCGE will be off the air for two weeks on a vacation trip. SQY8 and SCDP will be off for a couple of weeks for summer work. SDY5 is a new ham in New Castle. Welcome, OM. SDY5 is a new one in Ellwood City. Wonder if SGI has been spending grasshopper in September? SBRN picked up a message from the crew of the wrecked dirigible Italia. SC8D is back on the air now and is looking for traffic.


MARYLAND-DELWARE-DIST. of COLUMBIA—SCM. H. H. Layton, SAIS—Quite a number of the gang are to be found on the 80 meter band. Let’s have those reports, fellows, so we can put you on the active list.

Delaware: 3ALQ will be QRV traffic shortly. 3WJ has a new job with the local power company and has gone "off the air" for a quiet month.

Maryland: 3BBW rebuilt his transmitter and hooked up UTC and got off the air. SAEI is QRV operating a half-wave dipole. It is quite a job. Lots of reports coming in.

D. of C.: 3GT at Bolling Field continues to be high traffic man of the entire Section. Reports in from DRM from power breaks. Except the high, 2801 is next but high. He is a fast gun and two masts in a hurricane. 3NR is back from Florida and promises a large traffic total next month.


SOUTHERN NEW JERSEY—SCM. M. J. Loyshch, SFCP—The following stations are advised that their ORS obligations are still due. 3VX. 3BGT. 3CBX. 3BAY. 3AXL. 3SMZ. 3WB. SXX. SFCP never worked harder for traffic than his month, and his report still is rather lean. SBCA is a very consistent station and is a good ORS prospect for 1929. 3ZI is doing a bit of work with Army-Aviation work. He worked 1MK on RM right. (LRI) still is putting up with none and 20 meters. 3MUT reports by his customary nice letter 2BSD kept a
sked with WNIC. SCO resumed activity with nice total. SATJ and SARN are newcomers. Reports are requested from all active stations in the section on 40, 80, 160, and 2 meters. Make contact and get back in the game, and if you need more time be sure to mail yours by midnight of the 27th. Later reports cannot be inserted. Let's start going again this month for once. Contact the Secretaries to get details for next month's report. Let's have competition. (FB, OMs, see it—LTH)

Traffic: NUF 81, SWK 16, Z2I 15, S1V 18, 25BD 9, 80X 6, 80B 8, SARN 5, SATJ 5.

EASTERN PENNSYLVANIA—SCM, J. B. Morgan, 39F—The nightly express service for traffic from New York to Chicago and return originated by 2ZP is working smoothly. Traffic seems to be flowing pretty well and although the majority of stations complain of lack of traffic, QRS and so forth. Notice the same gang reporting each month—there is a reason. A lot of appointments will be QSK next month if you don’t show up.

Traffic: ZZF 235, SWK 34, SAW 82, SCQ 116, 3QF 71, 2AKH 124, 81H 28, SAVK 61, 8AQG 87, SCWO 9, 8HTJ 54, 3ADE 35, SAWO 2.

CENTRAL DIVISION

MICHIGAN—SCM, Dallas Wise, 8DJR who has been up at WOOD, Grand Rapids, will be home for the summer and will have 88XJ on the air. 8BQJ of Flint has several schedules with other stations and finds things are going well using a fifty with a current feed. Hertz and gets out in great style. 8CG is one of the USDA net stations. 8SWR has been quite busy on 40 and handed quite a few on 8CFP on schedule. 8EDD has been having QRM from baseball but still manages to lead Mich. for the month. 8DFB completed the run of the 140th on the 14th. July is rebuilding and getting ready for the fall rush already. 8CKZ says not much doing on account of the bad QRN on 80. 8AYR has been silent on 40 owing to a couple of tube rectifiers. 8CSS has just graduated from high school and has a job so will not be able to be on during the daytime except 8SCN turns in a nice total and says he is on about five hours a day. SAUB wants another bigger and better QSO party next fall. 9CE works a schedule with 9CEX every other day. The Mich. 80 meter QSO party went well and everyone believes that was on and good time. 8DKX takes the honors for the most QSO’s, having ten. 8NDF and 80DX were tied for the number of contacts at the same time. 8DJKX with a few QRP is rebuilding. Some of the eight test messages started, seven were delivered that same night which shows the traffic can be handled on a very short schedule. SAUB and 8SBW, SAUB, SAAF were some of the other fellows who helped make the party a live one.

Traffic: 8DJR 23, 88QJ 9, 8AAF 11, 8SWB 65, 8NDF 129, 8DFB 7, 8BRS 6, 8CKZ 4, 8CI 21, 8CNK 76, 8SAUB 22, 8CE 12, 8CFP 64.

INDIANA—SCM, D. J. Angus, 9CYQ—8AIN again leads Ind. for traffic handled. 9PAP is the short wave station at Fort Benjamin Harrison and is on the air in operation day and night, handling traffic for the CMTF camp. Plenty of ops as hams are there from all over Ohio and Indiana. 9PT is a new ham at Bloomington and is rebuilding. Both stations are about to be on the air. Many have contacted the SCM on the air and are looking forward to the fall. 8BPA is the call of the Indianapolis Radio Club portable station. It is crystal controlled on 88.75 meters. 8PTW is the call of the Bloomington radio club station. 9HJU is a new ham at Springfield. 8K8J is putting in a new chemical rectifier. 9DBA has moved to Valparaiso for the summer. 8DBB is turning on the bug. 8SHU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the bug and 8HJU is selling out for the 6th time. Don’t think it will stick. 8VEA is putting up a new mast. 8FFP is putting in a 210. 8Khart and South Bend are good QRM points on 80. 9PZM is returning the...
SOUTHERN MINNESOTA—SCM—D. F. Cottam, 29YMA—Traffic looks pretty slim this month. Remember the UX-210 and the 225 that could be yours if you keep up the traffic. 9COS is highest this month. He has been on a vacation, too. He has a cost of time on him that makes him look like No. 12 camel. 9DBW has been on a trip to Canada. 9FSN was with him. They visited several ham stations. 9BTW has been QSO SE and NN. 9EFO keeps one sked. He is very busy delivering groceries in his own town. The evenings have been on 80. 9BYA had a blow up of apparatus in general and has been depressed ever since. The worst of it is 9BYA was handling the 9XI schedule with 9M1 for passed on and then it was a new setup of all time had to work things. 9EPO keeps one schedule. 9DHO, a new reporting station, is doing some very good work with a 920A. 9FAI has been hamfisting all month, saw 22 stations and gathered a lot of info. The last Twin City radio club meeting of the season was held and University pictures of Twin City ham stations were shown. Everyone enjoyed them very much. Mr Summer T. Young was master SCM. We lost one SCM, which means that Twin City has a new projectionist. He is to be congratulated on his fine work in our interest.

Traffic: 9COS 49, 9DBW 18, 9BTW 15, 9EFEK 13, 9ELA 11, 9BYA 11, 9EFO 7, 9EHO, 9FAI 1.

NORTHERN MINNESOTA—SCM, C. E. Barker, 9EUG—SCKI says he may go to sea. 9DPX, who was absent as RJC, is back at St. Paul again operating his own station. 9EH1 used a Hartley on 40 all month. 9AHV has been with the National Guard up at Devils Lake. 9C9W and 9BRM visited the Shanley station on a trip by the Twin City club. The 9AHV and other hams report 9BRM is too busy to be out but paid the SCM a visit while on a short camping trip at the lake.

Traffic: 9CKI 6, 9DPX 3, 9EHE 6, 9HAV 2, 9EGF 1.

NORTH DAKOTA—Acting SCM, Prof. H. L. Sheets, 9D9M—9VMV is rebuilding. He went back to Minnesota this summer to visit and report. 9D9M reports 9IK is attending the summer session at Valley City Normal. He reports a new station, 9FKE. 9B9R is plugging away as usual. 9D9M is at the U. of Minn. working hard. A new ham has reported from Kilidn, N. D., but has not received his license yet.

SOUTH DAKOTA—SCM, P. J. Beck, 9DB—The weather has been good and getting ready for cooler weather. 9DIY has its C.C. set going OK. 9BOW was visited by 9DWN, 9DGR, 9DBZ and 9DRL visited the SCM. 9DIY is becoming from a hobby station out but separate for 20 and 40 meters, new receivers, etc., and handled some traffic besides. 9DNS is quite active on 40.

Traffic: 9DB 81, 9DNS 6, 9BOW 3.

DELTA DIVISION

ARKANSAS—Acting SCM, H. E. Valte, 9AB—Well, fellows, I have been appointed your acting SCM until you have nominated and elected a regular SCM. I am working on getting things ready for cooler weather, 9DIY has his C.C. set going OK. 9BOW was visited by 9DWN, 9DGR, 9DBZ and 9DRL visited the SCM. 9DIY is becoming from a hobby station out but separate for 20 and 40 meters, new receivers, etc., and handled some traffic besides. 9DNS is quite active on 40.

Traffic: 9DB 81, 9DNS 6, 9BOW 3.

Hudson division

EASTERN NEW YORK—SCM, J. M. Holbrook. 5AK—The very hot air was the thing at White Plains of 42 hams and would-be hams from 18 towns of Westchester County. The meeting was enthusiastic and invigorating. The SCM made the PPL with three spots. This is a result of schedules. 2AYK handled traffic relating to 2MD with 9NEF. 8AK was not able. 8SAF and 5AK had a schedule. 8HDZ is a new ham in Vicksburg. 8AGS and 5AKU will be in scout camp for the next eight weeks. 5AKU is on the air using the call 5ACM. 5AK is now rebuilding his transmitter, receiver, antenna and wires. He has been QSO GO, EF and OA daily on 20 meters.

Traffic: 5AKP 73, 7FQ 12, 5AKT 5.

LOUISIANA—SCM, C. A. Freitag, 6UK—6IE has some difficulty with his 6610 used in batteries. 6CM is a new station in Shreveport. 5AY, 6HJ, 6JQ and 5UJ are still going strong on 14m.

Traffic: 5ANG 11, 6NS 2, 5UK 7, 5BCM 6.

Q5 FOR AUGUST 1928
the trouble to report. He kept a schedule with ARO and worked nights. Brooklyn: 2 UI is the lone star in Brooklyn. Long Island: 2BGK relayed a message from the "Italia" long distance phone. He uses two 200's out of the lab and has left for Europe and won't be back until Sept.


NORTHERN NEW JERSEY—SCM, A. G. Wester, 2VR-2KR is on 40 again with a new plate transformer and is doing excellent work. The west and uses 2BME as an alternate. 2AT expects to put plenty of traffic into New York via 2GK, the SCM of N.Y. It is quite due to remodeling of club room. 2KA is rebuilding. 2GQ is QRV for any aeroplane test as he lives on the trans-continental Air Route. The YLs have 2AGM now that college is out but is busy with 2BIF work. 2MD kept a schedule with 6B-1AW. 2CTQ is using voltage polarized feeder for 20 now. 2CJX has been busy with business. 2BY is going to have several prominent YL operators call at her shack during the summer. Guess a few OMs will also be heard. 2HI has left to go a visit to 2MU at Montreal. 2AVK sent his report while enroute to Canada for a vacation. 2BAL is going back on 20 after a few days on 40. 2AOP expects a new drifter next week. 2ADV is left for the sunny South, stopping off at 3ANV, enroute to WSB. 2ANB is vacationing in Calif. 2AOS is predicting 2ABR is back in M.I.T. and will be heard on for the summer. 2ASK is with us in a late report. 2ARB has had very little VHF work. 2WPW handles all their traffic. 2BME reported a good total direct to HQ—just in time.

Traffic: 2WR 1, 2AT 22, 2EY 1, 2BC 6, 2EA 6, 2GK 1, 2JG 12, 2BY 4, 2BME 113, 2AVK 14, 2BAS 4, 2AAP 14, 2AIR 13, 2ABD 115, 2AEW 8, 2ABE 2, 2ARB 22.

MIDWEST DIVISION

NEBRASKA—SCM, C. B. Dietil, 9BRY—9GY says that 20 meters is SB for summer. He keeps a nightly schedule with 9BZK. 9BRE is still the maddest man in town. 9DVF is still at 'em. 9DI is on deck. 9CHR reports a ham panic at Superior City and hams and service were present. Have a very fine report from 9EOF at Norfolk. 9EQF is the shining example for Nebraskan ORS.

Traffic: 9EOF 29, 2DVF 9, 9QY 6, 9DI 4, 9CHB 4.

IOWA—Acting SCM, H. W. Kerr, 9DZW—First official action report allowing the public to place an "ox" before 3DOA. Our own "OUT" connects with 9EHN from 1MK and invites QSU when you hear that sign. "QRV" comes from all sides. 9EIV was " Violetta " and " Pottery", 9BWN eastern, and inspecting for the Bell Fone over the state. 9QUS and 9CUX have asked for rain check till fall. Our new YL station is going on a theme trip. 9BGA gets a big kick QSOing 5 countries and 3 continents in one night. 9EQU worked three on 10 meters, continues 5 meter transmission from 230 to 2 pm. Sundays. 9DRD failed to report his 80 last month but this lead. 9GKH had complete QSO with 9DIY Trevizo, Italy, on 20 meters also worked 9DIY on 100 watts with his "200" rig. The Acting SCM would like to hear from every Iowa Ham.

Traffic: 9DRA 76, 9EDD 68, 9BCA 48, 9EHN 41, 9EBF 34, 9GDI 29, 9EDG 22, 9EIV 9, 9PB 6, 9EIQ 4.

KANSAS—SCM, F. S. McKeever, 9DNG—"SCPN is in Kansas on his vacation so was pretty much QRT this month. 9DWW takes the cake this time. He worked for three nights but only for 9CV and 9CET are still coming. 9HI let his skeds all go. 9DII and 9DNG lost their antennas in recent storms. 9DNG wants to thank all Kansas ORS for help during the drought and won't be doing any more. Besides this being his last report as SCM, he is dropping out of the game for the present so the other stations are being circu- lated for 9CET and 9JU. FR.

Traffic: 9CWV 16, 9UJN 14, 9CV 14, 9L1W 12, 9HL 10, 9DNG 7, 9DII 1, 9HRH 1.

MISSOURI—SCM, L. F. Wolfe, 9RF—ISIS people to some reliable skeds and traffic showed an increase over last month. 9TK took second honors for traffic. 9BMU followed 9ZK with a good Chicago sked and some new equipment. 9BMU says his set got soaked in the rain. 9DNS and 9HII landed fairly well and installed a new 82B with good results. 9DHP works 9DIY fairly well and has a sked with 9AYK. He received his ORS this month, 9FTA is getting ready to operate. 9DZV is a new STL. Lecomte station that has a lot of friends but operated at another shack while temporarily QRT. 9DOE reports everything FB on W9X, his summer job. 9ADH escaped a tornado narrowly. 9BMS is rerouting from college and getting 9QV on 10 and 20 meters. 9DKG works on 20 meters mostly. 9ARA was handled a number of times by the SCM pounding brass. 9BUL handled quite a bit of traffic through QRM from blown condensers. 9EPX sends his first report. 9RR is rebuilding 9BSB and 9TYF in KB traffic. 9FIO. 2FED, 9DHJ and 9BKY QRV for USDA tests on the 23rd. 2DNQ is moving. 9EML and 9HUR handled a few. 9BBK is being operated by a YL sister who is an artist operating. 9EQC has a new transmitter and is QRV for traffic. 9FHV is a first time reporter. 9DQN has a good sked with 9CUE of Indianapolis. 9BSB keeps regular St. Louis skeds. 9BKE has helped the US Army chasing the USMARP report in this Section. The enlistment in the 9th district tripled in two months. The new ham club is doing fine. It is getting some hot dope to the SCM about commercial stations working under amateur licenses. FB, OM. More stations handled traffic in every part of the Section than last year. 9BMU is in St. Louis, Kansas City and in the out-state stations.

Traffic: 9BEU 61, 9ZK 44, 9BMU 19, 9DNZ 6, 9BEU 21, 9HRF 7, 9A0Y 19, 9AVS 24, 9ASV 21, 9BQA 17, 9FEP 5, 9DMT 6, 9DKG 8, 9BUL 18, 9EPX 1, 9FIO 12, 9EMH 11, 9ENUT 10, 9FYP 25, 9HUR 3, 9BSB 48, 9DQN 19, 9EQC 10, 9FIV 2, 9HI R.

NEW ENGLAND DIVISION

CONNECTICUT—SCM, C. A. Weidenhammer, 12L 1TD keeps a schedule three times a week with 1BR-1BOH in Boston, 1AMC has handled some traffic with WP and worked several European stations. OA and OZ stations were again worked by 1BJK who hopes to have an imposing traffic report next month. 1IMK again leads in traffic. Operator Par- mer reports that five sixth district schedules for San Fran. traffic are being worked, and that two more for Los Angeles are in the making. New England has planned an extensive building program for the summer months. A call for help in an Iowa's hand of precious moments for 1DQG, 1B1-1BQH states that his schedule with 1TD keeps him in touch very nicely with things at home. 1BJG worked New Zealand. The battery power supply at 1QG "went west" last month. 1HM has built a very successful photo receiver. 1MC has been very active on 20. 1ABF reports work on 20 where QRN is nil. 1IY has joined the studio operating staff of the NBC Broadcasting Co. 1ZL handled traffic with Australia, New Zea- land and South America. The SCM is getting an 80 meter transmitter ready for summer traffic work. 1RP is out for an ORS certificate. 1ASD has a job as a butcher. He states that he is a real "ham" now. Hi.

Traffic: 1MK 290, 1BQH-1B1I 66, 1BN9 19, 1AMG 17, 1AMC 14, 1JH9 1, 1ZL 2, 1BOC 9, 1OS 8, 1VE 3, 1TD 49. 1ASD 13.

RHODE ISLAND—SCM, D. B. Fancher, 1BVE—With this report your SCM is resigning. Having accepted a position out of the state. 1BVF is moving to New York and can't be reached. 9DIY was worrying about getting back to school. He has been too busy with school work this month to do much in radio. IOM is whipping out good DX. 1ALS has been having YL trouble this month. 1BEQ says that his school work has been keeping him getting ready to move to New London, Conn. Will see you on the air from there.

Traffic: 1BYB 34, 1BQD 19, 1BLS 14, 1IMO 8, 1AWE 7.

G.S.T. FOR AUGUST 1928

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NORTHERN DIVISION

A - L A S K A - S C M . W. B. Wilson, WWDN—Alaskan traffic is moving very lively. Schedules are kept and 10B seems to have the most punch if SCM gets 7FD. (This report was sent by TTO via 7TX to 7FD.) Many stations are on in Alaska but do not report. T7 will be used to QSR your contacts. They may be sent in through nafTD via 7TX, 7KO or 7LZ. The summer stations at the canners are in full swing and can be heard on the air.

We are well into our brief season of extreme activity with all the canner stations hard at their regular work. Most of the operators this summer seem to be equipped with short wave sets personally owned. 7JF in the Bristol Bay region got busy among the Oriental employees and originated enough messages to send us a 'shocker. 7JF copied these messages and hopes to make a better record for the month. 7JF says there is not enough time, 7JF says there is not enough time, 7JF says there is not enough time, 7JF says there is not enough time. 


WASHINGTON—SCM. Otto Johnson, 7FD—This month is featured by an 80 meter station, 7KO who is doing real traffic work with few, if any, "bump" nights. Practically all traffic handled by Seattle stations was with Alaskan stations who are in the midst of their fishing convention. The Seattle gang are QRV with plans on the coming Northwest Division Convention to be held at the Hotel Borenston on Aug. 31 and Sept. 1st. Full details will be found in QST and Roy Kilbride or may be had through ham. Louis R. Huber, 9DOA, the Assistant to the SCM, will be the Headquarters representative. Activities in Eastern Washington are bountiful. Though Gray's Harbor seems to be showing signs of life.


MONTANA—SCM. O. W. Viers, TAAT—7HP is knocking 'em dead on 40. He handled several DX messages and worked Mexico. 7HT who has less time for radio comes in second. 7TAA snapped out of it and gave the SCM several. 7HP handled a few and is still experimenting with crystal control. 7TC visited the SCM for several days. 7TAAT worked a few on the new Herts tuned to 984.

Traffic: 7HP 85, T7T 40, T7AA 25, T7D 21, TAAT 6.

OREGON—SCM. R. H. Wright, T?P—Some of the gang are rebuilding in anticipation of fall and winter activity, 7RB, a new call but old operator, is using a 75w rig. He's building a QRP and is setting up 7PB on 7PB on 7PB on the air again after a long period of inactivity. He is also using 75w watts. 7TAF, the Battleship Oregon, has been doing excellent DX on 40 meters. 7TM has a station operating list of 30 licensed hams. 7TN is high traffic man this month. 77Q is on irregularly. He works a few traffic occasionally. 7TALK is on regularly. 7TM will be in Medford during the after a period of inactivity. 77Q is back on the air. 7TM has 250 watts and is building a shielded grid oscillator. 7TP is installing crystal control.

Traffic: 7DN 80, T7P 31, T7P 19, 7PL 9, T7ALK 21, T7Q 8.

PACIFIC DIVISION

EAST BAY—SCM. J. Walter Frates, 6CZR—The fact that OM summer slump is more an excuse for the traffic rather than an actuality was demonstrated this month. Traffic was up to a point and we kept busy handling messages for those on vacation and for the local men in the city. 6CZR is in full swing and joyous from the mountain of traffic sent out by 6CZT and AV3 at the camp under the direction of BBD. He made the big signal 7PB on 7PB on 7PB on 7PB on 7PB on 7PB on 7PB on 7PB on 7PB on 7PB on 7PB on 7PB.
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Island most of summer. 6DPY worked 6DQZTJ and opSDY Min. BAU, aboard the portable 722A on schedule at Dayton, Ohio. 6AM was also QSO 9EF on 10 meters R5 and R9. 6DMG sends in a good report. 6AGV is on holiday and is being left in touch with Los Angeles by 6DTG of L.A. and 6DRC of S. F. 6PY is working with a portable. 6DQ3. 6DK7 sends that he and BDS and two new hams went to Moosaver for 3 months and took a portable like along but didn't have much luck. 6BXC went to Big Trees, Yosemite and back via Tioga Pass. He has had 20 meters, 60 meter and a few 40 meter contacts. Club. 6AKW is very happy with having now. 6CAF worked 6AM on 89. 6HR0 kept a schedule with portable 6D1V. 6GJX has been working for a job. 6B1W has been out of town. 6GCU. 6GDB. 6CSI. 6BHN. 6BUX and 6BGC all sent in reports as usual. 6LH is doing well and done it—made the WAC. Congratulations. He gives the Zep antenna credit for making it. Traffic: 6EQP 91. 6BEV 47. 6AAU 47. 6ERK 4B. 6GJU 14. 6FO 43. 6DST 62. 6AXV 50. 6AKJ 33. 6DKY 29. 6DKX 26. 6GQ 26. 6APW 26. 6AWQ 26. 6AYQ 35. 6AEQ 24. 6BSD 23. 6CTO 22. 6B2 29. 6BJS 16. 6KXJ 13. 6BMJ 11. 6ALR 10. 6CMQ 10. 6BZC 9. 6CMQ 8. 6DPPY 6. 6AM 6. 6DMS 6. 6ASM 6. 6PY 4. 6DJK 4. 6HJX 3. 6AKW 3. 6CF 3. 6BRO 2. 6AQJ 1.

SACRAMENTO VALLEY—SCM. C. F. Mason, 6BGS—6BHS helped 6ER change his seat from Colpitts to a TP and TG with self-rectification on two UX210's, 6DQF is in California and is keeping a job in early morning hours. 6DUN has the most of his time to spend on radio now that high school is closed. 6CDN is working using 25's for rectifier. 6OQ is on with two 25's portable balance plate giving pure DC. 6BHS has his TP and TG going now.

Traffic: 6CIS 103. 6ER 12. 6DON 77. 6ATQ 7.

A M O R T I Z E D — B. L. Lamb, GANO—BJSF is still receiving cards from France. 6BWS's XI reports a diamond ring for birthday. Who bought it, OM? 6BXX applied for ORS. 6D1R is going away on a vacation in Northern part of the state for the summer. 6BWS sent out 24 cards to stations working off wave. 6SW is installing a mercury are rectifier. 6CSY will be given some money may be raised to buy a 250 watt for 6EEL Radio Club. 6ANO is having trouble with line voltage. 6CDU works cards in the ordinary way.

Traffic: 6WJS 70. 6CDU 32. 6BFP 4. 6ANO 26.

ROANOKE DIVISION

VIRGINIA—SCM, J. F. Wohlford, 2CA—2ASC is moving his station. 5EC is using 1500 volts on a 15 meter antenna. 4B3C reports 30 meters and 60 meters on 10 yet. 5BCL is still working his schedule with 9UTC. 5ALS seems to be getting out and handling traffic off of account of sickness. 6SLC was reported 400 miles on 50 meter phone on new power. 5RG will be on with AC supply as line has been repaired to his place. 5BWS also has the AC now and will continue to work rectified current. The radio club of Richmond had a big meeting at which Commander Fawell, USN, was principal speaker. He gave some very interesting dope on various frequency developments and also on the International conference in regards to frequencies, etc.

Traffic: 4GK 88. 5ALS 29. 5AAJ 23. 5AG 9. SEEC 7. 5JNY 11. 8REL 5.

NORTH CAROLINA—SCM, R. S. Morris, 4FR—4FR reports his schedule working FB with fo-PM. 4JSW reports good traffic on N. 6BZK has been returning traffic contact. 4FA keeps a skep with 4EC who is now on the air at Wilmington and asks the gang please to note the schedule. 4AB says his schedules have gone to the dogs. 4JR is only for the schedules but promises more work soon. 4TO says he is going to apply for WAC as soon as he gets his cards from 4BIX. 5DWD has been working from power GQ. 5AVL has trouble in getting a fixed condenser to stand up in his 9ER transmitter.

Traffic: 3QJ 32. 4EJ 27. 4EA 23. 4AB 17. 4TO 11. 4EC 11. 4JR 6.

WEST VIRGINIA—SCM, C. S. Hoffman, Jr.—8HD 8GQZ sends with messages handled working re-SEA and 8FT. 8HFS reports good traffic. 8DCM is on daily. 6DNN has several schedules. Morris and Stevens of ex-6BDA are reported to be on with 8BIX. 6EWD worked a dozen European countries. 8RED-SAWM just returned from Yellowstone Park and other western points, having a splendid vacation trip, having several of the gang reported going to State College Convention in California.

Traffic: 3GQL 44. 5APN 14. 8DQC 2.

ROCKY MOUNTAIN DIVISION

COLORADO—SCM, C. R. Steedman, 9CACA—9EAM. the old Brass Founder, changed to a new QRA and we have heard him go with the new QRA and he is on 8000. 6ARV is going to Calif. 9AMJ claims his Ford is a good radio bug extender. Some of the Denver gang doubt the authenticity of his story. He seems to be successfully recovering from a badly broken wrist and numerous bruises. 9CACA is active and ready to go to the Denver ham player for the summer and is signing his portable 6E2C and showing the Denver gang up on DX. 9KRM keeps schedule with KVAK. 6G2B has been sent his report to the Colo. SCM this time.

Traffic: 9CA 8. 6DGG 1. 5BQO 2. 9CAW 9. 6CDR 3. 9EDQ 2. 9DRY 9. 9KNM 51. 9CAW 5.

SOUTHERN DIVISION

FLORIDA—SCM, C. E. Foulkes, 4LX—4ACG has a Jr. op. 4CK in Washington, D.C. C. C. handled quite a few messages before leaving. He made the EPL and leads all Florida by a large margin. Activity has been negligible, the ham has been heard from the looks of this report. 4ACG comes in third with his total. 4RN has been experimenting with a portable transmitter and was heard with a poor signal and seems to have been forgotten for 4AAO lately. 4LX has been working on the transmitter at NRQQ. Are the YLs QRMin 4TK? 4A0 works all continents.

Traffic: 4EJ 267. 4RK 2. 4RK 1. 4AEY 58.

SACRAMENTO—SCM, H. L. Reid, 4RJ—Georgia. The Atlanta gang is keeping the QRM alive and it is hoped that things will begin to move in as the days of old. 4RN will keep nightly skeds with 4SI starting July 1st when he clears for Europe. 4GJ is using a 210 now. He retired his five meter after working ef, on, and fm with 400 volts on the plate.

Porto Rico: 4KD has heard 4PQ, 4AAG, 4ACI, and 4AGN in St. Thomas, V. I.


ALABAMA—SCM, T. Trum, 5AJP—Alabama hams are just finishing rebuilding his transmitter. He thinks 56 meters is the better thing. Good things. BHA of 5ATS had the misfortune of losing his father this month. Alabama hams wish to express their deep sympathy in his hour of grief. 5ATJ is at Camp McClellan this month. He was out regularly while home and carried on some good traffic. A new ham is going on the air next door to him soon. 5ADA has been keeping sked with California regularly this month on 40. He is using a Hertz with a 210 back of him and 6000 volts on the plates. 5AVG is back on air after his illness, ready for traffic and radar-choosing. 5AYL has been off the air most of this month and has been taking advantage of the hot days in rebuilding his set. He now has 5VW on daily and 6JP pounds brass when he not out with the yls.

Now fellows when the new fourth district calls are issued out and we really get down to good work with them, lets all review the past of Alabama Amateur work with our dear old districts and them calls which we are reluctant to relinquish and make it a part of our daily amateur life to uphold our fine sending, rag chasing and contesting. 5AVG is a new ham and wishes to say to all of you, that we have the best gang in the world. Let's show them by giving me a fine report on your activity each month.

Traffic: 1611. 5ADN 22. 5AFY 9. 5AYL 7. 5ATS 8. 5BAE 4.
WEST GULF DIVISION

OKLAHOMA—SCM, K. M. Ehret, 5APG—On the morning of May 28th, 5AIR heard the "Italia" call CQ but couldn't raise him. 5BAQ has been rebuilding his antenna and has repaired it so far. 5AYO built a new receiver which will be shipped by 5VH. 5AVM has been doing repair work on his water tower which is too hot—saya lemonade and the hammock for him. 5HAX has been using a 201A but has graduated into the 5VH system. 5AMO left home before he had a chance to use in his traffic total but says it would have run around 130. 5AMO is too-dressing again down on an oil well in Texas. 5AVM has graduated school and hopes to get on July 4th with a real signal. 5QL is on vacation in his home town. 5AAV is on a commercial tour in Denver and operating under the call 5ZGC. 5APX is doing most of his work on 29 meters now. 5APG as well as 5QL heard the airplane "Southern Cross" several different mornings during the Pacific flight.

Traffic: 5AFX 10, 5APG 16, 5AIR 4, 5BAQ 1, 5AYO 25, 5BZJ 19.

NORTHERN TEXAS—SCM, J. H. Robinson, 5AKN—We have two more stations reporting this month than last which shows an increase in activity. All the followers report a lack of traffic. DX also seems to be less. CQ are too heavy. Army-Amateur activity is picking up. 5DQX reports scheduled with 5AMO and 5OM. 5BBF is building a Zepp antenna but says daylight work is good but night work is next to nothing. 5VMBX is back from college. 5HY has gone to CMTO and is operating crystal control station 5AIW. 5LJ has a 320 pounder and 40 is working. 5BAQ is on 20 meters and wants an ORS. 5BNW is on 20 meters. 5GD is putting a new 204A in his set. 5SAQ is rebuilding. 5DG-5AKN is working on both 20 and 40 meters.

Traffic: 5BAM 38, 5BBF 24, 5JRI 16, 5AHU 9, 5HY 7, 5LA 6, 5AQ 6, 5JD 6, 5AEK 4, 5ARKN 2, 5NW 2.

SOUTHERN TEXAS—E. A. Sahm, 5YK activity was up very good despite the merciless QRN of midsummer in the Gulf area. 5BLH has graduated school and others are back who had quit for a while. 5BS is looking forward to the San Antonio Hamfest. 5BNA at Miranda says the weather is too hot for Southern Mississippi and 5SH with a touring orchestra. 5LP, Melville Chub at Houston handled a message from Honolulu to New Orleans. 5TMA says he is doing a lot of work in a new transmitter. 5MU, Irving Seidmann at San Antonio is back after being away at school. 5ATT at New Ulm, and 5AIQ are the Bishop, are newcomers. 5SAK has become a commercial man in Corpus Christi. Texas and 5BAX has been heard in Paris. Our old friend and standby, L. D. Wall at San Antonio got married about a month ago.

TRAFFIC: 5EW 35, 5LP-5BBS 27, 5ATM 19, 5HS 2.

Canada

ONTARIO DIVISION

ONTARIO—SCM, W. Y. Sloan, VE8BJ—Central Dist: VE8BJ reports checking the latter part of May, he visited many stations along them 1MK. He is on the air nightly on 25.5 meters with his other 210A. Traffic scheduled with 3VE8BR says that 40 meters is used and that Bristol traffic has been handled. 5VE8BO uses a 210 on 40 and 55.5 meters with an intermittent station with 15 watts. 5VE8XX is in school exams but traffic has been handled. 5VE8BY is very busy these days. Also, but when he has more time, he will become Route Manager. 5B3J is now on 20 meters. His new official call is 4AL and has been continuing his work to schedules on 55.5 meters. 5ECO has been handling traffic from out-post stations in the Northern Ontario districts with nightly schedules after 10:30 EST. 5SA is away from home. 5WJL is working in Ontario and won't be back again until Sept. 5VE8E is an official 210A, 5VE8R has been keeping his work to schedules on 55.5 meters. 5VE8BP is an official 210A in the North with a fine signal on 55.5 meters. Eastern Dist: 5VE8S is on the air again. 5HE2 is rebuilding his crystal control for the last time. His antenna is the "是可以" call CQ but couldn't raise him. 5BAQ has been rebuilding his antenna and has repaired it so far. 5AYO built a new receiver which will be shipped by 5VH. 5AVM has graduated school and hopes to get on July 4th with a real signal. 5QL is on vacation in his home town. 5AAV is on a commercial tour in Denver and operating under the call 5ZGC. 5APX is doing most of his work on 29 meters now. 5APG as well as 5QL heard the airplane "Southern Cross" several different mornings during the Pacific flight.

Traffic: 5AFX 10, 5APG 16, 5AIR 4, 5BAQ 1, 5AYO 25, 5BZJ 19.

Quebec Division

QUEBEC—SCM, Alex Reid, 2BE—Although we are in midsummer with vacations, QRN etc., DX and traffic are holding their own and what is more encouraging, three stations other than VE8E are on the air during the month. It certainly appeared like old times to hear eight stations of this division on during one evening. 2BE and 5AU have been appointed ORS. 2AC of Thetford Mines has translated to the A.R.R.L. into French and has also started a radio club. 2AP, our newest station, worked four districts the second night out. He is using one of the new 250 watt tubes. 2FY got his first DX during the month. 2AE is using a Belgian 60 watt and doing good work. VE8A and 5BU are sorry to report that 2BV is ill. 2AL and 2BR are still pounding away at DX and traffic. 2BE has a Friday and Saturday DX contest with 2BEQ. 2BR hooked OZ during the month. 2CW is QRW training for the coming regatta. 2CA worked on 40 during the month. 2GH is still in the news. 2BB is the most consistent at DX and turns in a nice report. 2BH is rebuilding and increasing power. 2AQ is leaving for the Arctic for eighteen months.

VANALTA DIVISION

ALBERTA—SCM, E. J. Taylor, 4HA—4AIH is west operator at station CJCA. 4CL is out of town. 4GT moved to a new locality. 4AC is busy on 55.5 meters. 4TA reports us on a visit on his way to Seattle. 4CU is rigging a new receiver. 4HM is still in England. 4FF is getting into twenty meters and has a DX total on. Get behind the 52.5 band campaign to save this valuable channel for Wed. night all-Canadian gathering.

BRITISH COLUMBIA—SCM, E. S. Brooks, 6RI—The B.C.A.R.A. clubhouse is coming along fine and the gang are hoping to have it finished for the convention. 4BR sends in a good total of relayed messages. 4JH says he followed K'HAB most of the way across the Peace river. 4JH is of the Vancouver gang. 6GT has rebuilt again. 4AR has gone to Portland pro team. 6RI has quit the commercial end of radio but 6RI is a good DXer. 4CIP is very sick lately and the gang are hoping for a speedy recovery. 4CIP continues to build sets for the gang. 5AJ has returned from OA OZ districts. 6AD says 5OO, OA, OZ, OH and AJ in one night on 40. PB.

Traffic: 5BR 13, 5CJ 12, 5AD 12, 5CO 5.

PRAIRIE DIVISION

MANITOBA—SCM, D. B. Sinclair, 4FY—4EK still pounds away very consistently. 4AV took a station at Turtle Mountains with 4AR of Rolaeven. Several contacts were made with a portable transmitter. 4GT now has one. 4WJL is working a perking FB. 4FW's new UX852 will be on the air soon. 4DI put up a vertical antenna. 4CG still sounds good over both 4DI and 4FW. 4IF worked a 210 in a Hartley. Our old friend 4DP is back and holding the mines. He is now using a fifty. 4HLP has been getting DX reports from official call 4AKL. 4DR is rebuilding to TP-TG all glass-mounted. 4ATL is back on the line. 4GG managed to get on 20 once in a while. 4FO has a 250. 4BTC will be back on the air with his fifty in a few days. 4DG is still pounding away. Keep up the good work, fellows.

Traffic: 4AEK 16, 4DL 9, 4NR 8, 4DB 5, 4FY 5, 4DI 4, 4GG 3, 4DR 2 and 4on in the North with a fine signal on 55.5 meters. Eastern Dist: 5VE8S is on the air again. 5HE2 is rebuilding his crystal control for the last time. His antenna is the "是可以" call CQ but couldn't raise him. 5BAQ has been rebuilding his antenna and has repaired it so far. 5AYO built a new receiver which will be shipped by 5VH. 5AVM has graduated school and hopes to get on July 4th with a real signal. 5QL is on vacation in his home town. 5AAV is on a commercial tour in Denver and operating under the call 5ZGC. 5APX is doing most of his work on 29 meters now. 5APG as well as 5QL heard the airplane "Southern Cross" several different mornings during the Pacific flight.

Traffic: 5AFX 10, 5APG 16, 5AIR 4, 5BAQ 1, 5AYO 25, 5BZJ 19.

SASKATOON—SCM, W. J. Pickering, 4AC—4AI is a new station on the air operated by H. E. Breton of Meacham. Two 201A's are used in an E-A-C circuit. 4PC is back on Wednesday nights. The Saskatoon gang is becoming active. There are quite a number of stations operating and more coming up.

Traffic: 4FC 11, 4AI 8.

Q S T FOR AUGUST 1928

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NEW CONSTITUTION PROPOSED

By the time this issue gets into print, all National Section presidents and secretaries should have received copies of General Letter No. 10, sent out from I.A.R.U. headquarters recently. For the information of the general membership, it might be mentioned that this letter deals with a proposed new constitution for the Union, which will be voted on by all National Presidents and by the officers of the Union.

The Union started out with a membership composed of individuals. This was necessary, because in most countries there were no recognized amateur organizations to represent the amateurs there. However, during the past two years and more, strong national societies have sprung up in practically every country where amateur radio flourishes, and with this rise, the individual-membership feature of the Union constitution became increasingly unwieldy and burdensome.

Early in 1927 it was proposed to all the National Sections that the time had arrived when the Union should be converted into a union of societies, with one recognized amateur society or organization from each country being a member of the Union and representing the amateurs of its respective country in the Union. This suggestion met with approval, and the Executive Committee of the Union was instructed to prepare a new constitution to provide the machinery for such an organization.

The first proposal was prepared in the fall of 1927, and sent out for vote. Various objections were cited by most National Sections, however, and a revision was therefore made. It is this revision which is sent out under General Letter No. 10.

The basic objects and principles of the Union remain the same. Section I. of Article II., on membership, represents the heart of the new document, and reads as follows:

"The membership of the Union shall consist of the national amateur radio societies which, on the date of the adoption of these provisions, are recognized as sections of the Union under its previous Constitution, and any additional national amateur radio societies which subsequently may be admitted to membership as provided below."

Most of the other changes are merely to conform to this, although there are alterations in the plan for locating the headquarters, etc.

It is believed that the new document takes care of all the objections that were cited against the first proposal, and that this new Constitution will, therefore, be favorably acted upon. All votes should be received by the first of September, and announcement of the result will be given in the next available issue of QST, with the new Constitution printed in full, if it is passed.

All National presidents and other Union officers are urged to return their votes as promptly as possible.

CHANGE IN THE DUTCH SECTION

The Dutch Section of the Union has been converted into a national amateur organization, complying with the new ideas regarding national sections, and is now known as the Nederlandsche Vereeniging voor Internationaal Radio-amateurisme. The official "diamond" of the new organization is shown herewith, and represents another addition to what is now becoming a large family of such emblems.

R.S.G.B. BECOMES BRITISH SECTION

As a result of a vote of the members of the British Section of the I.A.R.U., the Radio Society of Great Britain has been appointed the National Section for Great Britain. Capt. Ian Fraser is President, and H. Bevan Swift is Hon. Secretary. This move brings Great Britain into line under the new scheme of the Union.

The old Section, together with its officers, is automatically eliminated, but Union

(Continued on Page 75)
Calls Heard

On 40 meters

WSQ, Between Mosquito Inlet, B.C., and Kilkerran.

19th July, L4, 0309. 0400, Harold C. Fernery, 119 Rutherford St.,

Note: All stations Include U.S.A. and U.K.

Ham's & Radios

119 Rutherford St.

July 25th, L4.

Operator: Ed Kranz, W6RY.

Note: All stations Include U.S.A. and U.K.

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Operator: Ed Kranz, W6RY.

Note: All stations Include U.S.A. and U.K.

Ham's & Radios

119 Rutherford St.

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Ham's & Radios

119 Rutherford St.
A Souvenir

173 Albany Ave.,
Shreveport, La.

Editor, QST:
The enclosed is a relic of the Hearn household recently unearthed in the attic. You will recognize it as recalling the "swing around the country" taken by Mr. Marconi shortly after he had announced his invention of wireless telegraphy. He came to Shreveport when I was 17 years old. I attended the demonstration held in the old Opera House (long since torn down). His audience was jocularly skeptical of him, for it was unholy to communicate from one point to another without visible physical connection! In fact, I dare say that ninety-five per cent of the audience put him down as a trickster or sleight-of-hand performer. My reaction, however (as I was at a period where facing the "unknown" was intriguing), was that there must be something to this—if only I had the intelligence to understand it!

—Bradford Hearn, SANC.

Off-Band Operation

984 Memorial Drive
Cambridge, Mass.

Editor, QST:
Having read with interest the various communications in QST concerning the operation of amateur transmitters outside of the legal wavebands I am prompted to express my feelings in a somewhat different vein.

Last fall amateur radio was almost eliminated by the International Radio Conference and it is only due to the valiant efforts of officials of the A.R.R.L. and others that we retain the privilege of operating our stations. Operation according to law is not only to our individual advantage but is our duty to our fellow amateurs and those who struggled so hard to have us recognized as a worthy class who deserved a place in the crowded spectrum. Promises were made or implied by those who saved us that our stations would be operated in accordance with the regulations set down by the Conference, and the great majority of them are. Off band operation whether wilful or accidental is carried on by only a very small percentage of the amateurs of the country, but every station which does so brings discredit on, and endangers the status of all the rest.

It is a truly laudable spirit which prompts us to protect our fellows who are guilty of such violations, but is it for the greatest good of the greatest numbers? We won what we did at the Conference only by a very small margin and it behooves us to guard well what we have earned. No other radio service would expect to carry on repeated operation in violations of its license without disciplinary action; and these other services demonstrated to the satisfaction of the powers that be that they have a greater right to the air than we amateurs.

I favor a much stricter application of the law to amateur stations than there is at present. It is to be assumed, if not from confidence in human nature alone at least in view of the difficulty of proving anything to the contrary, that all off-band operation is accidental and due to carelessness. I do not believe that the carelessness of a few should be permitted to endanger the status of the majority. I believe that a single repetition of off-band operation after a warning by a properly authorized station constitutes sufficient reason for suspension of the station's license, and further, I think it is the duty of the A.R.R.L. to report such violations to the Supervisor of Radio concerned.

The officials of the League got us what we have and we should back them up in helping the vast majority keep it against the carelessness of a few who have little regard for the rights of others.

—Harris Fahnstock, Jr., 1BBO.
The Mershon Condenser gives a very large capacity in a very small space. It is self-healing in case of puncture, and is unaffected by changes in temperature, or by moisture.

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

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

The AMRAD Corporation
Medford Hillside, Mass.

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

Name__________________________

Address________________________
No Grid Leak Interference with the
Bradley Unit-B Resistor

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

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

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

For Radio Manufacturers

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

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

Tapped Bradley Unit Resistors are also furnished to meet your specifications.

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

Allen-Bradley Resistors

Editor, QST:

I want to express my approval of the Editorial in the June QST on the use of amateur waves by commercial interests. One need only glance down the pages of a Call Book to see the many amateur calls assigned to stations whose real place is in a commercial band. Many of these stations communicate with amateurs and more do not. Among the latter are stations operated by oil companies, light and power companies and automobile manufacturers. Let's get these usurpers out of our bands. We are cramped enough for space ourselves and there are channels allotted for those services.

In regard to off-wave operation I think very highly of the idea of publishing off-wave station calls in QST. 9D5G is right when he says that an inaccurate wavemeter is just as inaccurate when used to check a received signal as when it is used to check the transmitter. Even so the off-wave list will be long enough if we just report the stations that are below NKF and NAA and above WIR and WIZ in the 80 and 40 meter bands.

So let's get all the commercials out of our bands and all the amateurs back into them.

—W. T. Schuitrich, 9CDT.

Editor, QST:

We hear of freakish results—sometimes not so freakish—when a station QSO's with a fraction of a watt. It has also been fairly well established that a re-radiated wave from guy wires, gutter pipes adjacent to wiring etc. may have a fraction of a watt output.

A receiving set (which generates harmonics all of its own) can easily receive signals on its third harmonic, thus being sensitive to signals which might be the fourth harmonic of a transmitter.

Recently, the writer heard a fifth district station on 22 meters QSO a New Zealand station. Upon sending a card the five wrote me an unpleasant reply stating that he was on 40 meters. The next time this five was heard his statement was checked and truly he was on 40, but with a perfectly readable signal right on the New Zealander's wave. Quite possibly the signal was caused from re-radiation from the receiving antenna tuned to the NZ station.

I mention this example for the benefit of those wishing an "Outside the Band" list of calls heard.

—Don C. Wallace, 6AM.

741 47 Street,
Milwaukee, Wis.
The Test Of Time
HAS PROVEN THAT
Cardwell Condensers
are BASICALLY RIGHT~ RUGGED~ STRONG~

FOR YEARS preferred over all others by the foremost Amateurs, Experimenters and Engineers. No gold plate, no funny doodahs, but ALL condenser, built to last for the life of your installation and longer, and to give you the utmost in service and efficiency.

"BALANCET" (midget) CONDENSERS
High, Medium and Low Voltage TRANSMITTING CONDENSERS (Standard and to order)
RECEIVING CONDENSERS

"One for every tube and purpose"
LITERATURE UPON REQUEST

The Allen D. Cardwell Manufacturing Corp.
81 Prospect Street
B'klyn, N. Y.

"THE STANDARD OF COMPARISON"
Is This Operating?

Lake Bay, Alaska.

Editor, QST:

I am a long-suffering type of person and it has taken me a long while to get "haired-up" to the point of writing about some of this lid practice in the amateur bands.

In the first place, who was the crank that coined the idea that in calling a station you should send your own call once after pounding out the other fellow's call for ten minutes? Here at Lake Bay my apartment happens to be my office also. Recently I was listening to a sixth district station (call withheld, though he deserves worse) calling a nine. I counted the 9ARA's coming from this fellow's key—five, six, seven, eight, until finally I reached up above my desk and grabbed a counting machine I use on the job. When the six had ceased pounding his key, and I my counting machine, the figures showed that 139 consecutive 9ARA's had been transmitted before the six signed once.

Now, gentlemen, if that's operating I'm St. Peter's brother. Let's prepare a nice chopped-up razor-blade pudding for these fellows.

Everett Rodenhouse, 7ADP.

(Continued from Page 61)

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

Manufactured and sold under rights, patents and inventions owned and or controlled by Radio Corporation of America.

Increase Your Radio Enjoyment

By replacing each tube in your set with a new Cunningham Radio Tube you are sure of clear, resonant tone. You are virtually giving new life and energy to your radio, and you thereby increase your radio enjoyment.

Don't use old or inferior tubes with new ones—use new tubes throughout.

Look for the name CUNNINGHAM on the Orange and Blue carton . . .

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

Say You Saw It In Q S T — It Identifies You and Helps Q S T
Frequency Precision
Attained by Using
\[\text{REL}\]
Frequency Meters

A radically new type of frequency measuring instrument designed expressly for the new amateur bands effective January, 1929.

Quoting Hiram Percy Maxim, President A.R.R.L: "If somebody were to ask you the question, 'What is the big outstanding problem in amateur radio today?', what would you reply? It was asked me the other day. I had given the matter considerable thought, so I was ready with my reply. My answer was, 'Frequency precision.'" That's the problem, fellow amateurs, but are you going to do precision work without precision measuring equipment? Your new transmitter and your new receiver cannot be designed to operate within the new lawfully assigned bands unless you use an accurate frequency meter. Your old wavemeters are useless. Obsolete!! Why? In most cases the new 7000 to 7300 Kc. band (old 40 meter band) is crowded into 5 to 10 divisions on the dial. It won't be so many meters any more, but it will be so many kilocycles. You will eventually specify your QRH in frequency.

REL is again pioneering for the good and welfare of amateur radio. The new line of amateur frequency meters deserves the critical attention of everyone interested in amateur radio. REL is presently developing new transmitters, new receivers, new coils and condensers. Watch for their announcements in the coming issues of QST.

### ADVANCE DATA ON FREQUENCY METERS

<table>
<thead>
<tr>
<th>Catalog No.</th>
<th>Type and Frequency Range</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>173</td>
<td>3500 to 4000 K.C. (96 to 75 meters)</td>
<td>$15.00</td>
</tr>
<tr>
<td>177</td>
<td>7000 to 7300 K.C. (42.8 to 41.0 meters)</td>
<td>$15.00</td>
</tr>
<tr>
<td>178</td>
<td>14000 to 14400 K.C. (21.4 to 20.8 meters)</td>
<td>$15.00</td>
</tr>
<tr>
<td>179</td>
<td>26000 to 30000 K.C. (10.7 to 10.0 meters)</td>
<td>$15.00</td>
</tr>
</tbody>
</table>

Each frequency meter is individually calibrated from a Piezo crystal controlled standard. New uniquely designed Coils and Condensers—Highly sensitive independent resonance indicator circuit. (Flashlight lamps, Neon tubes, hot wire meters, and galvanometers cannot be used to sharply indicate resonance on the new narrow amateur bands). Indicator produces no change of calibration. Large calibration curves allow accurate readings to within 1/10 of 1%.

Supplied with one original and one blueprint curve sheet.

Cat. No. 180 Frequency Meter Indicator
These are supplied with Weston milliampere meters and crystal rectifiers constituting the most sensitive resonance indicators known.

### RADIO ENGINEERING LABORATORIES

100 Wilbur Avenue Long Island City, N.Y.

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Say You Saw It In QST — It Identifies You and Helps QST
**How to Select a Resistor**

**EVERY** radio engineer is confronted by **two** important questions when he selects a resistor—

1. **“How accurate is it?”** and **“How long will it maintain its accuracy under the average load?”**

Until the resistor answers these two with perfect satisfaction, all other questions are unnecessary.

Here’s how Hardwick, Field, Inc., answer them:

1. Har-field Resistors can be supplied to you as accurate as plus or minus 1% if you wish.

2. Under average load conditions, all Har-field Resistors are guaranteed to maintain the accuracy your order specifies.

*Har-field Resistors are made in either vitreous enamel or specially coated cement finish. Tell us about the nature of your job, and we'll send you a sample with prices. Write HARDWICK, FIELD, INC.*

**SALE OFFICE**
122 Greenwich St., New York 5, N. Y.
**FACTORY**
251 Emsm St., Newark, N. J.

**HARDWICK, FIELD, INC.**

**WIRE-MOUNT RESISTORS**

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**Model no.**

Vario Denser

---

**Pep Up Your Set With X-L Products**

Tune quickly—adjust accurately—eliminate distracting noises get correct tube oscillation—with X-L VARIO DENSERS in your circuit.

Designers of all latest and best circuits specify and endorse the X-L LINE. Model no. “N”—Monometer adjustment easily made, assures exact oscillation control in all tuned radio frequency circuits. Neutroline Roberta 2-1/2-Capacity 2,000 to 20,000. Model no. “M”—200,000 to 2,000,000. Price $1.00.

**FREE**—New up-to-date book of wiring diagrams, showing use of X-L units in all popular hookups, also the Goodwin Aperiodic Protector Circuit applicable to any set, will be sent on request free of charge. Write today.

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**X-L RADIO LABORATORIES**

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**K I C K**


**RECTIFIER ENGINEERING SERVICE**

4837 Rockwood Rd., Lake View, Chicago, Ohio
No. 635
Stromberg-Carlson
Treasure Chest.
Price, less tubes $185.
Slightly higher prices
Rockies and West,
and Canada.

The New
Stromberg-Carlson

This new Receiver marks the success
of long experimentation by Strom-
berg-Carlson engineers in producing a
Receiver having the convenience and
simplicity of A.C. tubes and retaining
all the glorious tone quality for which
Stromberg-Carlsons have long
been celebrated.

Handsome in cabinet work
—a beautifully grained Ameri-
can Walnut; extremely sensi-
tive; highly selective and
producing fine volume over
the entire tuning range from 200
meters to 550 meters it provides a re-
markable instrument at a very reason-
able price.

As in other Stromberg-Carlsons
 provision is made for reproduction of
phonograph records. It is
totally shielded, tunes with a
single selector [illuminated],
is entirely self contained and
operates from any 60-cycle
A.C. house lighting circuit,
using no batteries or liquids.

Listen to the Stromberg-
Carlson Sextette Tuesday
evenings at 8 o'clock
Eastern Daylight Time,
through the NBC and
Associated Stations: WJZ,
WBZ-WBZA, WJR, WSS,
WBBH, WHAM, KDRA,
WREN, WMJ, WCCO,
KYW, KWK, KOA, WBT,
KWOC, WFAA, WOAL,
WMC, WHAS, KPRC.

Every new Stromberg-Carlson has handy jack
to facilitate playing Phonograph records.

STROMBERG-CARLSON TELEPHONE MANUFACTURING CO.
ROCHESTER, N.Y.

Stromberg-Carlson

MAKERS OF VOICE TRANSMISSION AND VOICE RECEPTION APPARATUS FOR MORE THAN THIRTY YEARS

Say You Saw It in QST — It Identifies You and Helps QST
There Has Never Been
Radio Like This
Before

BALKIT RADIO
IN CABINETS BY
Berkeley & Gay

FANSTEEL PRODUCTS COMPANY, Inc.
NORTH CHICAGO, ILLINOIS

Beginners! Students!
Advanced

The TELEPLEX Code Writer will make you
proficient in code practice
—both sending and
receiving, in half the
usual time. This is
the only instrument
that develops ac-
tual speed of
writing, according to operators.
Send for sample
messages, diagrams, etc.,
without cost.

FANSTEEL PRODUCTS COMPANY, Inc.
NORTH CHICAGO, ILLINOIS

Freshman Power Transformers
Complete Power Supply for 210 Transmitter or
Power Amplifier. Supplies Voltage of 375
Volts, Filament Voltages of 7½ volts (Center tappered)
for 210 and 281 tubes, also "C" Bias for 210.

SPECIAL $3.00 Ea.

AMERICAN SALES CO.,
19-21 Warren St., N. Y. City

Say You Saw It In Q S T -- It Identifies You and Helps Q S T
Watch dogs of tone quality safeguarding the musical reproduction of broadcast programs, Thordarson Audio Transformers do their part in making real musical instruments of hundreds of thousands of receiving sets annually.

Among leading set manufacturers, Thordarson transformers have long been recognized for their fidelity of reproduction. Today their use is so universal that it is difficult to find a dealer who does not sell at least one make of receiver so equipped.

Try this simple experiment. Ask your dealer for a demonstration of his receivers. Pick out the instrument with the most natural reproduction, and then look inside the cabinet. You will find, in the majority of cases, Thordarson amplifying and power supply transformers.

You will realize that it is wise to specify Thordarson amplification when buying your receiver, for the manufacturer who is far-seeing enough to equip his sets with Thordarson transformers, may be depended upon to have the balance of his instrument in keeping with this high standard.

THORDARSON
R-300
AUDIO TRANSFORMER

A superior audio transformer that will satisfy the most critical musical ear. The high impedance windings of the R-300 are wound on a core of D-X Metal, a recent development of the Thordarson laboratory. This new core material has an exceedingly high A.C. permeability, and an inductance that is 50% greater than that of the highest grade silicon steel. In performance, this transformer responds exceptionally well to the lower frequencies and provides the same degree amplification to the diapason of the grand organ as to the note of the flute. Ratio 3:1. Dimensions, 2½” x 2½” x 3” high. Weight, 2 lbs. Price, $8.00.
Centralab
Smooth Dependable Volume Controls

Volume controls are now adored by radio engineers to be one of the most essential parts of radio receivers. So much of the success of a set—the quality of reception—is dependent upon them.

Centralab Volume Controls assure absolute smoothness of control—a big factor in satisfactory operation. This smoothness of Centralab Controls results from the494 tin type construction—with no sliding contacts in the electric circuit. A Centralab Volume Control, in one of the many new tapers, is ideal for any set. Many prominent manufacturers specify them. They are in demand, also, for replacement on old sets.

Centralab Wire-wound Resistors will give better voltage regulation of power supply units. Their construction is heat-proof and warp-proof and provides for greater current carrying capacity. The Centralab Heavy Duty Potentiometers have an additional feature—they are non-inductive.

Write for complete descriptions, prices, etc., of Centralab Volume Controls and other radio devices.

CENTRAL RADIO LABORATORIES
29 Keefe Ave.
Milwaukee, Wis.

The ideal "Mike" for any purpose, broadcast or amateur phone, public address systems, etc. Two button stretched diaphragm type, priced at only $40.00. Split Primary Microphone Transformer, $10.00.

A New Standoff Insulator No. 90 is already used by thousands of Hams. 2 1/2 inches high, price 20c.
No. 60, the new one, is similar, but 4 1/4 inches high and with ribbed surface. Splendid for high voltages, load-in bushings, supporting antennas and ground lead, etc. Price 60c.

F. F. JOHNSON CO.,
Waseca, Minnesota

RADIO SCHOOL
Term Sept. 10 Catalogue Free
MASSACHUSETTS RADIO and
TELEGRAPH SCHOOL
18 Boylston St.
Boston, Mass.

40 Meters

I. A. R. U. News

(Continued from Page 60)

headquarters wishes to express to these officers, and particularly Mr. E. J. Simmonds, its great appreciation of the hard work put in by them in promoting the Union in the British Isles and in pushing to a conclusion the selection of the R.S.G.B., as the new National Section.

CHANGES IN ITALIAN SECTION

In accordance with a vote similar to that of the British members, the old National Section of Italy is eliminated, and the Associazione Radiotecnica Italiana (A.R.I.) becomes the National Section for this country. The diamond emblem of this society has existed for some time, and was shown in the May, 1927, issue of QST. Headquarters of the society are at Viale Bianca Maria, 24, Milan, and the official organ is II Radiogirone.

GERMAN REPORT

"The most important event during the last month for the DK hams was our 3rd annual convention, which took place during May 26-28th, at Dresden.

"Besides 70 hams from all parts of EK, we had much pleasure to welcome the representatives from Austria and Hungary, amongst them several PB dx-hounds. Many RIO visual QSO's were made, and all EK's enjoyed these days—and nights—very much.

"Some resolutions of the society will be of general interest:

"1. No DK will be allowed from 1st January 1929 to use raw or even poorly rectified a.c.

"2. The operation of the marking and spacing wave system will be strictly prohibited.

"3. The use of the 80-meter band is highly recommended for night traffic.

"A very interesting lecture and demonstration was given by Dr. Busse, of 4AAL, assistant to Prof. Esau, on the possibilities of the 3-meter waves, which are likely
Faithfully reproduces every note in
the register—from the lowest to the
highest—with all the accidentals.
Any instrument—
any volume.

COILS for the NEW
Dynamic Speakers

Again Dudlo keeps pace with Radio
development in meeting the demand
for special coils required by this latest
trend in speakers.

All wound to give that wonderful
clarity of tone characteristic of Dy-
namic type units.

Transformer Coils—Field Coils—Choke Coils

Superior insulation of Dudlo wire, highly skilled operators
on the winding machines, trained engineers who are coil
specialists, tremendous stocks and facilities—all contribute
to make this the industry's headquarters for these new coils.

DUDLO MANUFACTURING COMPANY, FORT WAYNE, INDIANA

Division of the General Cable Corporation

56 Earl Street 105 W. Adams St. 274 Brannan St. 4143 Bingham Ave.
NEWARK, N. J. CHICAGO, ILL. SAN FRANCISCO, CALIF. ST. LOUIS, MO.
AMATEURS
The Most Interesting Field for Experimenters.

Light Sensitive Cells

...and...

Their Applications

PHOTO ELECTRIC CELLS
have been used in Television, Telephotography, Talking Movies and innumerable uses with:

RADIO RELAYS

Our special polarized relay, a result of long research for a practical relay to be used with—Light Sensitive Cells—also used in connection with telegraph-printers, receiving time-signals and many applications in radio.

Write for further information:

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

Say You Saw It In Q S T — It Identifies You and Helps Q S T
Your New Radio Specification

Planning Next Season's Receiver!

What dependable, economical switches, receptacles, plugs, dial lights, etc., will you buy?

The Bryant Electric Company asks your consideration with experience of 39 years in the successful manufacture of wiring devices and in efficient factory production.

WRITE TODAY FOR A COPY OF OUR CATALOG ILLUSTRATING AND DESCRIBING OVER THREE THOUSAND "SUPERIOR WIRING DEVICES."

THE BRYANT ELECTRIC COMPANY
BRIDGEPORT, CONN.

New York Philadelphia Chicago San Francisco

Manufacturers of "Superior Wiring Devices" Since 1888
Manufacturers of Hemco Products
**The Logical Source on Parts**

**Filter Condensers**
Illustrating one of 9 types of Filter Condensers. Built in all capacities for use with filter circuits and power amplifiers. Exceptionally high insulation and permanent stability. For either gascons or filament type rectifier tube.

$1.50 to $7.00
Also By-Pass Condensers and Condenser Blocks.

Send Check or Money Order for immediate delivery on any of the items illustrated. Ask for Radio Parts Catalogue.

Dongan Electric Manufacturing Co.
2999-5001 Franklin St., Detroit, Mich.

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**FORESIGHT**
Says:

**Standard Apparatus for best results!**

**SIGNAL PRACTICE SETS**

- Key & buzzer set .......... $2.70
- Neon Bulbs G.E. ............... 55c
- No. 12 Enamel Aerial Wire per 100 ft. .......... 90c
- Bakelite cut to size, per sq. inch .......... 02c
- Bradleystats for 210 tubes .......... 2.95
- R.E.L. 852 Sockets .......... 1.80
- Thordarson Fil. Trans. 7½ Volt C.T. 35 V.A. .......... 6.35
- Thordarson 2098-550 Volt each side plus 2-7½ Volts fil. Windings ..13.95
- Acme 200 Watt 550-750 Volt each side plus 2 fil. windings .......... $16.75
- Complete line of Ward Leonard apparatus.
- 5000 Ohm C.T. 44 Watt .......... $1.50
- Free Short Wave catalogue will be mailed upon request.
- All Mail Orders promptly filled upon receipt of Money Order including postage.

**WIRELESS EGERT**
179 GREENWICH ST. NEW YORK CITY

---

JXAX or JXIX. They will QSR. Do not, please, write the station call on the envelope when you send your card directly to the unlicensed stations. And now, best 73’s.

—AJ unlicensed hams.”

**NORTHERN IRELAND**

“Several new stations have appeared on the air in Northern Ireland recently, and there are now 28 licensed transmitters in this area, the great majority of these being licensed for a maximum input of 10 watts.

“There has been little activity among the higher-powered stations, but several of the low-power men have been doing excellent work. There seems to be some friendly rivalry between 5MO and 6YW in Belfast working on 23 meters, and 5WD and 6WG in Coleraine working on 45 meters, as to who can put up the greatest score of NU stations worked. All four stations have already lengthy lists of NU QSO’s to their credit with only a few watts input.

“2IT is now using a Mesny circuit with two 40-watt valves on 23 meters, and reports that it is ‘the goods.’ 6MU has been almost entirely QRT owing to other work, but two nights on 20 meters resulted in about a dozen NU QSO’s with the NU West Coast.”

—E. Megaw, gi6MU.

**SOUTH AFRICA**

“At the Annual Conference of the S.A.R.R.L. held in Durban at Easter, a resolution was passed that all I.A.R.U. members visiting South Africa be made Hon. Members of the S.A.R.R.L. during their stay in this country.”

—A. Loquet, Hon. Sec’y, S.A. Section IARU.

**SHORT-WAVE STATIONS BELOW 50 METERS**

(Continued from July QST)

30. 1XR, Manila, P. L.
31. 2XI, Scheneectady.
32. GBL, Leafield, England.
33. GRM, Leafield, England.
34. JHK, Kagoshima, Japan.
35. JSK, S.S. Shinyo Maru.
36. KZET, Manila, P. L.
37. ANK, Melabar, Java.
38. PCJJ, Eindhoven, Holland.
40. PTQ, Quartel General, Brazil.
41. NAL, Navy Yard, Washington, D. C.
42. EAM, Madrid, Spain.
The Radio Book You Want!
“Modern Radio Reception”
By CHARLES R. LEUTZ

A Complete Ready Reference Educator

250 ILLUSTRATIONS $3.00

MODERN RADIO RECEPTION
384 Pages—250 Illustrations
Fully Bound—6x9 inches

Three Dollars Complete

PRACTICAL HELPS IN HANDY FORM

Diagrams, charts, graphs, illustrations, tables, easily read text make difficult problems easy.

“Modern Radio Reception” is a good book, explaining all important subjects on radio reception and radio receivers, written in a clear manner easily understood by anyone. It is not too technical, and the mathematical examples are confined to simple problems.

Considerable information is given on the operation and care of radio receivers and accessories. The most powerful receiver for broadcast reception in the world, the Transoceanic Silver Ghost, is described in detail. Short Wave Reception is also covered, as this is one of the coming events in world-wide broadcast reception.

As this handy book covers the entire field of broadcast reception in such a clear and complete manner, it will prove to be a practical daily help to both the student and professional worker, as well as the broadcast listener.

Professional and Student Radio Engineers find “Modern Radio Reception”, a Time and Money Saver. The book that every Broadcast Listener should own.

Here is an up-to-date, quick reference and text book on radio reception. It is the only up-to-date book exclusively on radio reception. Such late improvements as A.C. Tubes, Shielded Grid Tubes, “A” Eliminators, Push Pull Power Amplifiers, 40-volt “R” Eliminators, etc., are covered in detail.

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Tell the complete story—Answered on request. Radio $2.50, High Speed $2.50. Money order. None C. O. D. 13. 25 cents. See our Hamad. G. K. DODGE, MAMARONECK, NEW YORK.

Additional Notes on Iron Core Resistances

(Continued from Page 96)

that could be used could be calculated. It is necessary to do some guessing here and this is usually based upon what core sizes are available. Assuming a window opening of 1.5 square inches, it is possible to accommodate 6,000 turns of wire.

With the number of turns and the size of the core known, it was then possible to determine the choke resistance. If it was higher than permissible, then a greater core area should be used with a consequent reduction in the number of turns, and therefore, resistance. If necessary, a further reduction in resistance could also be effected by increasing the size of the wire used up to the limit of the window space in the laminations.

Proceeding with the design of the chokes, it was, therefore, assumed that (A) the area of the core was 2.25 square inches. The length of the flux path (I) was determined from the laminate to be 9.75 inches. The type of iron available was Intermediate Transformer, designated by No. 4 on the design chart.

With this data available, we had the following:

\[ L = 30, I = 0.165, l = 9.75, A = 2.25, V = I \times A. \]
NOW: You Can Convert Your Present Set Into a SHORT WAVE RECEIVER for ONLY $22.50

THINK of it—two sets in one—with the Flewelling Short Wave Adapter—no change in wiring—nothing else to buy. Instantly adapts your present set into a short wave receiver. Once more you can get the thrill of hunting for stations—and finding them. Already 26 U. S. stations are broadcasting on wave lengths under 200 meters. International programs can be picked up and heard clearly. London has been heard consistently and rebroadcast on WSAI at Cincinnati. Static is almost negligible. Summer broadcasting, and there is more this year than ever before, will come in clearly on your set.

E. T. Flewelling, noted radio engineer, has just perfected this remarkable device and has joined the staff of The A-C. DAYTON Company as Consulting Engineer. The A-C DAYTON Company has acquired exclusive manufacturing rights for the Flewelling Short Wave Adapter and has scheduled production to be able to sell it at $22.50. It is a worthy addition to the new A-C DAYTON line of A-C Electric receivers.

You will want a Flewelling Short Wave Adapter to bring your set up to the minute. You will not want to miss the real “kick” found only in hearing BIG BEN set the time, direct from London. If your dealer is not already supplied with a stock of Flewelling Short Wave Adapters, he will be glad to order one for you, or you can order direct, sending us his name and address. Use the coupon.

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DEALERS: There is a big opportunity for you with the Flewelling Short Wave Adapter. Write today for full particulars, discounts, etc. Include your jobber’s name and address.

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DAYTON, OHIO

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Enclosed, find money order or certified check for $22.50, for which please send me postpaid, a Flewelling Short Wave Adapter.

Please send descriptive literature. Include description of the new A-C DAYTON Receivers. My dealer’s name and address is

Name........................................... Address...........................................
City................................................ State...........................................

Say You Saw It In Q S T — It Identifies You and Helps Q S T
Arranged to form the equation

$$\frac{LI^2}{V}$$

we get $3.7 \times 10^{-3}$. From the design chart we find that 3.7 gives a corresponding value of 86. (At this time we also ascertained from the design chart that the air-gap should be approximately .0023.)

Since the number of turns

$$\frac{NI}{l}$$

value times 1 divided by I we find that with a value of 86, for

$$\frac{NI}{l}$$

9.75 for l, and .165 for I that the number of turns required is 5175.

As this would fit within the lamination and the resistance as determined by the mean length of wire was of the approximate value required, the design was considered satisfactory.

Upon measuring the choke on an inductance bridge with 165 milliamperes D.C. superimposed on 3 milliamperes A.C., the inductance was found to be exactly 30 henries, resistance 278 ohms.

It has been found, as a result of the design and construction of a number of filter chokes with the aid of the accompanying design chart, that the actual inductances will seldom vary more than 3% from the computed value.

9BBA found this statement in a Chicago daily: "... While there are instances of the short-wave apparatus operating at much greater distances, it has been found that they are consistent over a range almost directly equal in mileage to the wavelength in meters."

At that rate our 56000Kc. band simply must be of some value.

"The ordinary mercury arc rectifier will pass at least 12 amperes," writes C. T. Paidon of St. Louis, Mo., "and I can recall four instances where men were killed by the output of such rectifiers. Amateurs should adopt the precaution of connecting a fuse or lamp to blow at about half an ampere, right at the rectifier output."
Throughout the radio industry—from novice builder to professional and actual manufacturer—Acme Wire is used by the thousands of feet for every radio hook-up requirement.

Now we announce the three new wire products shown and described on this page. As with all other products manufactured by The Acme Wire Co., these three new items have been made to meet actual existing needs—to simplify wiring operations, thus saving the time and money of the men who build and repair radio apparatus.

Made by THE ACME WIRE CO.
New Haven, Conn., manufacturers of magnet wire, varnished insulators, coil windings, insulated tubing and radio cables.

Acme Twisted A.C. Celatsite Wire
For A.C. Filament Hook-up. One strand of Red and one strand of Black 16/30 Flexible Celatsite twisted together. The two colors are used so that, if desired, the same sides of all filaments can be maintained at the same relative potential. Packed 25-ft. coil in individual carton.

ACME PUSHBAK WIRE
This is the speekest hook-up wire for the Professional Set Builder—simply push back the insulation! No. 19 solid tinned copper wire covered with cotton wrap and braid, then thoroughly impregnated with wax. 25-ft. coil in individual carton. Six colors: black, yellow, brown, green, red, blue.

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R-112 cable, shown above, is universal for A.C. or D.C. use for 12 conductors or less. Has four twisted pairs and four single wires. One of twisted pairs has extra heavy current capacity. 100-ft. coils. Enclosed in full glazed cotton braid with rayon tracer.

Cables containing 5, 6, 7, 8 or 9 conductors are also made for use in battery and power supply hook-up. 5-ft. and 100-ft. coils.

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REG. U.S. PAT. OFF.

The Central Division Convention

THe above convention, sponsored by the Milwaukee Radio Amateurs’ Club was a huge success with some event of interest going on every minute. The city officially greeted the arriving delegates with “Welcome Central Div., A.R.R.L.” displayed in letters three feet high on the municipal building. From the opening night, May 25, when the gang got together for a smoker and general hamfest, to the May Ball, Sunday evening, which officially closed the convention, the events were thoroughly enjoyed by hams and YLs alike. The highlights of the smoker were a lecture on ether waves by Rev. A. H Poetker, Prof. of Physics, Marquette University, a thorough discussion of ham problems by K. B. Warner, Secretary A.R.R.L., Editor-in-Chief of "QST", and original selections sung to old tunes by the M-"RAC" Songbirds. Throughout the convention, interesting talks were interspersed with airplane rides from Maitland Field, trips to local amateur and broadcasting stations and visits to industrial plants.

After making several such trips, the gang met Saturday afternoon at the Milwaukee School of Engineering. First on the program was the demonstration of a large Tesla coil. This reminded us of the old “spark” days and was more inspiring for some of the new hams present who had no memories of “spark” work to reassure them. S.C.M. Crapo presided at the meeting as at the previous meetings. Following a talk on “Communications” by the C.M. from Hartford, “Antenna Feed Systems” were explained in detail by D. J. Angus, Indiana S.C.M. and the organization of the Central Division was discussed by Central Division Director, Clyde E. Darr, W2ZZ, “Television” by H. R. Harley, Transmission Engineer, Wisconsin Telephone Company illustrated by slides provoked many questions and the afternoon ended with a talk by W. C. Evans, Manager of KYW.

During the banquet the convention photo was made and a special entertainment program added to the fun. Following the awarding of prizes, George Turner, Senior Radio Inspector, 9th District, announced the results of the radio operators license examinations held Saturday morning and a large number of new hams were welcomed by acclaim. Toastmaster R. E. Knoff next introduced Major W. L. Razar, representing the Signal Corps. He was followed by Lieutenant-Commander R. H. G. Mathews C-V(S) USNR who spoke on behalf of the volunteer Naval Communication Reserve. Many other speakers helped to make the evening complete. This convention is one that will be remembered for a long time by everyone there. About two hundred A.R.R.L. members were present and all joined in expressing thanks to those of the M.R.A.C. who worked so hard to contribute
A New Simple Tube Checker

Jewell has succeeded in developing a tube checker that is indeed simple. It is so simple that all that is required to prepare it for testing tubes is to plug the attached cord into a 110 volt 60 cycle outlet.

This new tube checker known as Pattern No. 150 is somewhat similar in appearance to other Jewell tube checkers which have earned an enviable reputation for accuracy and reliability, but differs in that all tubes can be tested without resorting to batteries of any kind. This is accomplished by incorporating transformer which furnishes the required voltages, making use of alternating current instead of the conventional A and B batteries.

All tubes can be tested from the WD-11 and 199 tubes up to the 210.

A five-prong socket is supplied with an adapter for 4-prong tubes and a rheostat enables adjusting the filament in conjunction with the 0-48 volt A.C. voltmeter. Plate current is read on a 0-15 milliammeter.

This new tube checker is described in our Form No. 2004. Write for a copy.

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To the enjoyment. In making farewells many present were looking forward to another pleasant and profitable meeting at the next big Central Division Convention.
—F.E.H.

REFERENCES and BOOK REVIEWS
By R. S. Kruse


The major portion of this book is, as in the past, devoted to generation and distribution and need not be further discussed here. The radio provisions of Section 50, Part 3 are of direct A.B.R.L. interest, especially since the book has been adopted as standard by the American Engineering Standards Committee as of Nov. 15, 1927. It may therefore be expected to be the basis of many local rulings.

The radio rulings are on the whole same. Low power stations being not given any requirements to follow, while the requirements for medium and high power are adjusted in a manner that seems rather reasonable until one begins to examine the definitions of low, medium and high power. It becomes clear that the committee should have had an amateur member present, or someone from the Radio Department who is familiar with the conditions under which amateur station (very much the most numerous of all transmitters) operate.

Consider these definitions, quoted from page 469.

'1-Low Power. Transmitting stations to which the power supplied is less than 100 watts and where the voltage of the power supplied is less than 400 volts.
2-Medium Power. Transmitting stations not classified as low power or high power.
3-High power. Transmitting stations to which the power supplied is greater than 100 watts or where the voltage of the power supplied is greater than 2000 volts.'

Just what this means is a bit hazy. Amateur stations draw their power from 220-volt lines or 110-volt lines, therefore they all are low power as far as the line-voltage requirements go. The power taken from the line is likely to be either below 100 watts (making the station low power on that count too) or else between there and 1000 watts, making the station medium power. What seems incomprehensible is the thought that there may exist such a creature as a set with less than 1 kilowatt in put, fed by a line with a voltage above 400, or even above 2000! Clearly the numerous amateur stations were (as usual) not being thought of and the relatively few commercial ones were being considered. However—let us be thankful that the provisions are sane, even though the classification of stations seems rather muddled.


This reviewer must admit a certain community of spirit with Mr. Dashield, for the Technical desks of QST are haunted constantly by the same sort of imp that follow one step behind any writer of a popular radio book, demanding that everything be made simple—no matter how abstruse it really may be.
ORD? This Summer

VACATION time—whether "roughing it" over mountain trails or taking it easy in a "cottage by the sea"—there is one form of entertainment which the transmitting fan now finds indispensable. And that's the portable station,--keeping in touch with home, the world of sports, vacationing friends on other trails. Something to do when the camp supper is finished and the long evening is ahead.

And so, now is the time for those who have not already done so to get that Mobile License and check up on needed equipment. Is your portable station in complete order? How about the instruments? You'll need at least two—a Radio Frequency Ammeter and a Filament Voltmeter. And Weston is prepared to make immediate delivery—by mail or express—if your dealer hasn't just the size or range you need.

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3rd.—That we will ship the closest frequency crystal we have to your desired frequency, and that the frequency of the crystal will be stated ACCURATE to BETTER THAN A TENTH of 1%.
4th.—That all crystals are absolutely guaranteed in regard to output and frequency, and immediate shipment can be made on crystals in the amateur bands. Prices for grinding POWER CRYSTALS to oscillate in the various amateur bands are as follows:

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1715 to 2000 Kilocycles</td>
<td>$15.00</td>
</tr>
<tr>
<td>3500 to 4000 Kilocycles</td>
<td>$25.00</td>
</tr>
<tr>
<td>7000 to 7800 Kilocycles</td>
<td>$40.00</td>
</tr>
</tbody>
</table>

Note: The above prices are effective July 1st, 1928, to be in effect until November 1st, 1928. (Add $10.00 to these prices if crystal is to be mounted in an excellent dust-proof power mounting.)

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Wouldn't you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only amateur association that does things. From your reading of QST you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on page 6 of every issue. We would like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio, and incidentally 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.

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Radio Clubs of which a member ...........

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Characteristics of the Photo-electric Cell, by John P. Arnold, Radio, Feb., 1928.

Playing With a Photo-electric Cell, by Samuel G. McMenn, Radio, Feb., 1928.

Decreasing Radio Congestion by Wired Radio, by R. D. Duncan, Jr., Electrical World, Jan., 1928.


Short-Wave Direction Finding With Loop And Auxiliary Antenna at Large Distances, F. A. Fischer (in German) Zeitschrift Fur Hochfrequenztechnik, Dec., 1927.

Concerning the Suitability of Short Waves for Direction Finding, by Day and Night, by F. Michelissen (in German) Zeitschrift Fur Hochfrequenztechnik; Dec., 1927.

Recording of Radio Signals, Mario Santangeli (cIEEE) Revista Telegrafica, Jan., 1928.


Short-Wave Echos (Geltow, Germany to Rio de Janeiro,) Wireless World, Jan., 1928.


A Vacuum Tube-Voltmeter, by the Laboratory Staff, Radio Broadcast, Jan., 1928.

Atlantic Division Convention
State College, Pa., June 14, 15 and 16

I t has always been a matter of regret with this writer that strict necessity for conserving space in the magazine allows only a column for convention reports; this applies particularly to such conventions as the Third Annual Atlantic Division Convention, which was held at State College, Pa., on the dates mentioned, under the direction of G. L. Crossley, F. M. Gager, Director Woodruff and the operating staff of XE.

If you were not one of the lucky ones who attended, picture to yourself an ideal location among the Pennsylvania mountains, more than 1000 feet above sea-level, three
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No. 10 Enamelled copper wire, any length, ft. $0.01½

Barlow Bradley $5 4% volt, or
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Thordarson Power Transformers
$13 list—T-125, cap. 500 watt, secondary each side of neutral 350 and 550 volts. $9.95.
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$20 list—T-127, cap. 900 watt, secondary each side of neutral 1000 and 1500 volts. $22.50.

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m e t e r s ,  U s e s  s t a n d a r d  U X
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t he  a p p l i c a t i o n.
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t h o u g h  h e  h a d  b e e n  f o r w a r e n e d  t h a t  t h e
e s t i m a b l e  “ d o c t o r ”  w a s  a  f a k e ,  h a d  s e r i o u s
doubts a b o u t  i t  a t t i m e s  d u r i n g  t h e  t a l k .

A t  t h e  b a n q u e t ,  i n a d d i t i o n  t o  t h e  s p e a k e r s
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b y  a i r - m a i l  p a r c e l  p o s t !  A f t e r  t h e  b a n q u e t  c a m e
f o r  t h e  F o u r t h  A t l a n t i c  D i v i s i o n  C o n v e n t i o n  i n  1 9 2 9 .

T h e  c o m m i t t e e  w h i c h  w a s  r e s p o n s i b l e  f o r

d a y s  o f  p e r f e c t  s u n n y ,  l a z y  S p r i n g  w e a t h e r ,
T h e  m o r n i n g  a n d  a f t e r n o o n  o f  t h e  f i r s t
d a y  w e r e  g i v e n  o v e r  t o  r e g i s t r a t i o n  a n d
h a s,  c o l l e g e  s o u r c e s ,  p l e n t y  o f  t e n n i s  c o u r s e s  t o  p l a y  o n  “ a f t e r
s h o u s i n g  C o m p a n y ,  s p o k e  o n  r e c e i v e r c h a r a c t e r i s t i c s  a n d  t h e i r
m e a n s  w e  m i g h t  a s  w e l l  m e n t i o n
i s  t h e  s h a m e  w e  c a n n o t  s a y  m o r e  a b o u t  e a c h  o n e ,  b u t
w e c a n  n o t  s a y  m o r e  a b o u t  e a c h  o n e ,  b u t
h o u r s ” ,  a  c h a r m i n g  h o s p i t a l i t y  w h i c h  m a d e

A d d  s o  c l e a r l y  m a d e  u p  a n d  e x e c u t e d
b y  t h e  O a k m o n t  g a n g  t h a t  t h i s  w r i t e r , e v e n
t h o u g h  h e  h a d  b e e n  f o r w a r e n e d  t h a t  t h e
e s t i m a b l e  “ d o c t o r ”  w a s  a  f a k e ,  h a d  s e r i o u s
doubts a b o u t  i t  a t t i m e s  d u r i n g  t h e  t a l k .

A t  t h e  b a n q u e t ,  i n a d d i t i o n  t o  t h e  s p e a k e r s
m e n t i o n e d  a b o v e ,  w e r e  D e a n  S a c k e t t ,
f o r  t h e  F o u r t h  A t l a n t i c  D i v i s i o n — h e  m a i l e d  h i m s e l f  d o w n
b y  a i r - m a i l  p a r c e l  p o s t !  A f t e r  t h e  b a n q u e t  c a m e
f o r  t h e  F o u r t h  A t l a n t i c  D i v i s i o n  C o n v e n t i o n  i n  1 9 2 9 .

T h e  c o m m i t t e e  w h i c h  w a s  r e s p o n s i b l e  f o r

days of perfect sunny, lazy Spring weather, the
companionship of several hundred fel-
low-minded hams, college surroundings,
plenty of tennis courts to play on "after
hours", a charming hospitality which made
everyone feel they owned the town and
everything in it, perfect management, and
a technical program which stands out as
the best this writer has ever attended—and
you can begin to get an idea of what it was
like.

The morning and afternoon of the first
day were given over to registration and
hamming, but in the evening we got the
first broadside in that A-1 technical pro-
gram when Mr. V. D. Landon, of the West-
inghouse Company, spoke on receiver char-
acteristics and their measurement. While
we are about it, we might as well mention
the other technical speakers—it is a shame
we cannot say more about each one, but
lack of space forbids: Dr. Woodruff spoke
on 10 meters and gave us a most effective
picture of radio’s place in the scientific
world of frequencies, as well; Mr. F. W.
Dunmore, of the Bureau of Standards, gave
us a chance to listen to an illustrated talk on the
operation of aircraft radio beacons; A. W. McAuly,
8CEO, gave us the dope on Kenotron rect-
ifiers; Dr. J. O. Perrine, a most finished
speaker, talked on transatlantic telephony,
and also ran off some phonograph records
that showed what happened when certain
frequencies were eliminated from normal
speech and music, over-modulation intro-
duced, etc.; Miss E. M. Zandonini, 3CDQ, of
the “Bustan” talked on crystal grinding and
calibration, and Mr. Alfred Crossley, of the
Naval Research Laboratory at Bellevue,
D. C., gave a masterly talk on crystal con-
rol as applied to amateur sets. All
the talks were excellently illustrated with
slides and charts.

And we must not forget the lecture of
Dr. Ulrich Franzkoff, 8DHU, of Germany,”
a stunt so cleverly made up and executed
by the Oakmont gang that this writer, even
though he had been forewarned that the
 estimable “doctor” was a fake, had serious
doubts about it at times during the talk.

At the banquet, in addition to the spea-
kers mentioned above, were Dean Sackett,
of the School of Engineering, and Prof. C.
L. Kingsloe, head of the Department of
Electrical Engineering at State College,
Hairy and Budlong from A.R.R.L. head-
quarters, and Dr. Dunn from the Hudson
Division—he mailed himself down by air-
mail parcel post! After the banquet came
the second drawing of prizes. The sessions
were over after selecting Philadelphia as
the city for the Fourth Atlantic Division
Convention in 1929.

The committee which was responsible for
this affair is most heartily to be congratu-
lated; it was a fine job, and the Philad-
elpia crowd has a mighty high mark at
which to aim.

—A. L. B.
THE life blood of your set—plate power. Powerful permanent, infinitely superior to dry cells, lead-acid, Ba, B eliminators. Trouble-free, rusted, abuse proof, that's an Edison Steel-Alkaline Storage B-battery. Use electrically welded pure nickel connectors insure absolute quiet. Lithium-Potassium solution (that's no lye). Complete, knock-down kits, parts, chargers. Glass tubes, shock-proof jars, penny elements, pure nickel, anything you need. No. 12 cooper copper enamelled perfectly aerial wire $1.00, 100 ft. Silicon steel laminations for that transformer 15c, Details, full price list. Frank Murphy, Radiomart, 10589 Rockwood, Cleveland, Ohio. PURE aluminum and lead rectifier elements holes drilled brass screws and nuts, pair 1"x4" 18c, 1"x6" 15c, 1½x6" 17c, 1¼x6½", 19c. Sheet aluminum 1/16" $1.00, lead 1.00 square foot prepaid, $1.00 or more. Silicon transformer steel cut to order .014" 10 lb, 25c, 5 lb, 30c, less than 5 lbs. 35c lb, .022" 5e less per lb. Not cut 2"-7" wide 15c lb, minimum 10 lb postage extra. Edge wise wound cooper ribbon 7" arm size see January QST. Air pocket and stand off insulators 25c each, 4 for $1.00. Glazed porcelain 5 and 6½" long prepaid on 4. Electrolytic condenser parts, $1.50 prepaid. Geo. Schulz, Calumet, Michigan.

BULLETIN 68-E Lists the Ensal Radio Laboratory receivers, transmitters, wavemeters, etc., Item No. 69 and 68 free to all licensed amateur operators, telephone, broadcast, amateur, WW, WWV times, weather, X-ray, filter chokes, high voltage variable condensers, plate rectors, etc. We build to order any apparatus using your parts if desired. Kit and blue print service on any power amateur station. Write for copy of Bulletin 68-E.

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

IMAGINE an organization of radio "nuts" with over 3000 clients scattered throughout the world, hundreds of them hams, all of them radio-owners—dealers, experimenters. Over $40,000 worth of radio receiving and transmitting parts only, no sets. Spend over $5,000 yearly on our own experimenting, carry nothing until it passes our tests. Will bring priced over four pages, catalogs, circuits, data, dating with complete parts list for experimenters and builders (more reliable data than all radio magazines together)—20 weeks $1.00, 52 weeks—$5.00. Will dealers' discounts to licensed hams and radio-wise builders. Fred Luther Kline, Established 1920, Kent, Ohio.

HALWLEY Edison element battery and parts standard for five years. Our prices, below—no thin wire to drop off—contains 20 times more metal than regularly used. Heavy shock proof cells, filter capacitors, etc. Order direct, $5.00 minimum supply. Complete assembled 100 volt "B" $10.00. Knock-down kits at still lower prices. Chargers that will charge in series up to 160 volts. 2.75 to $4.00. Trickle B Chargers, for at $15.00 $15.00, 95. Special transmitter "B" batteries up to 6,000 milli-amp capacity, any voltage. Write for interesting literature, testimonials, M. H. Hawley Smith, 360 Washington Ave., Danbury, Conn.


FOR sale—Two complete radio transmitters, one 500 watt master oscillator power amplifier, one 500 or 750 watt crystal control power amplifier, UV204, UV204A, UX852 tubes, numerous small parts and other equipment. Write for list and prices. 9KG. Paul Harris, Graham, Brothers, Evansville, Indiana.

LARGE 24½ volt Rayovac batteries, 8c, RCA 50 watts, pioneer, cartons, $1.50, 50c, 25c, 10c. 350-550 each $1.45. 600 watt generators, 2½ volt, $1.25. 500 watt generators, 2½ volt, $1.00. 500 watt generators, 3½ volt, $1.25. Special transformer "B" batteries up to 6,000 milli-amp capacity, any voltage. Write for interesting literature, testimonials, M. H. Hawley Smith, 360 Washington Ave., Danbury, Conn.

ENGRAVING—Finest workmanship on radio and laboratory apparatus panels. A. L. Woody, 19 S. Wells St., Chicago, Ill.

CURTIS-Griffith 250-watt power-filament transformers 250-550 each side $10.50. Thordarson mounted transformers 550-560 each side $7.75. 1000 watt transmitters each $90.00; Thordarson 350-550 power transformers mounted $16.00; 1000-1500 power transformers $22.00, Thordarson 550-600 watt power-filament transformers for 75 watts $16.00. Aluminum square foot $5c; Lead square foot $5c. Potter 2-mfd 1000-volt condensers $2.75. "Ham-List" 4c. James Radio Curtis, 1109 Eighth Avenue, Fort Worth, Texas.

OMNIGRAPHS, telephones, condensers, transmitters, receivers, chokes, tubes, batteries, capacitors, cathodes, screen suppressors, S. Tubes, vibrophones, electric and portable receivers, Phone transmitters. Bought, sold exchanged. L. J. Ryan, 9CN9, Hanaholm, Mo.

ENGRAVING—finest workmanship on radio and laboratory apparatus panels. A. L. Woody, 19 S. Wells Street, Chicago, Ill.

HAVE sold 66 transformers made by G. E. Carry 1000W, 1100-2200-4400V. each side center tap. Guaranteed. Few
LOUD SPEAKER units rewound and remagnetized, $1.50 each. Curtis, 1109 Eighth Ave., Fort Worth, Texas.

Q SL cards: 100 two sider .95 each, 150 government cards, samples.

BET, $12.50. Also larger motors and generators. James Sinat, Watkins $65 each, 400 Volt generator $8.50. Couplings $1.75. Drive $225.00. 1500 Volt 750 Watt Motor generator 5.

Write to BVC, the Wave-meter specialist, Lutes Ave., St. Johns, N. Y.

WESTERN ELECTRIC generators with field resistance each $8.50. Two 1/3 H.P. 110 Volt 5500 speed alternating current motors with coupling to direct connect to generators or any machine having a 1/2 inch shaft each $10. Also a few half horse power 110 Volt 5500 speed alternators. George H. Harris, 1911 Chicago Ave., Chicago, Ill.


WE still have them, Navy five wattters in original boxes. 7.5 volts filament 750 volts on plate $1.30 each. The best and lowest priced power transformer on the market 750 volts 500 watts. Write for offer. Start cap. 10 cent wound with center tap. 9 plunks. Grebe "ROBK" 2-stage amplifier, 10 berries. All in excellent condition. 5AQ, Box 11, Comanche, Texas.

CRYSTALS with quality the first consideration. Sold subject your approval. Herb Hollister, 9RD, Edwardsville, Kansas.

SELL—G. E. mercury arc, used but good condition, 9 buck$. 250-watt Curtis-Griffith power transformer, mounted: plate 130 volts. Central 10 watt center wound with center tap, 9 plunks. Grebe "ROBK" 2-stage amplifier, 10 berries. All in excellent condition. 5AQ, Box 11, Comanche, Texas.

WANT QSL cards that are different from anything you've ever seen? We print 'em. Write for samples. EAHU, Box 46, Comanche, Texas.

TRANSFORMERS 1000-750 and 500 each side 250 watt unmounted $8.50. 100 watt $2.50 each side with two 1/2 volt windings $5.50. 25 each side, $1.50. 400 Volt 750 volt 100 Amp. $7.00. Specials to order. Chokes, 250 milli-20 to 50 Henry adjustable core, $7.50. 80 to 150 Henry 100 volt $3.50 each. Adjustable DC. wattmeter, key thump, $1.25. Send for list of materials and specifications. M. Leitch, Park Drive, West Orange, New Jersey.

WANT the latest ham doings? Then subscribe to Ham Network, 58 pages, monthly. 25c for three months. 16917 Muirland, Detroit.


DISCOUNTS to Amateurs—I can supply the following at regular dealer discounts—Aero Products, Jewell Meters, Wye seen motors, Western Electric Inductors, R.P. G. Rectifier Blocks Condensers, REL Parts, Flechtheim Condensors, Thorrdarson Transformers, Amaco Condensers, Goodrich Pumps, I specials. Send me your equipment and stock many lines not mentioned here. A postcard brings prices and literature. R. N. Johnston, 56 E. Mill St., Akron, Ohio.

WANT G. E. 24-1500 dynamotor new or slightly used. 9NM.

Selling out—250 watt transmitter with W.E. tube $140. 50 watt transmitter with 203 es W. 60, 76.5. Ham stuff. Robert Freeman, Box 124, Adel, Iowa.

WANTED; several new or used UV217 Kenetics. Write and give prices. SACL.

HAVE you bought your Master Radio Wavemeter yet? If not, why not? Join the ranks of thousands of satisfied users and get a perfectly calibrated Wavemeter! Only $5.50 and $8.50, but worth more. Four coil plug-in, 18-200 Meters. Send for full description. Specials: Raytheon Kino-lamps—$12.50. GE Emitter rectifier $7.50. 200 Mf. condenser $25.00; 6 Mf. condenser $9.50. 250 watt $8.50. 200 Watt $6.00. 100 Watt $4.00. 50 Watt $2.50. 20 volt $1.25. 10 volt $1.00. Two 12 volt $0.80. Fada power plate 300v. Dubller .022, .060 and .090 condensers. 150 watt condenser $5.50. 3000 volt 1000 ma rectifier elements and copper tubing inductance. Send for free catalog, "Quick Service" William Harrison, 26 Ft. 24, Chicago, Ill.

WE stock Tube Deutschmann (Mueller) transmitting tubes. 250 watt $28.75, 20 watt $17.25, 7.5 watt $8.50. These are now capacity short wave tubes. 6EX Rectobulbs $15.00, 50 watt $20.00, Jewell $7.50 meters. 45. Ant. meters $8.50. 95% pure alicos heavy duty, 70 volts 700 sq. ft., acme No. 12 numbered wire 95c 160 ft., 5000 volt Sangamo cond. $1.60, extra large 82.8-83.8 crystals.

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New Data Book Now Ready

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

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UNI-RECTRON POWER AMPLIFIER

(Ideal for use with dynamic speakers)

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

The UX-210 super power amplifying tube and the UX-216B or 261 rectifying tube are used with this amplifier, which cannot overload. From the faintest whisper to the loudest crash of sound—R.C.A. Uni-Rectron amplifiers each note at its true value. High and low notes are all treated alike.

The volume and quality delivered will be a revelation.

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

LIST PRICE $88.50

Special $19.75 EA.

SEND FOR OUR LISTS OF RADIO BARGAINS

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Say You Saw It In Q S T — It Identifies You and Helps Q S T
DURING our long period of experimentation and development, we have always maintained a money back guarantee and we have SURVIVED.

This means that we are putting honest effort into our Products and that we merit your orders.

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<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
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<tr>
<td>W. E. 211</td>
<td>$16.50</td>
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<tr>
<td>W. E. 212</td>
<td>40.00</td>
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<tr>
<td>U. V. 203A</td>
<td>19.00</td>
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<tr>
<td>U. V. 204A</td>
<td>75.00</td>
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<tr>
<td>U. V. 204</td>
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(10% Discount on lot of 6 tubes, from above list)

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

We purchase burnt out tubes of the above types.

**SOLVE** your rectifier troubles once and for all.

**RECTOBULBS**

3000 Volts and 250 Mils. **$15** ea.

Type 203 50 Watt Tube **$20** ea.

No charge for crating if cash accompanies order.

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You Have Until
AUGUST THIRTY-FIRST
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Replace your old radio! Seven and a half million sets now obsolete

1928 Features
Few radios AT ANY PRICE contain all of these features.

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An improved model of the 1927 pioneer that led the world to better radio. Genuine Neutrodyne. May be had with or without battery box where AC current is not available.

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Operates satisfactorily from dry cells and is especially designed where AC current is not available.

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The outstanding feature is the 6 tube speaker available, still maintaining its tremendous popularity, as from its inception in 1925.

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When the pentant Harmonic meets
...You’re there with a Crosley

Your set has served you well but you will not be satisfied with its strained stringy tones when you hear a new full toned power speaker Crosley set

1928’s greatest radio

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Say You Saw It In QST — It Identifies You and Helps QST
A New and Better
SHORTWAVE RECEIVER
The Aero International Four

(‘Rear Panel
View’)

These are the new Aero L. W. T. Coils
used in the Aero International Four. Read
about them below— then plan to build this
superlative set at once!

THE new Aero “International Four” Receiver marks a distinct milestone in radio progress. For
the first time, radio frequency amplification on short waves has become a possibility. Sensitivity
has been increased, control has been made far easier and receiver noises have been reduced considerably
below their former level by development in the design of this receiver.

Newly designed parts have been incorporated throughout. The tuning condenser has no metal-on-metal
bearing, so that the hissing noises formed by the variation in contact has been eliminated. New coils of
a smaller diameter, having a much smaller external field, a better shape factor and improved efficiency
are employed. The foundation unit with holes drilled for mounting every part, simplifies the construction
of the set, and assures proper placement of the parts. The isolation of the antenna from the tuned stage
means that swinging of the antenna will have no effect on tuning and variations in antenna lengths have
little effect on the operation of the set.

The Aero “International Four” is to our knowledge the first short wave receiver of any kind designed
particularly for reception of musical broadcast rather than code reception, and as such fills its place far
better than the best of all-purpose outfits, although due to its ease of control and great sensitivity, it is
superior to most all perfect short wave sets in any field.

Uses The Aero Coil L. W. T. 10 Kit

The new kit of coils illustrated above is the L. W. T. 10, price $10.50. This is designed to go with
special drilled and engraved foundation unit, in which mounting base is provided in drilled sub-panel. If
you desire to furnish your own foundation unit, order the L.W.T. 11 Kit, price $11.50. This kit includes
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The New Aero L. W. T. 12 Coils

This is the new Aero L. W. T. 12 kit. Consists of 3 new
small diameter Aero Interchangeable Coils and base mounting
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56% air dielectric and corresponding high efficiency. A
pronounced improvement, even superior to our last season’s
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the best in short wave reception performance.

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Send today for complete descriptive literature on the Aero International Four. This completely illustrates
and embodies a complete list of parts and special price list. You’ll want to build and own this wonderful
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