QST

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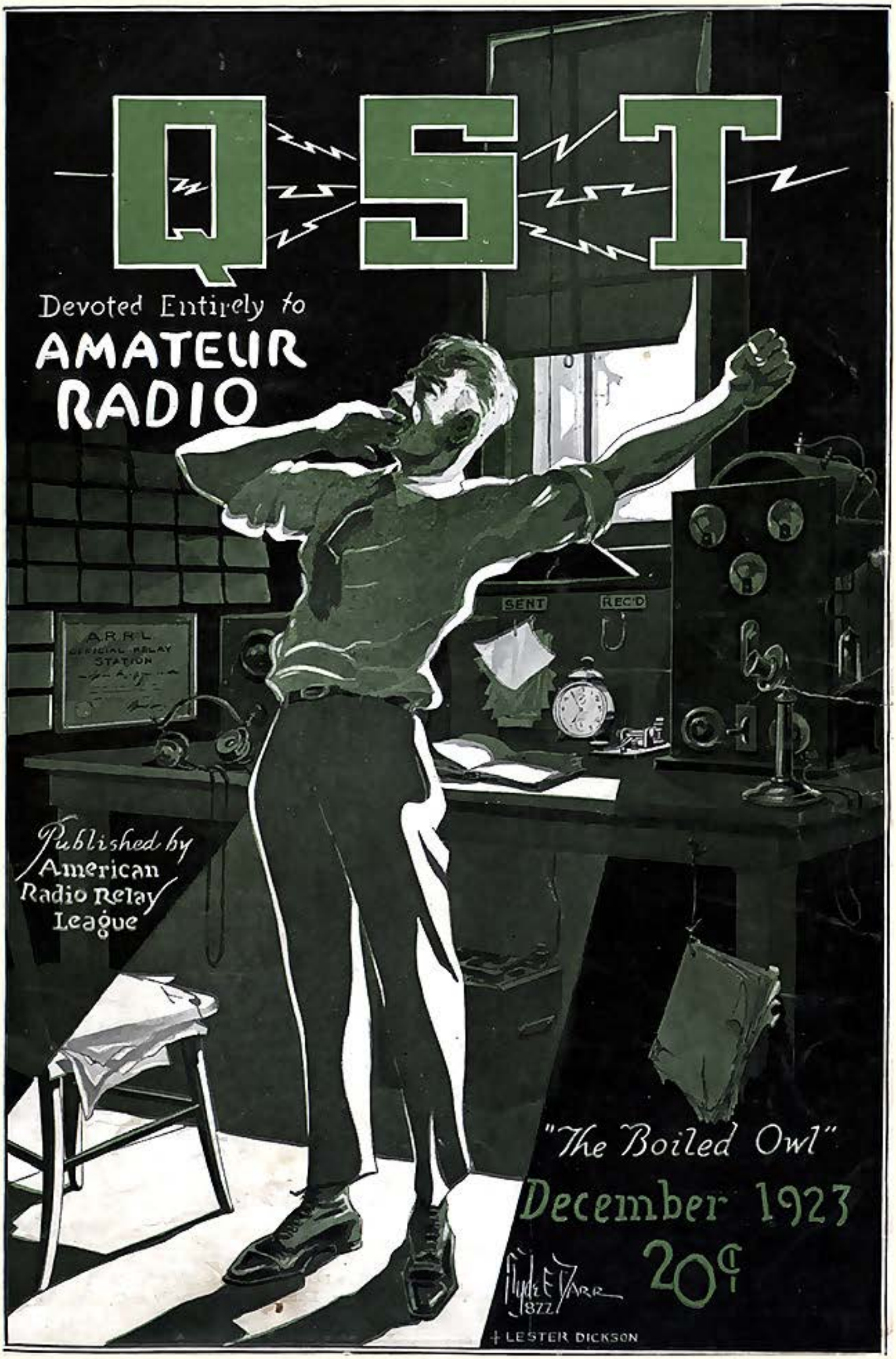
RADIO



Published by
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Radio Relay
League

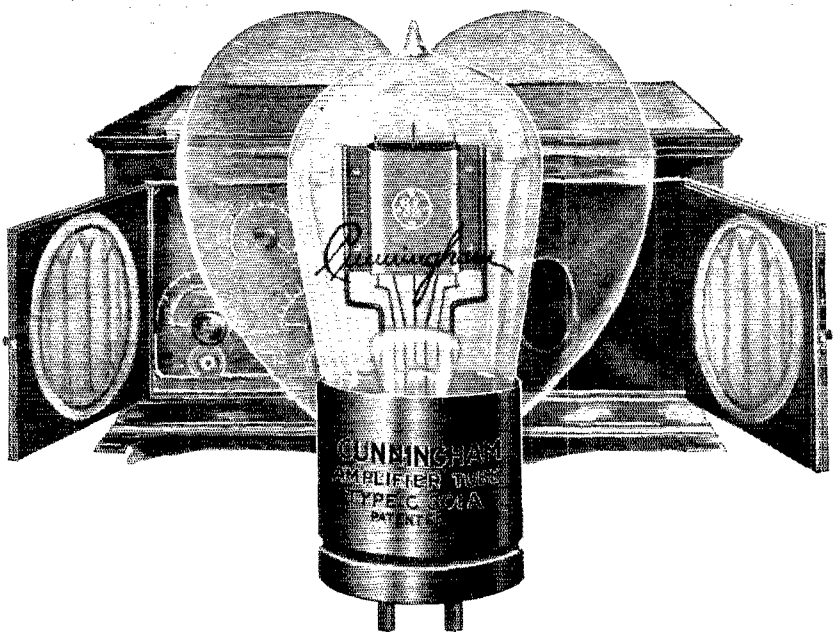
"The Boiled Owl"

December 1923

20¢

FLYNN E. TARR
8ZZ

+ LESTER DICKSON



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The Heart of your Receiving Set

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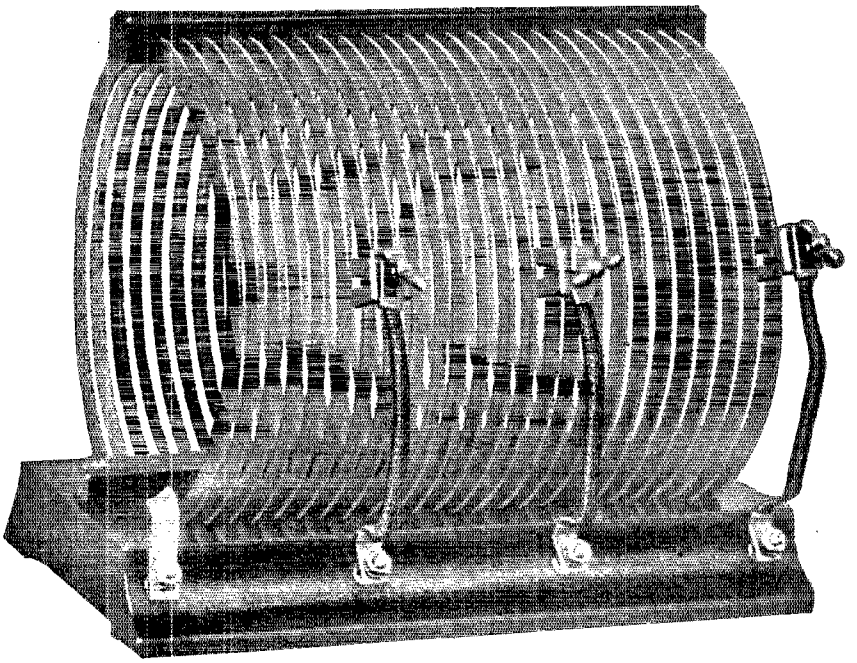

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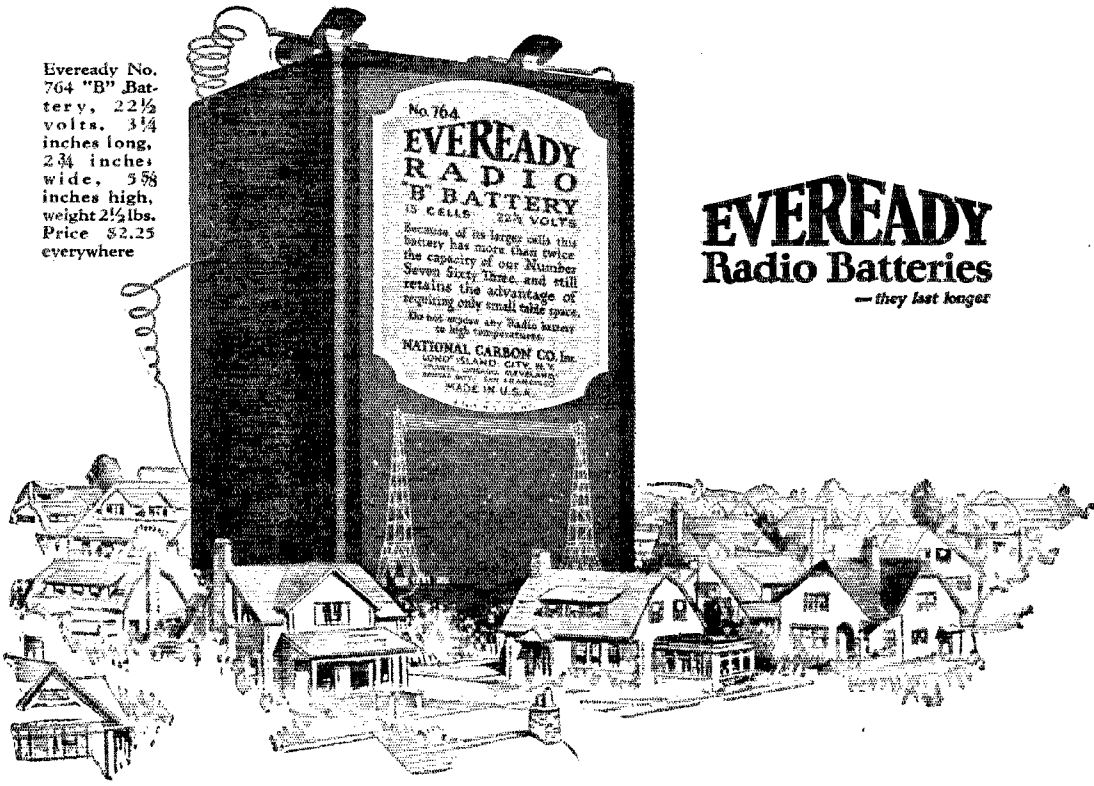

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Day Letter	Blue
Night Message	Nite
Night Letter	N L

If none of these three symbols appears after the check (number of words) this is a telegram. Otherwise its character is indicated by the symbol appearing after the check.

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CLASS OF SERVICE	SYMBOL
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Day Letter	Blue
Night Message	Nite
Night Letter	N L

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MAJOR. LAWRENCE MOTT

16A

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—Confucius

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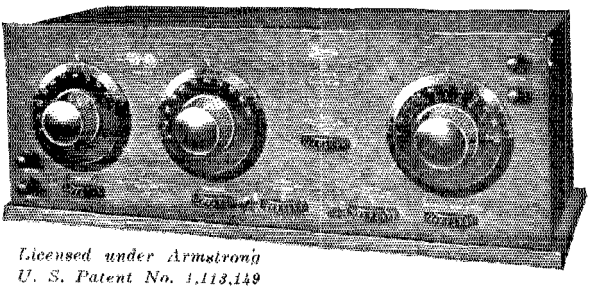

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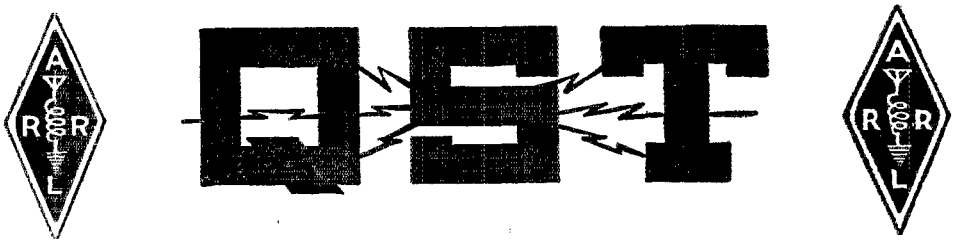

The Official Organ of the A.R.R.L.

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THE AMERICAN RADIO RELAY LEAGUE, Inc.
HARTFORD, CONN.

THE AMERICAN RADIO RELAY LEAGUE

The American Radio Relay League, Inc., is a national non-commercial association of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, for orderly operating, and for the practical improvement of short-wave two-way radio telegraphic communication.

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

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

Inquiries regarding membership are solicited. Ownership of a transmitting station, while very desirable, is not a prerequisite to membership; a bona-fide interest in amateur radio is the only essential. Correspondence should be addressed to the Secretary.

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EDITORIALS
de AMERICAN RADIO RELAY LEAGUE

Be a Sport!

ELSEWHERE in this issue our Traffic Manager announces the plans for the Fourth Transatlantic Tests, which start on December 21st and run until January 10th. Except for attempts at two-way communication at the conclusion of the tests, North American amateurs do not transmit in these tests—we have proved to everybody's satisfaction that our signals get over. Instead, we are concentrating on reception and our European cousins are doing the transmitting. We have not yet heard foreign amateurs with enough consistency to lead to two-way contact—that is why we are having these one-way tests this year.

We did not make good in the tests last winter. A very few of us, by virtue of pure good luck, heard a European signal or two thru the merciless interference caused by the morons in our midst. We want no morons this year. (Quick, T.O.M., the Wouff-Hong!) We want quiet air. We're already used to the idea of quiet hours thru part of the evening, and it should not be difficult to restrain the itch to pound brass for a few hours during these tests. Every American amateur must blush with shame at the recollection of the conduct of our fraternity in the last tests, when the ether was blue with signals from our own fellows, including many of our prominent stations. The prestige of American amateur radio is at stake in these tests, and we must not fail again.

We are very much exercised over the situation, and we want to say frankly that we will regard it as much worse than mere bad form and as positively dishonorable for any amateur acquainted with the facts to transmit during the listening periods under any provocation other than that of an emergency. These tests are an international sporting event, and the whole world is invited to participate—but in *listening*, not in sending. We shall never be able to dwell again upon our wonderful spirit of co-operation if we duplicate this year our actions of last December. Do we get the idea across?—these are *listening* tests and any amateur who opens up his transmitter, of whatever power, between 0100 and 0600 Greenwich Time between December 22d and January 10th will simply be "smearing" the chances of everybody else in the whole country to copy Europe. Do you remember French 8AB at the convention, and his enthusiasm to connect with us? —let us not disappoint him!

Nor have we done everything necessary when each reader of these lines resolves to keep his own transmitter quiet during the tests. There are others: the fellows who are not League members, the chaps who miss this issue of *QST*, the youngsters just starting in the transmitting game. Unfortunately these classes are usually the least experienced of operators, the kind who will merely increase power and try again when they get no answer to their CQ during the tests. We must tell them about the tests and enlist their co-operation. They will be

fair, we know, when they learn what is on foot and how much is at stake. Every amateur who reads this editorial is earnestly asked to consider himself a committee to spread the request for quiet air on 200 to every other amateur in his vicinity, via club meetings, letters, conversations, and announcements. We must not defeat ourselves again.

There are some thousands of dollars worth of handsome prizes donated by our friendly manufacturers as awards for successful performance in the tests. And don't forget that *QST* is still offering as a trophy a genuine brown derby to the first North American amateur to establish definite two-way communication with a European amateur. But we want to say right here that no prizes, nor the derby in particular, will be awarded to any amateur who transmits during the listening periods, however fine his accomplishment otherwise.

We don't know anybody who isn't interested in fishing for Europe, but if you happen not to be, for goodness' sake be a sport and lay off your key for these few hours per night so that the rest of us may have a chance. It ought to be easy; we know, from last year's experience, that we can hear Europe when our own gang is QRT.

Atten—shun! Right—dress! Front! Attention to orders: *No transmission during the listening hours.* Outfit dismissed—each man to go out and do his darndest to put over this job to the glory of Amateur Radio and the credit of our A.R.R.L.!

Some Changes

WITH this issue we are changing the location of our editorial page to the front of the magazine where we have felt for some time it should be located. We hope everybody likes it here, where it will serve the better to present important amateur topics for consideration. Incidentally it saves the Technical Editor a lot of worry in figuring out what article ought to run on the first page!

But there are still more important changes in *QST*'s make-up this month—the Operating Department reports and our "Calls Heard" section are being printed on a separate form which is bound into the magazine as usual in the case of copies going to all the members of the League, but is omitted from the newsstand edition. This change results in a saving in expense which enables us to print eight more pages of informative articles than otherwise would be the case, and these eight pages appear in every copy. As A.R.R.L. members know, our League derives from *QST* the bulk of its revenue with which it carries on its activities, which are a heavy load—so much so that we are unable to present more articles by the simple process of printing more pages; unfortunately our printer insists upon being paid for this work. For a long time there has been a heavy premium on every inch of "white space" in *QST*, and we have been sad over the wonderful array of interesting material our space limitations have kept us from presenting. At our last editorial conference the thought occurred that the Operating Department news and "Calls Heard" are of interest only to our membership, roughly half our circulation, and that if they could be omitted from the other half of the edition there would be a saving sufficient to add several more pages of articles to both editions. We are trying it this month as an experiment, and if it works out satisfactorily it will be continued permanently. Thus our members get everything that *QST* gave them before, and more; and our non-brasspounder readers, whose support via the newsstands has been so helpful to *QST*'s success, will find everything that previously interested them—and eight pages more of the same!

The "O.D." and "Calls Heard" appear slightly out of their normal positions in the membership edition, and the pages have Roman numerals. We hope that if we have "newsstand readers" who are interested in these sections, they will embrace the opportunity presented on another page of this issue and become members of our A.R.R.L.

And now, bunch, what do you think of the new idea?

"R. O. W. H."

FOUR new initials now take their important place in the life of the radio amateur, standing for the Royal Order of the Wouff-Hong. Is there any amateur who does not know by now what the R.O.W.H. is? It is a fraternity, a "lodge" of one degree, strictly of and for the good ham, be he A.R.R.L. member or not. Originally conceived by the amateurs of the Flint

(Michigan) Executive Council, it has been polished to a state of perfection and was first presented in its completed form at the Second National Convention. Its affairs are managed by its Supreme Council, all Flint men. It has the approval and endorsement of the A.R.R.L. Board of Direction. The degree is conferred only at state, district, division, and national conventions of the A.R.R.L. upon the approval of A.R.R.L. Headquarters and the assent of the Supreme Council.

The ritual is founded wholly upon the traditions and history of Amateur Radio as we know it in this country. In its presentation the candidate, who seeks to have the fellowship of other good amateurs who have gone before him and to have the benefits of the lessons of the W.H., is led on a journey in the course of which he encounters all the pitfalls and obstructions to progress which perplex the way of the ham today. By following wise counsel and by learning, he at length emerges victorious, and, what is most important to us, a better amateur. That we are sure. If there is any good whatsoever in an amateur, the conferring of the degree of the R.O.W.H. will emphasize it and will make of him a better operator, a better neighbor, and a better friend.

Church Services

WE are talking quite a lot in this issue's editorials about quiet hours, but there is yet another angle of the subject which we must lay before you. The Department of Commerce has written us about the protection of church services. The present regulations require of us amateurs a silent period beginning at 8 P.M., our local time, and this does not protect the evening church services which almost always begin at an earlier hour, often at 7 P.M.

Regardless of how any of us may feel as individuals about the subject of broadcast church services, this thing demands and rates our respect. There are many people who think most intensely about the question, and the man who voices opposition in a subject of this sort almost always gets licked. It is therefore up to us to give it serious thought.

The regulations of the Bureau of Navigation are subject to change without notice, and it would be easy for the Bureau to require silence during church services by a mere change in the regulations. It is difficult to work out, however, because of time divisions and the uncertainty from whence the various receptions are occuring, and so before attempting to amend the regulations the Bureau brings the subject to the attention of the A.R.R.L. They say: "There are so many people who are for many reasons unable to attend church and who get a great deal of pleasure by listening to the church services by radio that the Bureau feels that the amateurs should respect this service to the extent of observing the silent periods necessary to enable those who unfortunately can not attend the churches personally to be able to listen uninterruptedly to the broadcast service."

The Bureau is right, fellows. Not only is it the part of discretion, but the special nature of the service demands our respect to the extent that each of us investigate broadcast reception of church services in our neighborhood and observe a silent period at all times when transmitting would interfere with them. Your A.R.R.L. Headquarters so recommends to you.

The Fourth Transatlantic Tests

By F. H. Schnell, Traffic Manager

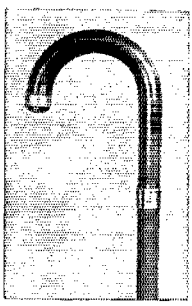
LAST year we defeated ourselves in the reception of European amateur signals because some of us couldn't keep our fingers off the keys of our transmitters during the reception periods. We defeated ourselves in establishing two-way Trans-Atlantic Amateur Communication. Will there be some among us this year who will ignore our appeal for quiet air and again ruin our chances to establish two-way communication? We hope not!

Our chances appear to be ever so much better this year for several reasons. First, we are not licensed to transmit during the "Quiet Hours"—8:00 to 10:30 P.M. Second, we hope to have the entire air quiet because there is no schedule of transmission by American or Canadian amateurs until after January 11, 1924. Third, to make it worth your while to keep your own transmitter silent, the many manufacturers, jobbers, and dealers of the country have donated prizes (value $3500.00) to be awarded for the best reception records. Read on and learn why it is worth real money to you to throw your key away during the tests. Right here we want to make it clear that any amateur using his transmitter during any period of the scheduled hours of the tests will be disqualified for prize competition regardless of how many signals he

hears. The prize list includes a complete tube transmitter using four 50-watters, donated by A. H. Grebe & Company, which was described in October *QST* on page 28. Look it over and see if this alone wouldn't make you disconnect all power lines to your transmitter during the tests! The only exception to this is where an amateur is called upon to use his transmitter in case of emergency. When in doubt—stay off the key!

The Secretary Wins Another Trophy

As the result of a wager with Mr. W. Witt Burnham, British 2FQ of London, that at least ten American amateurs would hear European amateur signals in the 1922 Transatlantic Tests, our Secretary-Editor has received the handsome English walking stick here shown. It is a beautiful stick, with gold end and a gold band on which is engraved: "To



K. B. Warner, from W. W. Burnham, Transatlantic Test Bet, December 1922."

This stick is a fitting companion-piece for the famous Transatlantic Hat, which it will be remembered was also won from Mr. Burnham. Just watch the Ed's smoke at future conventions!

This year we've offered to bet 2FQ a pair of green suspenders on anything he wants to name, including the establishment of two-way communication across the Atlantic. First thing you know we'll be all dressed up.

Space in this little magazine is precious we must get down to the necessary details, which follow:

AMERICAN AND CANADIAN AMATEURS ARE NOT SCHEDULED TO TRANSMIT DURING THE TESTS, FROM DECEMBER 21, 1923, TO JANUARY 10, 1924. PLEASE LET US HAVE ABSOLUTELY QUIET AIR IN EVERY QUARTER OF THE NORTH AMERICAN CONTINENT BETWEEN THE HOURS OF 0100 AND 0600 G.M.T.

Particularly do we point out that those little 5-watters in remote corners cause considerable QRM when all other transmitters are quiet.

On each night of the tests there will be an European free-for-all period (0100 to 0300 G.M.T.) during which time both French and British amateurs will transmit on wave-lengths between 180 and 220 meters, with 200 meters the objective. (Please note—European amateurs *only* are to transmit.) The remaining three hours (0300 to 0600 G.M.T.) will be given over to individual transmissions by French and British amateurs on alternate nights. Each transmitter will be assigned a different code word for each night—the code word will not be same for more than one night, but may be used in the free-for-all on the succeeding nite. Transmission will be in the following form:

ARRL ARRL ARRL DE 8ZZ 8ZZ 8ZZ TARIK TARIK TARIK, etc.

In the above, TARIK is the code word. Copies of the code words will be on file under seal at A.R.R.L. Headquarters for identification and verification purposes.

The wave lengths, while specified as 180 to 200 meters, may very slightly, and to be on the safe side we urge you to "comb the ether" from 175 to 220 meters.

European Transmission Schedules

EUROPEAN FREE-FOR-ALL — FROM 0100 TO 0300 G.M.T., DECEMBER 22, 1923, TO JANUARY 10, 1924, INCLUSIVE.

FRENCH INDIVIDUAL TRANSMISSIONS—FROM 0300 TO 0600 G.M.T. DECEMBER 22, 24, 26, 28, 30, JANUARY 1, 3, 5, 7, 9, INCLUSIVE.

BRITISH INDIVIDUAL TRANSMISSIONS—FROM 0300 TO 0600 G.M.T., DECEMBER 23, 25, 27, 29, 31, JANUARY 2, 4, 6, 8, 10, INCLUSIVE.

ATTEMPTS AT TWO-WAY TRANSATLANTIC AMATEUR COMMUNICATION ARE OPEN TO ALL AMATEURS OF EVERY COUNTRY ON JANUARY 11, 1924. Who will be the first to connect up and win Warner's brown derby which he offered some months ago for this feat? Any American or Canadian amateur may win this lid, and it isn't a quiet lid either!

From reading the above you will see that the tests are scheduled to run in Greenwich Mean Time (G.M.T.) which, for the first night, for example, converted to E.S.T., is from 8:00 P.M. of December 21st to 1:00 A.M. of December 22nd; C.S.T., 7:00 P.M. to Mid-night of December 21st; M.S.T., 6:00 P.M. to 11:00 P.M. of December 21st; P.S.T., 5:00 P.M. to 10:00 P.M. of December 21st. Don't let your clock fool you. If you are in doubt, write A.R.R.L. Headquarters for information before the tests start.

Reporting Your Reception

When you hear a signal which you believe is being sent by some European amateur, LOG EVERYTHING YOU HEAR. After the end of the tests each day, send your report to A.R.R.L. Headquarters either by paid night letter or special delivery letter, giving as much detailed information as you can. We cannot accept guesses, we must have facts—KEEP AN ACCURATE LOG and specify the time you use. If it is G.M.T., say so; if E.S.T., say so.

Beginning December 26th and continuing every third day thereafter, at 2100 G.M.T. (4:00 P.M., E.S.T.) WII on 13,600 meters will transmit a report of European amateurs heard. There will be no report of calls heard more than once.

Prizes and How to Win Them

The Grebe Transmitter is to be awarded to the contestant who, at the end of the tests, has to his credit the greatest grand total of station miles of reception (the sum of the mileages of all the receptions) of bona-fide European amateur signals. Each station heard shall be counted but once during any one transmission period (0100 to 0600 G.M.T.) and when a code word is transmitted the code word must be copied and submitted for verification. At least one French and one British amateur station must be logged with code word verified, to quality for this prize. The contestant winning this prize is not eligible for any other prize.

In each of the following groups there will be at least five (5) places. This is based on the sum total of about $3500.00 worth of prizes, less the value of the Grebe Transmitter. In the event that more prizes are offered, the number of places in each of the following groups will be increased accordingly, or the value of prizes in each group will be increased proportionately.

In the event that a contestant qualifies in more than one group, he may have his choice of any prize in any event in which he has quaified but he shall receive *only one prize.* It is to be understood that this is purely a sporting event and there is no excuse for anybody to be unreasonable and expect to grab everything in sight. One prize only to each winner.

The value of prizes in each of the groups is approximately the same in dollars and cents, and the apportionment by places is approximately the same. For example, first place in any one of the five groups will entitle the winner to apparatus valued at about $200.00; second place, about $120.00; third place, about $75.00; fourth place, about $45.00; fifth place, about $20.00. Of course these amounts are subject to change depending on the value of prizes received between now and the time the tests end. This merely gives you an idea that there are going to be at least 26 prizes, the smallest of which will be in the neighborhood of $20.00 worth of apparatus.

For the purpose of identifying the different contests, they will be known by groups.

GROUP "A"—The reception of a bona-fide European amateur signal over the greatest distance from the transmitter, at any time during the tests.

GROUP "B"—The reception of the greatest total of station miles of bona-fide French amateur signals on any one date (0100 to 0600 G.M.T.)

GROUP "C"—The reception of the greatest total of station miles of bona-fide British amateur signals on any one date (0100 to 0600 G.M.T.)

GROUP "D"—The reception of the greatest grand total of station miles of bona-fide French amateur signals during the entire tests.

GROUP "E"—The reception of the greatest grand total of station miles of bona-fide British amateur signals during the entire tests.

(It must be remembered that there are second, third, fourth and fifth places in each of the above groups.)

There will be a committee of judges, which will be named in next issue of *QST*, to make the awards, and the prizes by groups will also be listed. The main thing for you to think about now is to get as many European signals as you can and think about the prizes later.

We feel the necessity of having a few simple rules which you are to follow if you want to qualify in the prize contest. Of course, the most important of all is that you furnish the judges with accurate copies of your complete logs and stand ready to furnish any further information requested by them. Date, time, code word, call and wave length of the station heard are very important.

Final log must be received at A.R.R.L. Headquarters not later than January 25, 1924.

All mileage shall be computed by the judges in Great Circle distances from the transmitter to the receiver.

Please indicate in what group you are competing.

The judges' decisions shall be final.

There's the dope, gang; go to it, and may you have the best of luck!

Entries for the 1923 Department of Commerce Trophy donated by Secretary Herbert Hoover, must be filed at A.R.R.L. Headquarters by February 1, 1924. See complete details in November *QST*, page 25, and start plans for your entry.

Tuned Radio Frequency Amplification

*By A. L. Budlong**

In theory a tuned radio-frequency amplifier is fine; it should greatly increase one's receiving range and a single stage is (on paper) perhaps as effective as three stages of untuned transformer-coupled radio amplification.

Why isn't it in universal use? That's Mr. Budlong's story and we will let him tell it.

Please notice that this paper does not pretend to discuss the effect of stablizing the radio amplifier with the Hazeltine "neutrodon" condenser. Therefore the article is not one that condemns all radio amplifiers and all their descendants: it simply points out in clean-cut fashion that the theoretically beautiful tuned R. F. amplifier needs much taming before it will jump from tune to tune in the nimble fashion that the commercial and amateur code man demands. Perhaps the neutrodyne arrangement for preventing the R. F. tubes from oscillating will help, but how does one successfully "neutrodyne" the last R. F. tube when it is working into an oscillating C. W. detector? The only way out seems to be to drop the oscillating (autodyne) detector and use a separate heterodyne. Such a set is not cheap, simple, or easy to handle—Tech. Ed.

THE following dissertation on tuned radio frequency is based on results garnered from two years' experimenting with this branch of the art, and efforts have been made to treat the subject fairly from every standpoint, the writer telling the actual results obtained rather than the results he wanted to see obtained. Many circuits and variations were tried, most of them being built again several months after the first trial in order to compare the first circuit with some later development. Every effort has been made to discount enthusiasm and imagination when it came to comparing signal strengths, and while accurate measuring instruments were not available it is thought that the resulting opinions are as unprejudiced and unbiased as possible.

Needless to say, the subject of tuned R.F. amplification can not be completely covered in an article of this nature, even though the author were in a position to essay such a task—which he is not; nor is it possible to list all the results obtained from personal experimentation. Correspondence on phases of the subject not treated in these pages, or on some subject which is treated but which the reader may not agree to, is solicited.

The Tuner Impedance

The tuned impedance as a method of coupling in radio frequency amplifiers consists of a tuned auto-transformer in the output circuit of each amplifier tube, this transformer usually taking the form of a variometer, or tapped coil shunted by a variable condenser. The main obstacle to successful operation with maximum results is the tendency of the amplifier to oscillate, since the transformer constitutes a tuned plate circuit in the amplifier tube system. It is claimed that the neutrodyne system overcomes this hindrance, thereby making considerably greater amplification possible. Previous issues of *QST* are referred to for information on this latter system, *as it will not be discussed here.*[1] A tuned R.F. one-stage amplifier, of the type to be discussed in this article, is shown in Fig. 1.

Advantage of Tuned R. F.

Theoretically, tuned impedance coupling permits greater amplification at a given wave length, due to the comparatively high peak value obtained with an amplifier tuned

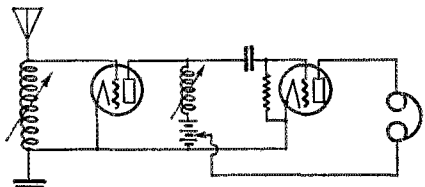


FIG. 1

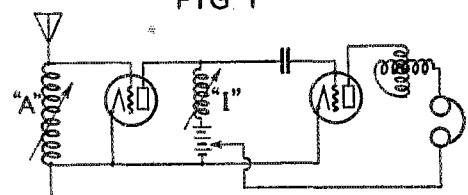


FIG. 2

to one wave length, or within a narrow band of waves, compared to the much lower curve necessitated by a transformer covering a band from 200 to 500 meters, for instance. Unfortunately, it is practically impossible to realize this theoretically greater amplification on account of oscillation in the amplifier, so our main advantage loses much of its force as an argument.

Disadvantage of Tuned R. F.

The disadvantages are many. Perhaps one of the greatest is the multiplicity of controls necessary beyond one stage of amplification. Each stage of amplification means at least one added control, and usually means two; in addition, of course.

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[1]See "Tuned Radio-Frequency Amplification with *Neutralization of Capacity Coupling*" *in QST* for April, 1923; also "Notes on the Neutrodyne" in *QST* for June, 1923. Both of these issues can be obtained from our Circulation Dept. at the usual rate.

to the regular tuning apparatus. Mounting several variometers or condensers on one shaft has been suggested as a remedy, but does not entirely solve the problem, since individual control is necessary for realization of best results. Oscillation as resonance is approached is, as has been mentioned, a serious drawback.

Tuned R. F. at 200 Meters

In my opinion, this is absolutely a waste of tubes and equipment. I know that this statement will bring down much criticism, for it has been frequently stated, even by prominent amateur experimenters, that one stage of tuned R.F. is decidedly worth while on 200 meters. I thought so myself when I first tried it out, but I think if the experimenter will, after the first effects have worn off, carefully compare the results obtained from a regenerative set with those from a one-step tuned R.F. outfit, checking one against the other on a given signal under varying conditions, he will be convinced that the radio frequency outfit does not give any noticeable added signal strength.[2]

Tuned R. F. at 360-500 Meters

Much better results than at 200 meters, but value doubtful unless two or more stages are employed. When this is done, however, the set gets into the laboratory class, as it is no longer a quickly and simply tuned apparatus.

Radio vs. Audio

The statement is often made that one stage of radio amplification at ham or phone wave lengths is equal to or better than one of audio. No statement could be further from the truth. One radio at 200 meters gives absolutely no appreciable gain in signal strength, and so far as has been determined by hours of experimentation, does not bring in any of the weak signals that the regenerative set fails to get. At 360 meters, one tuned radio stage *when carefully adjusted* will result in a slight, but noticeable increase; but this increase does not begin to compare with the amplification obtained with one step of audio.

Our conclusions on this matter are, then: Never waste a tube on one step of tuned R.F. at 200 meters or under. Put it into audio. At 360 meters, or over, you might put in one step of tuned radio amplification if you have an extra tube lying around doing nothing, but even here don't sacrifice audio for radio.

Regeneration in the Detector Circuit

The thought occurred to me early in my experiments with tuned amplifiers, and no doubt has occurred to many, that after putting in, say, one step of tuned radio amplification, it is still entirely possible to put a variometer or tickler in the plate circuit of the detector, as in Fig. 2, and get additional amplification by regeneration. Extensive experiments and innumerable trials have convinced me that, within practical limits at least, there is no combination of circuits which will give this desired result.

Variometer in the Detector Circuit. Case 1: It must be remembered that any oscillation which may occur is not confined to one part of the circuit. Let us consider our amplifier in Figure 2. When our tuned impedance approaches resonance the amplifier tube starts oscillating, and this results in the *whole system* being subject to those oscillations, and that includes the detector circuit. The plate variometer has not been observed to have any effect whatever under these conditions.

Case 2: The suggestion is immediately made that we keep the radio amplifier tube from oscillating and then go ahead with our detector regeneration. Sounds good, but doesn't work out. The following attempt at an explanation is given: Suppose, after getting the impedance "I" adjusted to the correct value, we turn our R.F. tube up to within three degrees of oscillation. We will find that it is now only possible to advance the variometer in the detector plate circuit about three degrees before the whole system spills over into oscillation. If we turn our amplifier tube 'way down with a "stabilizer" (that is, a grid potentiometer), we can turn our plate variometer a corresponding distance up before oscillation occurs, but by no combination of arrangements is it possible to change the place at which the system seems to oscillate, nor does it seem possible to get any gain in signal strength. This is a rather dense explanation, but may suffice. No attempt is made to explain this action from a thoretical or scientific standpoint. I merely know that that is what happens, and that the putting of a variometer in the plate circuit of the detector will not give any increase in signal strength under any combination of conditions known to the writer.

Tickler in the Detector Circuit: The general results may be classed as the same as those occurring in the case of the plate variometer. It does not seem to matter whether you couple the tickler to the tuned impedance "I" (Fig. 2) or to the initial tuning inductance "A" (Fig. 2); the results are the same. Your system is going to oscillate at a certain point, and you can get that result by turning up your amplifier tube half way, and then making up the other half with a tickler or plate vario-

[2]Mr. Budlong probably is speaking of a tuned R.F. set in which a separate heterodyne is used to secure the beat note from a C.W. signal. For spark and I.C.W. this separate heterodyne is not needed; it is simply a question of comparing the amplification obtained with a stage of tuned R.F. as against the amplification obtained by using a tickler or variometer in the plate of the detector; in other words, we are then comparing regeneration with one stage of tuned R.F.

meter, or you can turn the R.F. tube up to within a shade of oscillation and then advance your detector variometer or tickler the remaining shade, but the point of oscillation seems to be fixed, as does the ultimate signal strength possible of attainment, and puts a very effective damper on "regeneration" schemes in conjunction with the tuned amplifier.

Using the Impedance as a Tickler

This comes under the same class as the above paragraphs on additional regeneration. For all practical purposes the tube is going to oscillate at a given point, and no combination of tickler and tuned impedance will result in greater signal strength than if merely one of the methods were used. If you use both, you can only use each to half its former extent.

A variation of the tickler-impedance is that in which the tickler is made to "buck" the circuit, so that the tendency of the system to oscillate is repressed, instead of being aided. This works out all right in that oscillation is stopped, but the signals also go out with the oscillation. You then have either to pull the tickler back until the signals come in again, by which time you are getting near oscillation, or else you make up the loss by regenerating in the plate circuit of the detector, but here you find that you are simply up against the same old "regeneration' problem as previously described, and no combination of adjustments at the hands of the author resulted in increased signals over a simple tuned impedance, and this was no better, as has been mentioned, than an ordinary regenerative circuit.

Exception to above: For the sake of emphasis, the above statements that no combination of regeneration in conjunction with the tuned impedance were successful, were made very sweeping. However, it is possible, by using the "zero beat" principle, to realize slightly increased amplification, but this system is so unstable in operation that it is practically out of the question for the average operator. Since its operation is identical with that of a two-stage tuned R.F. set, we will discuss it later under that head.

"Lossers"

One of the first problems taken up in conjunction with tuned impedance amplifiers was that of the so-called losser, which usually is given either as a potentiometer ("stabilizer") across the "A" battery for varying the grid potential, or a series resistance of the order of 300 ohms in the grid circuit, for introducing losses in the grid circuit sufficient to stop oscillations. It was found that turning down the filament of the R.F. tube to a point where oscillation ceased was entirely satisfactory as a method of oscillation control, and gave the same results, as far as signal strength was concerned, as did either of the "lossers".

Turning down the filament of the tube, while it will accomplish the desired result, becomes tedious if individual control for both tubes in a two-step amplifier is used, but it is not recommended that one master rheostat be used for both tubes because individual control is necessary for maximum results. It has been stated that, when using R.F. transformers, it is only necessary to have the "losser", or whatever method of oscillation control is used, attached to the first tube in the amplifier bank, as the other tubes will take care of themselves. This may work for transformer circuits, where the inductance and capacity in the circuit are more or less fixed, but in the tuned impedance, where you are varying both the input and output impedance values for every change in wave length, it will not, and individual control of each tube becomes a necessity.

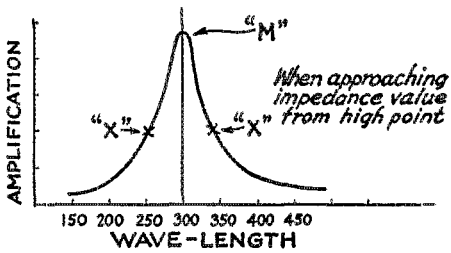


FIG. 3

How to Tune the Impedance

For those who are determined to try a tuned impedance the following pointers on operation may be useful. The writer has observed several times that many experimenters in using, for simplicity sake, a one-step tuned R.F. set, will turn the R.F. tube up to full brilliancy, and then go ahead and turn up the impedance variometer, or condenser, until oscillation starts, imagining that they are then operating their set in the proper fashion. This is not so. Most tubes, and particularly the new 201-A, will start oscillating some time before the correct impedance value is reached. Let us consider Figure 3. Here is shown the curve of amplification of a tuned impedance amplifier at the wave length of 300 meters. Now, as we turn the impedance variometer, or condenser, up toward that peak we will find, if the tube was turned on all the way, that oscillation will start perhaps somewhere in the neighborhood of "X". Don't start an argument on the shape of the curve, or the point where oscillation starts, as it is drawn only to illustrate a point. Anyway, our tube starts oscillating at "X" and, while we

hear signals in the detector tube, we are not getting the full value of amplification or anywhere near it. The only way to realize as much as possible from a tuned R.F. amplifier is to keep oscillation down until the correct impedance value "M" is reached. This is found as follows: It will be observed that as the R.F. tube is turned down, the band through which oscillation occurs as the impedance is varied, narrows down very rapidly. By *carefully* lowering the filament temperature we eventually find a point where the tube will oscillate through but one or two degrees of scale on the impedance dial. This point represents the value "M" which we are after. Now, when you have found the correct impedance value for the particular station you are working, turn down your tube until it is on the verge of oscillation, for phone, or for C.W., just over into oscillation and you will be getting the "regenerative amplification" mentioned by Ballantine in his chapter on this type of amplifier.

If you simply turn your tube all the way up, and then go ahead and tune your impedance until oscillation starts, you might as well junk the outfit, as you aren't getting even the little gain possible under most efficient management. To get that gain, you have to resort to the more tedious method of keeping the tube low until you find the impedance value for the particular wave you are working on, and this means taking more time.

Two Steps of Tuned R. F.

For those desiring the last word in critical instability in a radio set, the two-step tuned R.F. amplifier is recommended very heartily. We have previously remarked that a one-step tuned R.F. amplifier is positively a waste of equipment on 200 meters, and gives only a barely perceptible increase in sigs on 360-500 meters. Let us now consider the two-step.

The operation of two steps of tuned impedance is very similar to the operation of one step with a variometer in the plate of the detector; which means that it is a tricky proposition. This operation will be discussed further on. First, let us consider what results we get out of the set. The results of considerable experimenting have proven quite conclusively to me that, generally speaking, the two-step tuned impedance is a waste of equipment for 200 meters just as was the one-step. For phone wave lengths, the two-step gives a noticeable increase in signal strength, but the physical difficulties connected with operation are such I do not believe the average experimenter will have one chance in a hundred of ever picking up a very weak station with the outfit, and the ones that aren't weak can be picked up with a regenerative set just about as satisfactorily and much more quickly. Let us consider the two-step shown in Fig. 4 and go about tuning the brute for a certain wave length.

Method 1. First, set the tuning inductance "A" at or near the desired wave length, which is, let us assume, 300 meters. If this is calibrated—and it ought to be—so much the better. Now set your first tuned impedance "C" also at 300, but turn this first tube's rheostat well down below the oscillation point, or even turn it out altogether. Now turn up your second amplifier tube and tune with the first and second impedances, using "C" as a "secondary" and "E" as the oscillation control, until

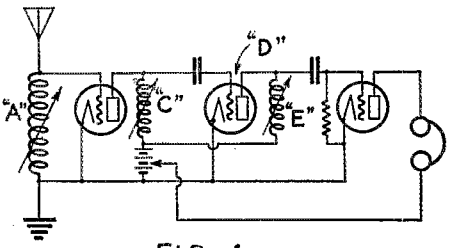


FIG. 4

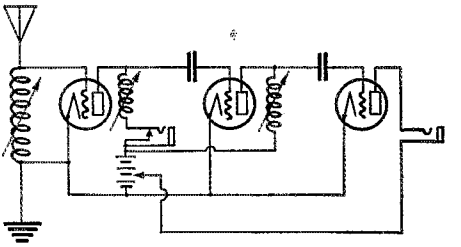


FIG 5

you have located your signal, which we will say is a phone. Now you can turn down your second amplifier tube "D" and proceed to find the true resonance point for the second impedance "E", as explained previously for the operation of a one-step amplifier. Having done this, tune your tuning inductance "A" until the signals comes in the strongest. The frequency of the heterodyned carrier wave will not change noticeably during this latter operation, merely the signal strength varying. After the correct value of "A" is found, turn up your first amplifier tubes as much as you can without losing the signal, retuning all circuits for finer adjustment.

Having got your signals, go carefully about your business, and if you have luck you may succeed, within ten or fifteen minutes, in getting all three circuits exactly in resonance, still having the tubes turned up fairly well, but having no oscillation. This is similar to making use of the familiar "zero beat" tuning method ordinarily em-

ployed in three-circuit tuners. Obviously, if we can do this, we can turn each amplifier tube up a little more, thereby realizing greater amplification, but not being troubled with oscillation.

Of course this doesn't work as easily as it sounds. I have succeeded in accomplishing the above operation once or twice—mostly by luck. If we have the tubes turned up far enough to do any good, the set is so extremely unstable that it is almost impossible to maintain this desired non-oscillating resonant condition, if we by some chance happen to get it. A swinging antenna is enough to cause the system to spill over, and variations of the "A" battery current, the slightest body capacity, etc., will usually spoil the works. It takes some time to get the desired effect, and then when you get it—or *if* you get it—you can't keep it. The set is very sharp under the above conditions, too, and very often, after patiently getting all circuits in resonance, we find that we are no longer tuned to our desired signal, and if we try to tune it in by the fractional variation of any of the tuning elements, we spoil the balance and start oscillating again.

Of course you can work your amplifier and not be bothered particularly by oscillation if you keep the tubes turned well down in the process, but then you aren't getting any amplification either, to speak of, so what good is your amplifier doing you?

Method 2. A second method of tuning is that of tuning each stage successively by plugging in the phones, first into the plate of the first amplifier tube, then into the detector, it being unnecessary to plug into the second stage. To do this it is necessary to insert jacks as indicated in Figure 5. The jack in the first tube will cause no appreciable loss.

Plug into your first tube, pick up the desired signal by operating the set as a regenerative set, and then locate the correct impedance value as previously described. Then go down to your detector circuit, turn your second amplifier tube on—but not too high—and tune your second impedance until you get the best signal in the phones. Then try for the zero beat method again.

Method 3. Method 2 is probably the easiest to employ, but there is still another way that can be worked. In this case, turn all tubes fairly well up. Then set your antenna tuning inductance somewhere near the desired wave, and then start with one impedance—it doesn't matter which—at the extreme *low* value, and start with the other at the extreme *high* value, and turn one down and the other up toward the desired resonant point. Here, as before, you will encounter oscillation before you reach the impedance value, but having started the set oscillating, try and pick up the signal and land on the "all-resonant" point again, as previously described. You probably won't do it, but it's an absorbing way to take up an afternoon that would otherwise be dull.

The possibilities of picking up a very weak signal under the above conditions are left to the reader's imagination.

Conclusions

From the rather strung-out mass of language above, we can draw the following conclusions:

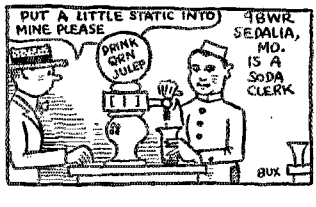
One step. No good for 200 meters. For phone waves, value extremely doubtful, as only very slight amplification is obtained, and this only when set is operated at maximum efficiency, necessitating several additional operations and taking additional time.

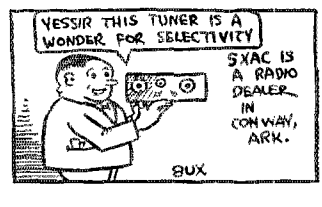
Two steps. Would probably give slight amplification on 200 meters and considerable on 360-500 if we could operate the set, but operation so critical under maximum amplification conditions as to be almost impossible. Very unstable, and difficult to pick up weak signals, which are the ones we are after. By the time conditions are altered so as to render the amplifier stable enough to operate conventiently, we have lost most of our amplification at 400 meters, and practically all of it at 200, and in addition the set has too many controls for the quick tuning necessary for relay work.

Moral

If you want anything better than a regenerative set, build a superheterodyne!

Editor's Note: This article was written before the appearance of the Grebe CR-13 and should not be taken as condemning that set. At this writing we have just received a "13" for test. As yet we know little about its performance.





My Impressions of American Amateur Radio

By Leon Deloy, French 8AB

American Amateur Radio has been honored and very pleasantly surprised by a month's visit from Mr. Deloy, the leading French amateur, well known to our readers from his "Letters From France" in our columns. Mr. Deloy came over expressly to study the methods of American amateurs, in order that his station, the first in France to be heard here, may be the first actually to work with us from Europe. While here he visited many of our better-known stations and attended our Second National Convention, where he had the distinction of being the first foreign visitor at an American convention and was initiated as the first foreign member of the R.O.W.H. In this all-too-brief article he tells us of his American impressions.—Editor.

IT is a "Letter from America" I write this time instead of a "Letter from France!" What a great feeling to be back in this country which I left four years ago!

Taking part in this Second National American Radio Relay League Convention was a wonderful experience and certainly worth every one of the five thousand odd miles I had to travel to come from Nice to Chicago. I will never forget the wonderful reception that was given me everywhere, at the Convention, at the A.R.R.L. Headquarters, and in every amateur station I visited. I always looked upon every American Amateur as a personal friend and I was exceedingly glad to have this opportunity of meeting many such friends and shaking hands with amateurs of every District and Canada.

I am awfully proud to be the first European amateur to have come to one of your conventions and to have been able to deliver to you verbally a message of warm greetings in the name of all French Amateurs. My coming over has given you one proof more of the very keen interest your French comrades take in your work. You may rest assured that we will spare no effort to establish two-way communication with you. Remember what we did during the last Transatlantic Tests with a very short preparation, practically no previous experience in short wave work, and under the handicap of distance and France's southerly and inland position. I have no doubt that we will do far better during the coming winter. I know of several one kilowatt stations being built by some of the best French amateurs for the sole purpose of communication with you; I would be extremely surprised if two-way communication was not established very soon. Let us all look forward to that epoch-making day with confidence and let us make every effort in our power to hasten its coming. It will be more than a radio achievement; it will be one more tie of friendship between the two great nations which have been brought so close together by the late war.

MR. DELOY AT THE NATIONAL CONVENTION, IN A GROUP SHOWING AMATEURS OF THREE COUNTRIES. Left to right: Chas. H. Stewart, 3ZS, A.R.R.L. Vice-President and Manager, Atlantic Division; Mr. Deloy, French 8AB; Mr. W. D. Terrell, Chief Supervisor of Radio, Bureau of Navigation; A. H. Keith Russell, Can 9AL, A.R.R.L. Canadian General Manager.

I have been asked to state in these notes "very frankly" what I think of "amateurism in this country." The complete description of my impressions since my arrival here would take a great many pages and I know far too well how precious *QST's* space is to attempt anything of the kind; so I will make this brief.

The enthusiasm and co-operation I have

noticed everywhere seem to me one of the main reasons for the wonderful achievements of the American amateurs; the same spirit is developing very fast in France and I think it can be considered as an excellent omen for the future. I also noticed that the average amateur in this country is much younger than in France.

From a technical point of view the main difference between your stations and ours (outside of their number and average power, both of which are much greater here than at home) is the business-like way in which they are built here. Your principal aim seems to be traffic handling while our only aim is experimenting (no traffic handling allowed in France!) Consequently your transmitters are often remote-controlled and installed in a separate room from the receivers, while our transmitters are, in every French station I know, right under the eyes and hands of the operator, which naturally is the best location from an experimental point of view.

To me it seems a pity that you still have sparks going (no sparks allowed in France). On the other hand, it is very interesting to watch the efforts you are making to go to pure C.W. In France the air is comparatively free on amateur waves (except for arc and spark harmonics and QRN!!!) and nobody is opposed to A.C.C.W.

About your receivers many of the remarks I made regarding your transmitters hold good. They too are made for traffic handling and that means that most of the manufacturers have sacrificed to a certain extent sensitivity to ease of adjustment. Our receivers are most of the time "spread all over the table" and we very often use tuned radio-frequency amplification; all this means difficulties in adjustment and less realiability, but I think we very nearly get the maximum sensitivity possible out of our sets and most of us like far better to experiment with new hookups whenever we please than to sit night after night in front of the same nicely finished cabinet. Naturally it would not be so if we wanted to handle a great many messages. When aims are different the means employed have to be different too. As we have so many adjustments to make in our receivers we usually save some by using no filament rheostats and any plate tension between 40 and 100 volts. The French receiving tube of the usual hard type will work very well with a two-cell storage battery connected direct to the filament and anything between 40 and 100 volts on the plate; it will work equally well as a detector or amplifier and so far I have never found a foreign tube to give better results.

Before ending this "letter" to my numerous American friends I want to thank them once more for the wonderful reception they have given me, and I take this opportunity of saying to those who have taken particular pains to make my visit to this country pleasant, that they have been highly successful in doing so and that I will never forget their kindness to me.

NM nw gdbi all and long live the A.R.R.L.!

The International Intermediate

—An Important A.R.R.L. Announcement—

DID you ever hear U. S. 1AW call Canadian 9AL and instead of separating the calls with "de" (known as the intermediate or interval sign), use "aa" instead? And did you hear 9AL, answering, use "fm"? Probably you did and maybe you have heard Canadian stations working among themselves using "v" while U. S. stations use "de". Works fine, doesn't it—as long as you keep those arbitrary intermediates in mind—which you don't because the Canadians often use "Can" in front of their calls when signing off, just to make sure the rest of the world won't make a mistake and log them for a British, American, Cuban or Australian station. When we made this arrangement with the Canadian amateurs, across-the-border traffic was "sitting pretty" and it worked out more or less satisfactorily but we didn't take into consideration that across-the-water work was at the threshold of amateur radio and before long we would be QSO and logging our British, French, Mexican, Cuban and Australasian confreres and getting an extra couple of tubes handy to copy South Africa, Japan and the Argentine. This is materializing faster than we realize and with it comes the necessity of correctly identifying the calls we hear, especially since no international amateur call letter arrangement is in force like the commercial calls and different countries are assigning their amateurs similar calls.

The present Canadian-U.S. arrangement was OK in theory but if extended in practice to include other countries it would mean the assignment of various arbitrary intermediates of all kinds and conditions and a card index file to keep them straight and decode

them when logged. Some brave souls even undertook to write this dictionary of intermediates for future use but soon found themselves so involved in the vicious circle that friendly advice prevailed and they went back to pounding brass again. The need grew more imperative nightly and gave rise to several excellent plans which received publicity through *QST* in the form of articles and communications; a call for criticism or counter-suggestions brought forth still more valuable material on which to work. The fact that the SOS produced six acceptable plans also indicated if these six plans were submitted to the world at large they would produce thirty-six additional pet schemes and a sheaf of amendments; it was likewise apparent we could not pick out any one scheme, polish it up and tell amateurs of other countries this was absolutely the latest wrinkle and if they wanted to be listed correctly in "Calls Heard", they would have to fall in line and use it. The only feasible course lay in picking what *seemed* to be a perfectly workable arrangement, writing every representative radio club, amateur organization or prominent amateur of every country of which we knew at the time for an expression of opinion, constructive criticism or counter proposal, to present in the end the consensus of opinion, the vote of the majority of international amateurdom as nearly as we could gauge it. Eleven different countries were scoured, representing hundreds of thinking amateurs, and after a year's correspondence and fifteen pounds of letters had been tabulated and marshalled into line, the proposed arrangement with minor changes was awarded first honors. Some correspondents backed it without reservation, some had slight changes to make in form, some had certain points which needed clearing up, but all were enthusiastic and the interest displayed showed clearly the thing we had hoped for—a unified international amateur plan as nearly representative as we could get.

Let us first consider what requirements must be met in order that the needs of the situation be filled, and actual identification of all amateur signals, no matter what nationality, be assured.

(a) Should not increase the length of calling now used between amateurs of various countries.
(b) Should make identification, both of call and nationality, reasonably sure.
(c) Should not employ arbitrary signals.
(d) Must be capable of use by amateurs of all nations.
(e) Must not change assigned government calls.
(f) Must identify amateurs of the same country working each other, when heard by amateurs of another country.
(g) Should take care of present and future requirements for several years or until such time as the next International Radiotelegraphic Convention meets and assigns a better scheme on the basis of the present commercial assignment of calls.

In considering the plan in its final form, it should be remembered that it doesn't comply with all the above exactly but aims to come as near as possible. With that in mind, let us get down to business.

Replacing the present arbitrary intermediates used between Canadian and U.S. amateurs with the initials of the respective countries, we find it quite easy to identify each, provided they are arranged correctly so that the initial of the country *called* comes first and initial of the *calling* country second. For purposes of illustration, assume the initial "c" is assigned to Canada, "u" to the United States. Canadian 9AL now calls U.S. 1AW in the regular way but instead of separating the calls with "fm" he uses "uc", meaning 1AW (u) is being called by 9AL (c). In other words, "1AW 1AW 1AW *uc* 9AL 9AL 9AL."

When 1AW answers 9AL he turns the intermediate around to indicate in the same manner as above what nationality is called and by whom called. In illustration, "9AL 9AL 9AL *cu* 1AW 1AW 1AW k". It works out beautifully and requires little effort to remember, since in almost every case the initials are those of the two countries, except where two countries of the same initial have amateurs; in this case it has been necessary to assign an arbitrary initial to one but you will notice that with one exception these arbitrary initials are phonetically suggestive of the country, which makes it that much easier. They are as follows:

A—Australia
C—Canada
F—France
G—Great Britain
I—Italy
M—Mexico
N—Netherlands
O—South Africa (the exception)
P—Portugal
Q—Cuba (phonetic)
R—Argentine (phonetic)
S—Spain
U—United States
Z—New Zealand

This leaves twelve letters still unassigned for future developments and as the call arises they will be allotted and the proper publicity given.

Note another point: when calling an amateur of your own country use the initial of that country, *once only*, as the intermediate, since your sigs have a habit of traveling over international boundaries and oceans and things and even tho you want the fellow in the next block, a station three countries off may hear and like to know who you are.

That is, if Canadian 1AR calls Canadian 3BP he says "3BP 3BP 3BP c 1AR 1AR 1AR" and the same intermediate is used in answering. Someone suggested this intermediate initial be repeated twice, as "cc", for the sake of greater accuracy but it seems unnecessary, as the whole series will probably be repeated several times.

Now a word as to the legality. The last International Radiotelegraphic Convention, known as the London Convention, did not provide for amateurs and we therefore have our being through our respective governments who license us, generally in accordance with their own radio regulations, which latter are generally in accord with the London Convention articles. Each government, therefore, is the one to smile and give its blessing and while the plan is not strictly according to regulations, nevertheless it has been unofficially in operation in modified form between Canadian and United States amateurs for several years without government protest and since it would amount to an agreement between amateurs only, for the betterment of their operating conditions without in the least affecting commercial, military or broadcast interests or causing confusion in calling, we do not look for objection from that quarter. Several governments have unofficially indicated approval and since it is a matter involving a slight technicality, we see no necessity for official action, unless specifically requested to do so.

The one exception is in the case of British amateurs; their government has unfortunately raised technical objections, stating the only acceptable plan would be for them to prefix their assigned call letters with the initial of their country, retaining the "de" as at present. For example, in calling British amateurs, the first plan will hold, but the British amateur answering, will prefix both calls with the country's initial, instead of using the initials as the intermediate sign. For example, if British 2SH calls French 8AB, he would send "F8AB F8AB F8AB de G2SH G2SH G2SH k". As this is the only exception to the general plan, it is hoped the British Post Office may be induced to change at a later date.

Amateurs reading of this plan for the first time will probably light on several objections, and therefore, to forestall doubt or dissatisfaction where it may exist, they will be answered before asked.

(1) Some countries will have same initial. As explained previously in case of such conflict, an arbitrary initial will have to be assigned but every effort will be made to do so phonetically.

(2) Not enough initials for all countries in the world. Quite true but neither does every country boast an amateur and with twelve initials left, the supply will last for five years or so, before which the International Radiotelegraphic Convention will have met, and probably considered the international assignment of amateur calls itself.

(3) Incorrect logging of the intermediate initials may result from QRZ or QRM signals. Yes, but when calling foreign amateurs or those over long distances, the call sequence will be repeated more than usual, giving the logger several chances.

A word about the plan that ran second to this and its objections. Several endorsements of the plan to be used by the British amateurs were received, but careful analysis brought out the following disadvantages:

(a) The prefixing of a call with an initial (F8AB G2SH) would not be permitted by several governments, as the calls are assigned originally by the government and no change thereto may be made by the amateur.

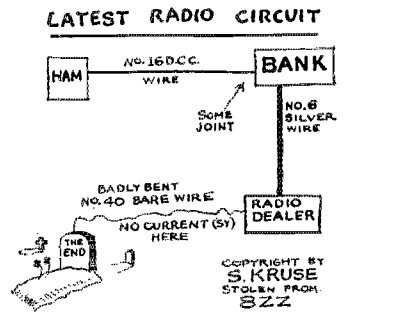
(b) Some government services have already been assigned calls commencing with a letter, followed by a numeral and one or more letters, so that conflict would certainly result, should the amateurs use this system generally.

(c) It increases the length of call unduly. 25% in the case three letter calls, 33⅓% with two letter calls.

(d) Unless calls are sent very carefully and received quite clearly, the prefixed initial may be transposed by the logger as constituting the last letter of the call. (F8AB may be logged 8ABF).

As we said somewhere before, the first plan is not absolutely watertight but it was the one which received the united support of international amateurs over the other plans, and the main need right now is to get started—quickly—before the Transatlantics and other tests. The Traffic Manager has approved and endorsed the scheme. Midnight, December 15th, 1923, is the date it goes in effect; get set, OM, read this again to make sure you understand it perfectly, tell the rest of the gang, and—let's go!

—*C.A.S.*



Dixie Invites You

To The First Southeastern Convention

EVEN lively Atlanta will receive some new sensations on December 27th, 28th and 29th. That's when the Fourth Radio District and the East Gulf Division of A.R.R.L. hold their first independent convention and initiation to the Royal Order of the Wouff Hong.

"Beat the National Convention" has been set up as a slogan and the Fourth District has been humming with activity—this will certainly be a lively convention. The "Welcome Everybody" sign is out for all A.R.R.L. men of every district and division, and the homes of Atlanta amateurs will take care of those who can't stand the hotel bills.

The Program

December 27th:

Forenoon-Registration at the Hotel Ansley, Atlanta. Rooms reserved for delegates at the following rates: single with bath, $2.50; four in the same room, $1.00 each. Tickets for the entire convention, including all trips, meetings, stunts and convention badge, $5.00.

2:00 P.M.—Trip to amateur stations and also to the great Confederate memorial which is being carved on the face of Stone Mountain, the world's largest rock.

7:00 P.M.—Banquet, district roll call, and formal opening of convention, with short talks by leading delegates.

10:45 P.M.—Parody on Broadcasting—sent by Atlanta Journal station WSB, working as Atlanta Radio Club Station "IOU."

December 28th:

10:00 A.M.—Technical Meeting.

2:30 P.M.—Trip to amateur stations and to 5-kilowatt Signal Corps tube station WVR, largest Army station.

7:45 P.M.—"Good of Amateur Radio" meeting; discussion of plans for the future.

9:30 P.M.—Amateur radio and athletic contests for the apparatus prizes.

December 29th:

10:00 A.M.—Technical Meeting.

2:30 P.M.—Second amateur meeting; plans for next year's convention and vote on next convention city.

7:30 P.M.—Drawing of the stunt-night prizes, followed by Wouff Hong initiation.

Speakers

The following speakers have been invited and almost all of them have already promised positively to come:

Hon. D. B. Carson, Commissioner of Navigation, Dept. of Commerce.

W. D. Terrell, Chief Supervisor of Radio, Dept. of Commerce.

Captain Van Nostrand, Supervisor, 4th Radio District.

Either F. H. Schnell, Traffic Mgr., A.R.R.L., or A. A. Hebert, Field Representative, A.R.R.L. (possibly both).

C. M. Jansky, Jr., Technical Advisor, A.R.R.L.

John L. Reinartz, the tuner man.

H. L. Wills.

H. E. Bussey, Atlanta office, General Electric Co.

E. E. Bucher, Sales Mgr., R.C.A.

Doesn't that sound good? And think!!—this is the very time when most of us are sick of the sight of snow and weary of being frost-bitten—wouldn't it be fine to skip out, to go to Atlanta where weather and welcomes are warm? Come on, gang!!

—*S.K.*

Trans-Pacific Report

Word from Mr. K. P. Frederick of *Radio Journal* states that the first cable report from Australia contains information that signals are coming thru fine with 6KA as the strongest. 6XAD-6ZW reports hearing what he believes to be a signal from Australian 5GM or 3GM. Word has been received that 6CEU, Hawaii, has been heard in Australia. A second cable said, "Big list over weather better." No further reports received at this writing.

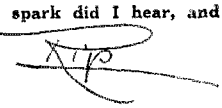
Louis W. Richwein

All amateur radio mourns the passing of Louis W. Richwein, federal Radio Inspector, who died at Seattle, Washington, October 5th. Mr. Richwein was a true friend of the amateur and for many years operated 3XX in Baltimore, Md., where he formerly lived. He served in the Navy during the war and it was there that he contracted tuberculosis, which caused his death. In June of 1923 he went to Seattle from the Third District as Assistant Radio Inspector and on July 3d was promoted to Radio Inspector by the Secretary of Commerce. He loved his work and gave his life to the radio art. Interment took place at Baltimore, his home town.

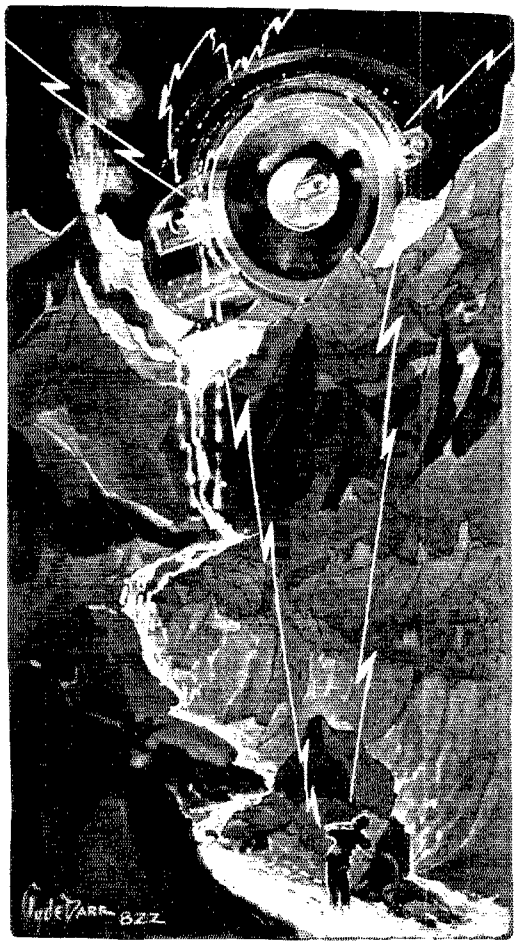
The Land of Blue Lightning

By Porter T. ("Rip") Bennett, 5IP

"LQ":
Here it is, OM. The idea hit me last night while listening in. Nary a spark did I hear, and I thot how good it would be to hear one closing down with the power still on and the note descending on the "dah-de-dah." But all I could hear was signals that stopped with a sudden abruptness that left something lacking. C.W. is better than sparks and I like it better, but the ringing of the cowbells sounds sweet to a farmer still.



TO him who is hoary and white, contentment and satisfaction are given if he may sit and doze while recalling childhood's memories and the echoes of halcyon days that are gone. But with these things there also come silent heartaches, for who does not retain a deep and abiding love and an empty place in his heart for something that is forever gone; who does not long for the old familiar sounds of a child's laugh, the tinkle of ice in a julep glass, the call of "Swing your partners?" And of the elder radio men amongst us many yearn for that sweetest sound of the olden days, the musicale of the sparks. Beginning with a rumbling basso, their voices came with rapidly increasing volume and ever rising inflection to high clear notes like those of silver bells. Alas, those days have gone! No more do clear notes come winging thru the ether at eventide and at midnight, telling us that some brother is searching for communion with another soul—a friend whom he has never seen but whom he knows well. No more do we hear those beautiful tones that sounded like organ pipes playing softly in a great cathedral, from the deep booming bass to the shrill flutelike stacatto—no more do we hear the faint sounds as of cold winter winds coming over vast distances of bleak rock and sand and sea, carrying ghost voices and the sounds of dying men on sinking ships. No more is the robin-trill of the synchronous spark—gone, gone. Ah! what would we not give to have one night of the past back again. Would that we could light the magic bottles, call back time, or go into the spirit land, and for a space of just a few minutes hear that mellow music again!



But time has flown and we sit and listen to what is left, noises like an army of skeletons on the march with a discordant and worn-out flare of music at the head. Listen! "Doy - dit - doy-dit-doy - doy - dit - doy, spit spit spit, splat, spalaat, spluut, splewt, blaaaaaa-a-a-ah, wonk wonk dit oink, wheeeneeeneeh, spink, spink, spink, tickety tickety, tickety, tickety, asshhpaaaaaah, fry, fry, gobble, obble, obble," and thru the whole the monotonous wavering drone

whoooouuuuunhnhnhnhnhnhnhn" of a generator.

High pressure efficiency, the mushrooming of the listening-in fields, has caused these peaked and strident noises, and perhaps from an economic and operating standpoint it is well. But esthetically speaking, this is the death dirge of our blessed music; we must say "Jazz," in its filthy way, has also submerged our blessed sparks.

Epilogue

In my dreams I saw a distant and terrible land, filled with mighty roaring. As I approached great lightnings leaped, burst and writhed like Medusa's Snakes. I trembled but my soul was filled with joy, for behold, they were giant wheels with knobs of azure fire on their peripheries, rotaries piled higher than the volcanic mountains about them, whirling and spinning 'til misty blurs were seen instead of spokes and faces. The mighty roaring discharges caused the red belchings of the nearby volcanoes to pale.

A great dark figure approaches—I know him for the genie of this land. He salaams; "Oh, Sir, thou beholdest Sha-we, ruler of this land and keeper of the Ancient Wouff-Hong. It is given to thee this day to take that which thou desirest. Speak that thy servant may do thy bidding."

A great longing filled my soul for all that was contained in that valley but I knew that only one thing would be allowed me, so I pointed to the wheel nearest me and made known that I would take it. The genie moved his jewelled hand and in my arms I found the snarling, spitting fiery thing. I loved the touch of it and pressed it to my breast. I felt the prickling sting of its flames in my face, I had a fulfillment of my heart's desire, for my beloved spark was burning its way into my soul to stay there forever.

The genie was gone, black clouds rushed overhead with heavy thunders, a heavy hot wind sprang up, lightning flared blue at the rotaries. Then came sheets of rain and tons of rocks thundered down the mountains. I could still feel the prickling flames in my face when there was an intense flash that blinded me and threw me to the earth. In the midst of this pandemonium a woman's voice screamed shrilly and I awoke. I was lying on the floor, in my arms I held tightly a great fern, my face buried in the sharp fronds. Rain poured in at the open window and my wife was pounding me with both fists trying to make me come out of the trance and quit acting like a fool.

9BP Still Chief Contact With MacMillan

For the information of those who are not acquainted with the story, Dr. Donald B. MacMillan, the famous Arctic explorer, is now in the far north with a crew of eight men on the 88-ft. auxiliary schooner "Bowdoin." They are frozen in for the winter at Refuge Harbor, Greenland, 11 degrees from the Pole. The vessel is equipped with radio and the operator, Donald Mix, is an amateur sent along on the expedition by the A.R.R.L. "WNP" is the "Bowdoin's" radio call. WNP's communication has been entirely via amateurs of the U.S. and Canada, and Capt. MacMillan's news stories appearing in the press thru the North American Newspaper Alliance have all been handled via amateur stations of the A.R.R.L. The following brief article is a report of October communication with WNP.—Editor.

THE month of October saw no important change in the contact with WNP. That means that Jack Barnsley, Canadian 9BP, of Prince Rupert, British Columbia, continues to be the only reliable clearing-house for traffic to and from the "Bowdoin," an honor he has enjoyed ever since he first connected with WNP on Sept. 7th. Many messages have been handled in both directions, some of them long and difficult, and several press stories received. The crew of the "Bowdoin" have been in touch with their families and friends with much the same facility as if there were a Western Union office at Refuge Harbor. They have heard a little broadcasting but almost no news by that source, but hot news and the World Series scores have got to them via 9BP. Barnsley has done a wonderful work, and A.R.R.L. Headquarters is not the only place where it is appreciated, as is shown by a message WNP sent him on Oct. 24th:

Aux Schooner Bowdoin Oct 24
J Barnsley Rdo 9BP
Prince Rupert BC

Accept sincerest thanks from myself and party for your interest in our expedition and for your very valuable help in transmitting messages. Your loyality will not be forgotten upon our return from the Arctic.
Donald MacMillan

The "Bowdoin" is now frozen solidly in the ice for ten months, the temperature is 15° below zero, and there is heavy snow. The sun has not been seen since Oct. 25th. All the crew are well and happy, and enjoying their adventures. Draw just a little upon your imagination, reader: doesn't radio mean something real to that party? And if you have an amateur station you have a good chance of talking to them this winter!

The table in this article records all reports of WNP received for October. A few

stations thru the center of the country have heard her, but the only reliable copying has been on the West Coast and the only actual contact reported is via 9BP, except for a brief moment with 9EBT. We don't know how to account for this condition but it surely exists. It hasn't been all roses even for the West Coast, either. There have been periods of a week or more when nothing was heard of WNP, only to learn when she and 9BP connected again that both had been on watch every night and that Mix had heard 9BP calling him each night but had been unable to make his own signals heard. Perhaps the magnetic pole is having some effect on communication; possibly it is aurora. It all adds to the fascination of the project and as the winter wears on we shall learn more about it. All persons hearing WNP are requested to send particulars to A.R.R.L. Headquarters.

—*K.B.W.*

Mix at the "Bowdoin's" Wheel. (Photo by MacDonald)

Log of A.R.R.L. Stations with WNP

(Local Standard Times)

Sept.	20	Early	J. N. Smith, Mile 7, Alaska	Copied WNP an hr wkg 9BP, QSA, some QSS.
"	21	Early	7DG, Cordova, Alaska	Hrd WNP on det.; no particulars.
Oct.	2	Early	9BP, Prince Rupert, B. C.	Wkd WNP; took 146 wds N.A.N.A. press and 2 msgs; sent 1 msg.
"	4	Early	9BP, Prince Rupert, B. C.	Wkd WNP; took 6 msgs.
"	4	2:05 a.m.	9DKB, Minot, N. D.	Copied WNP one hr wkg 9BP; very QSA.
"	4	Unstated	Can. 3WG, Guelph, Ont.	Hrd WNP QRK.
"	4	7:30 ?m.	9DBF, Evanston, Ill.	Hrd WNP clg CQ.
"	4-5	Midnite	9BP, Prince Rupert, B. C.	Wkd WNP; sent him 7 msgs without repeat; took 1.
"	10	Early	9BP, Prince Rupert, B. C.	Wkd WNP; WNP started press but QSSed out.
"	10	Unstated	6XAO, Piedmont, Calif.	Hrd WNP fairly consistently several nites.
"	10	12:13 a.m.	7AIY, Wenatchee, Wash.	Hrd WNP clg 9BP vy QRK.
"	11	9:15 p.m.	9CLQ, DesMoines, Ia.	Hrd WNP sining off QRZ.
"	20?	Unstated	1YB, Hanover, N. H.	Cld WNP; hrd him reply but unreadable.
"	22	Early	9BP, Prince Rupert, B. C.	Wkd WNP, sigs weak. Sent 10 msgs and baseball scores.
"	23-24	Midnite	9BP, Prince Rupert, B. C.	Wkd WNP; took 200 wds N.A.N.A. press and 1 msg; sent 3 msgs.
"	25	Early	9EBT, Fargo, N. D.	Wkd WNP; took 1 msg; then apparently lost him.
"	25	Early	9BP, Prince Rupert, B. C.	Wkd WNP QRK; took 9 msgs; gave him news for 1¼ hrs OK.
"	25	1:15 a.m.	6XAD, Avalon, Calif.	Copied WNP two hrs wkg 9BP. QSA but QSS.
"	30	Early	9BP, Prince Rupert, B. C.	Wkd WNP, sent 8 long msgs and news; took 3 msgs and 500 wds N.A. N.A. press.
"	30	4:10 a.m.	9DSW, Fairmont, Minn.	Copied WNP two hrs QSA wkg 9BP.
"	30	5:14 a.m.	3BAU, Glenside, Pa.	Reports hrg WNP clg 5MK QSA but QSS; hrd agn at 6:08 a.m.

The Other Side of the Argument

*By S. W. Place**

In the August issue of QST, on page 36, there appears an article "Hard Rubber in Radio Instruments," in which the advantages of hard rubber are presented. Here we have the other side of the argument, the case for the family of products that the scientist describes as "Laminated Phenolic Condensation Products," but which we know better under the names of Condensite Celeron, Formica Micarta and Bakelite-Dilecto. Read the two articles together and decide which product suits your particular job.

THERE are properties which an insulating material for radio must have, for without these properties its efficient service will be short lived.

In some respects Hard Rubber and one or two other materials are splendid for insulation. They have the necessary dielectric strength, and are impervious to moisture; but insulating materials for radio must have no tendency to warp when exposed to heat or unusual cold. Neither should they be so brittle as to be likely to crack or split in the process of machining.

Think what it means to a man who has invested his money in a radio set to find that the warping of the panel has thrown his dials out of alignment, interfered with their easy rolling movement, and disrupted the working adjustments of his set. Consider the advisability of using a panel board that has *all* the necessary properties and which *will not warp!*

Laminated Phenolic Condensation products are known under various trade names as "Condensite Celoron," "Bakelite Dilecto," "Bakelite Micarta," "Formica," etc. These phenolic products are built up of a laminated structure consisting of paper or thin sheets of fibre especially treated with the phenolic gum. Twenty-five or thirty of these sheets may be required to make an ordinary radio panel. The sheets are placed in a heavy hydraulic press, between polished plates, and subjected to a pressure of almost one ton per square inch. At the same time, steam, circulating around the plates, heats the gum causing it to soften and flow, after which it hardens forming a solid sheet.

Laminated phenolic products are tough and hard, have high dielectric strength, fine appearance, are chemically inert, insoluble and infusible. Unlike hard rubber, it is practically unbreakable even when dropped on a stone floor. It is easily drilled, tapped, turned, sawed, or milled. It can in fact be worked in any manner that metal can. It is not affected by sunlight and it will always keep its original high finish. No degree of heat or cold it is likely to encounter will cause it to warp or crack.

*Radio Engineer, Diamond State Fibre Co.

The importance of this last named feature alone can hardly be over-estimated. The ultimate buyer cannot get satisfactory service from a set in which the panel or mounts have warped. No matter how perfect the outfit may be in every other respect, this one fault is enough to condemn it and the firm that makes it in the eyes of the amateur.

Laminated phenolic products are the leaders in the line of radio insulation. The following tests will be of interest to the radio amateur as they establish without doubt the superiority of this class of material.

CONDENSITE CELORON — GRADE 10

Wave Length Meters	Approx. Frequency Cycles per Sec.	Phase Difference Degrees	Dielectric Constant K
373	804,000	2.0	4.7
1,295	231,500	1.8	4.8
3,067	97,800	1.8	4.9

Here are some additional dielectric tests made by the Electric Testing Laboratories of New York City:

	Dielectric Strength (at 60 Cycles) Blunt needle point under Oil. Increase of voltage about 3,000 per second.	
Material Tested and Color	Average Thickness in mils.	Average Breakdown Volts per mil.
Grade 10 Black	206.	805
	17.5	1,520

Average surface resistivity 2,000 to 4,000 times 10^5 ohms per square centimeter at 25% humidity.

Average volume resistivity 6,000 to 9,000 times 10^8 ohms per cubic centimeter.

Mechanical Properties

Specific data relative to the mechanical qualities of Condensite Celoron is given in the following tables. These tests are the average of many. They are not merely the most favorable. We prefer to follow this conservative practice rather than cite highest tests only.

Tested for	Laminae Vertical lbs. per sq. in.	Laminae Horizontal lbs. per sq. in.
Tensile Strength	7,000 to 9,000	10,000 to 13.000
Compressive Strength	27,000	44,000
Transverse Strength	18,900	19,000
Modulus of Elasticity	1,450,000 aver. of ten readings	

Weight .054 lbs. per cubic inch—20 cubic inches to the pound.
Coefficient of expansion .00002 per degree F.
Brinnell hardness 30 to 40.
Specific gravity 1.4.

The San Francisco Convention

THE Fourth Annual Sixth District Convention, held at California Hall, San Francisco, October 13, was one of the livliest held in some time. The attendance was somewhat below that expected—but it didn't matter, there was plenty of enthusiasm.

Messages from President H. P. Maxim and Supervisor Dillon were read and the convention formally opened with our good friend McGown, 6ZE, in the chair.

The chairman's opening talk an amateur radio struck the keynote and from that time on discussion was eager and active.

Previsou to the convention there had been a considerable amount of correspondence between Traffic Manager Schnell, Director Babcock and Division Manager Wise regarding the advisability of partitioning California into a number of sections with an Asst. Division Manager in charge of each. In the absence of Mr. Wise, Director Babcock explained the plan, which was approved by the meeting, the division lines being at once established and the A.D.M.'s chosen. Details will appear in the Traffic Department report for December and January. An excelent change!, California is a mighty large state.

A.R.R.L. broadcasting stations were then taken up and motions carried recommending that all these stations send at 7:00 and 10:30 on Wednesdays in addition to the Saturday schedule, also that the Bay Counties A.D.M. appoint a local B.C. station for national and local news.

Transpacific work came up next and a committee picked the following stations to act as west-coast terminals in forthcoming two-way tests with Australia—6PL, 6ALK, 6KA, 6CMR, 6CGW, 6BVG, 6AWT, 6ARB, 6ZH, 6CHL, 6NX, 6AUU.

Next the Pacific plan was modified by removing the 15-minute limitation on conversations and by opening the hour between 6:30 and 7:30 to both local and DX work.

A committee was appointed to consider the possibilities as to a west-coast office of the League. This committee recommended that the matter be referred to the Board of Direction in the form of a resolution which they had drawn up. After some discussion this report was approved for forwarding to the Board of Direction.

A number of new members were taken into the League during the convention and interest in all matters concerning the League ran high.

Santa Barbara was chosen as next year's convention city, a vote of thanks extended to Chairman McGown, and the convention adjourned at 5:30 P.M.

—*S.K.*

Here's A Chance To Win A Storage Battery

Mr. Harry Morrell of 1CKY, New Haven, Conn., is offering a 300-ampere-hour 6-volt Edison A battery in a development contest, to be staged by members of the A.R.R.L. between now and June 1st, 1924, for the best single aid to Amateur Radio Operation which is submitted to the Board of Judges between no wand the closing date. The device must be of a kind that will be helpful in *amateur* radio operation; there is no other limit on it.

It is not absolutely necessary for the man who wins this prize formally to have entered himself, nor yet to have been entered by another person. However, Hartford is in one corner of the country; we can not possibly know even a small fraction of the radio developments that are going on; therefore enter your favorite man when he has accomplished something that you think "rates" the prize. It need not necessarily be apparatus: any radio development may be just as good.

The award of the prize will be made by the following judges in accordance with the best of their own estimate of its value:
K. B. Warner, Secretary, A.R.R.L.
F. H. Schnell, Traffic Manager, A.R.R.L.
S Kruse, Technical Editor, *QST*

Remember, entries must be in before June 1st, 1924; they must be addressed to the Headquarters of the League at 1045 Main Street, Hartford, Conn., and each entry must be distinctly marked "MORRELL PRIZE." *Put this on the letter*, not on the envelope.

Erratum; November *QST*, p. 54. The first line of the last paragraph on the page should read, "In the *parallel* supply method a radio . . . . ."

A New Non-Oscillating Detector

IN a paper to be published soon in the proceedings of the Institute of Radio Engineers there is described a new detector tube devised by Harold P. Donle.*

The construction of the tube and the usual method of using it is shown in Figure 1. Current from the A battery passes thru the filament rheostat R, then thru the filament (shown dotted) and the heater-wire H (wrapped around the outside of the tube) to the other terminal of the battery. The purpose of this heater is to keep the tube warm enough so that it will be filled with sodium vapor, a slight amount of metallic sodium having been placed in the tube at the time of the exhaust. C is a "collector" which takes the place of the usual grid. Because C is rather large and very close to the filament the "collector current" (equivalent to the ordinary grid current) is quite large and the input impedence is low. To keep the collector current within reasonable values a "neutralizing voltage" is supplied from a slider running on the potentiometer P.

The plate (anode) circuit impedance is normal and the tube will work into the usual phones or amplifiers. The collector

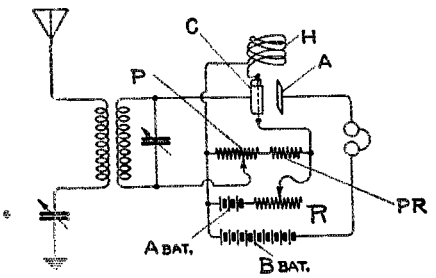


Fig. 1

circuit will not work well with the usual tuner, as the input impedance is very low and a secondary circuit adapted to operation at low voltage with larger currents must be used. This calls for a relatively large condenser across a low resistance coil with a few turns, the number of which is adjustable.

The tube does not oscillate, nor is it an amplifier tube; altho it has three electrodes it acts differently from the normal tube and can be used for detection only. When so used a sustained radio frequency impulse causes the plate current to drop in proportion to the applied voltage. This is markedly different from the standard tubes in which the response is in proportion to the square of the applied voltage. Thus it seems that the tube will not give tremendous signals from a loud station but will respond well to very weak signals—tending to equalize the signal strengths of various stations more than is the case with standard tubes.

The plate voltage and the filament current are not critical. The position of the grid-potentiometer slider must be adjusted

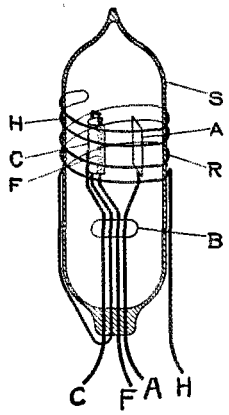


Fig. 2

with some care but this is not a "tricky" adjustment since the tube has no tendency to begin oscillating.

For spark, phone or I.C.W. reception the new tube would seem to have desirable characteristics; the C.W. operator will think twice before adopting a non-oscillating detector with the attendant complication of a separate heterodyne. However, it will be well to consider such a change in neighborhoods where there is interference on 200 meters between oscillating receivers operating on the same wave.

—*S.K.*

*Chief Engineer, Conn. Tel. & Elec. Co., Meriden, Ct.

NOTICE

All amateurs hearing or working WNP are hereby instructed to keep the texts of messages to themselves and to deliver messages to th addressee only. Furthermore, amateurs are instructed to pass out no information to anybody without authority from the A.R.R.L. Instructions for handling traffic with WNP appeared in July *QST*. If you don't know how to handle WNP messages, refer to that issue. Don't take a chance of handing out information that may become public property—read the U.S. Radio Communication Laws.

F. H. Schnell, *Traffic Manager.*

The Grebe CR-13

IT is a happy feeling to have a radio manufacturer, after all these years of broadcast-receiver building, bring out a set especially for the amateur. Such a tuner is the Grebe CR-13, which is now exciting wide interest in amateur circles. The Grebe CR-13 is not based on a new circuit, but on the development of a well-known one for a particular purpose. Referring to Figs. 1 and 2 we see that the system consists of a single stage of tuned radio-frequency amplification feeding a non-regenerative detector. To the left of the dotted line we have an ordinary single-circuit tuner, consisting of a condenser VC in series with a variometer Var-1. The antenna circuit does not go thru the entire winding but only thru one stator coil and one rotor coil—in other words, thru half the winding of the variometer. This loosens the coupling to the antenna somewhat and in addition causes the size of the antenna to have less effect on the tuning. The only inductance which is quite loosely coupled to the detector grid circuit and is not tuned at all—in fact, is deliberately made with such a low inductance that it cannot get into tune with any incoming signal.

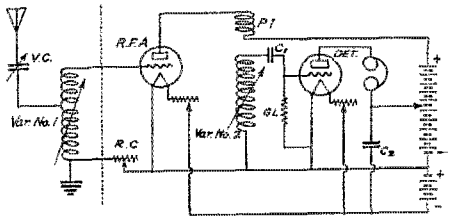


FIG. 2 "13" CIRCUIT SIMPLIFIED

The tuning range of the device is from 80 to 300 meters, a range that is not especially changed by the antenna used as this can be compensated for by setting the

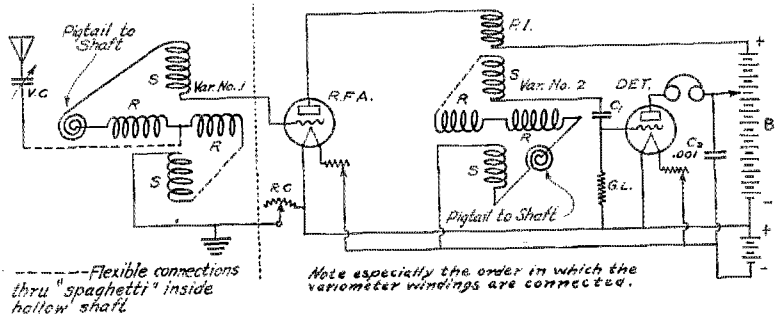
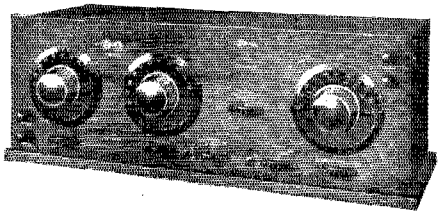


FIG. 1 THE "13" CIRCUIT

unusual thing so far is the resistance RC which is increased to prevent oscillations when receiving spark or phone.

The output of the R.F. tube passes thru



the plate inductance which is coupled to the detector-tuning variometer Var-2.

The difference between this radio amplifier and the tuned amplifiers we have been accustomed to lies mainly in this plate condenser VC. Favorably reports have been received but no tests have yet been made by the writer.

Those interested in trying a "home-brewed" tuner of this type will appreciate the following dimensions. First variometer, wound with No. 14 D.C.C. wire, 19 turns in each half of the stator and rotor or a total of 76 turns for the variometer. The plate coil PI of the R.F. tube consists of 15 turns of No. 26 silk-covered wire on a tube 4¾ inches in diameter, this tube placed over the stator of the grid variometer, Var. 2, but with rather loose coupling. The grid variometer, Var. 2, is wound with large cotton-covered wire, about No. 16, using 23 turns per half of the stator and rotor, thus giving a total of 92 turns for the entire variometer. The condenser VC may be something less than .00025 μf.

There are several possible ways of start-

ing to tune, hence detailed advice is needless. It is well, however, to make sure that the grid leak has the right value and to become familiar with the use of the rheostat RC. This rheostat, by the way, should have several hundred ohms resistance and had better be non-inductive. Some potentiometers will do very well.

The "13" shows the usual beautiful Grebe workmanship together with some special refinements. Of these we especially appreciate the wave length scale on the second variometer dial and the double rheostats which will work with any tube now available.

—*S.K.*

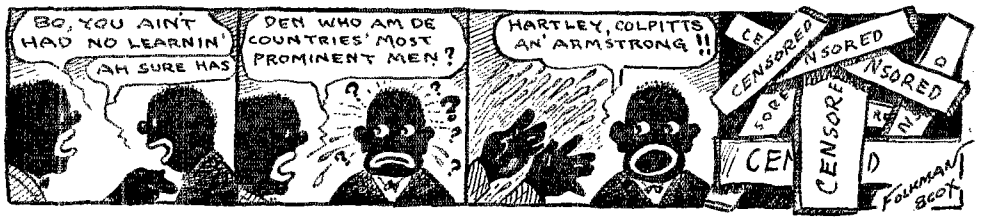
Financial Statement

IN accordance with instructions of the Board of Direction the following statement of revenue and expenses of the A.R.R.L. for the quarter ending July 31, 1923, is presented for the information of the membership.

K. B. Warner, Secretary.

Condensed Statement of Revenue and Expenses, May 1, 1923 to July 31, 1923

REVENUE		
Advertising sales	$14,656.34	
Newsdealer sales	8,663.82	
Dues and subscriptions	3,668.99	
Back numbers, etc.	261.03	
Emblems	366.00	
Interest on bank deposits	65.52	
Bad debts recovered	103.47	
		$27,785.17
Deductions		
Returns and allowances	$2,625.95	
Exchange and collection charges	5.94	
Discount 2% for cash	213.78	
		$2,845.67
		$24,939.50
EXPENSES		
Publication expense	$11,614.10	
Salaries and commissions	9,912.73	
Forwarding expense	571.26	
Telegraph, telephone and postage	660.25	
Office supplies and general expense	2,226.83	
Rent, light and heat	508.08	
Traveling expenses	495.61	
Depreciation of furniture and equipment	96.02	
Bad debts written off	435.30	
Public stenographers at meetings	286.25	
Operating Department field expenses	434.81	
Publicity Department field expenses	148.57	
Legal expenses in Bergman law suit	500.00	
		$27,889.81
Net loss from operations		$2,950.31



Edison Storage "B" Batteries

By F. M. J. Murphy, 8ML

AWAY back in '98 Tom Edison must have had a vision of some thousands of us on our weekly battery picking expedition, for it was then that he started on his work that resulted in the invention of the Edison Storage Battery. It was eight years after this that the Edison was perfected to a point which satisfied its inventor. When we consider the average life of the usual type of storage battery with which we are all familiar, and then discover that some of these Edisons have been in service for ten to fifteen years, we can see what painstaking care was expended in their conception.

Inside the Battery

Those of us who have one of these Edison cells, have wondered what's in those little nickel plated steel pockets. Must be diamonds, considering how they snap off the small drills with which we seek to penetrate them. The thin flat element is the negative, made in two halves from perforated high-carbon steel strip, and as the halves are clamped together in an hydraulic press to form a pocket, the black iron oxide, which is the active material, is forced in under heavy pressure. The end of the pocket is then turned in and sealed.

The container for the positive element is spirally wound from a narrower high-carbon steel strip, then packed under a ton pressure with over 600 layers of alternating nickel hydrate and nickel flake. This flake is so light that a bushel weighs but four and one-half pounds.

In charging the battery, the current passing from the nickel hydrate element to the iron oxide element causes the oxygen in the iron oxide to pass over and attack the nickel hydrate and form nickel peroxide, which has a very high resistance. By alternating this high resistance active material and nickel flake a low resistance path for the current is provided. The tendency for the hydrate to swell on charge is restrained by steel rings forced down over the tube.

In the final makeup of the battery the positives and negatives are mounted in nickel plated steel grids under a pressure of 40 to 120 tons.

The container, which is welded on, is of corrugated nickel plated steel with insulating bushings in the top.

The 21% solution of caustic potash, which constitutes the electrolyte, contains a small percentage of lithium hydrate, which must have been added for some good reason, as it is an expensive salt. The solution is furnished in welded air-tight steel containers and has a gravity of from 1215 to 1225. Renewal is necessary only every 300 cycles of charge and discharge, or not oftener than every two or three years, when the density falls to around 1175. In renewing the solution the cell is first full discharged to release the energy in the elements and prevent heating, the solution changed and cell recharged. If left in the open air the oxygen of the air combines with the active material and discharges the stored energy.

A dead short on an Edison does not even give it a pain. It has a higher resistance than the lead-acid battery—one of the reasons it cannot be used as a starting battery in an automobile—which limits the short circuit current to a reasonable value. If you forget to charge an Edison it waits patiently until you need it again, even though the period of inactivity be years. When it is left in fully charged condition 10 to 15% of the charge disappears in the first few days, after which the loss is imperceptible. This is a good argument for giving the battery a frequent boost, then immediately using the energy you put into it.

Charging the battery in the reverse direction has no effect other than running up the light bill. Inspecting the interior through the filler hole by the light of a match invariably gives a conclusive demonstration of the affinity of oxygen and hydrogen gas. It is not dangerous to touch the positive pole of the battery simply because it has a red ring around its base. The addition of acid to the battery will ruin its future prospects not to mention the carpet. It lasts so long you forget in what year you bought it. No gas mask need be worn on approaching a battery on charge. If it falls off the table or down the cellar steps, nothing but its feelings are hurt. The Edison Storage Battery Company thinks so much of its product that it will allow 25% of the purchase price on the return of an Edison battery in *any* condition. That explains in part why it is so hard to pick up old Edison cells.

What's It to Us?

All this sounds fine, it sounds so fine that you are beginning to wonder when the joker is going to be sprung. But there isn't any joker, the things are not only good as "A" batteries, they are good as receiving and sending "B" batteries too—provided you are willing to make a "B" battery from the parts of an old 6-volt battery.

Scouting

In scouting around for an old Edison battery to break up as material for a "B" battery it is well not to appear too prosperous. Don a pair of horn-rimmed specs, slouch hat, and baggy trousers, if you are not already addicted to such attire. Try the junk yards, garages, electrical vehicle and truck manufacturers, and the service stations—also the old lady on the hill whose electric car has gotten too rusty to appear on the street. In any one of these places put someone under obligations to you by bailing 'em out when they are pinched for speeding, lending 'em a $10 and forgetting about it, or marrying the eldest daughter who is approaching the hopeless age. Any of these privations is worth while if you can get your hands on a couple of cells. When anyone makes you a suspiciously good price for an Edison look first at the bottom to see if acid has eaten any holes in it. When you have a battery that is apparently OK enquire as to the type number. If it is a B1, it has a single positive with 15 elements, and 2 negatives with 16 elements each. The positives are ¼" in diameter, 4½" long; the negatives 2¼" long, ⅛" thick, ½" wide. A B4 has 4 positive, 5 negative plates. An A-type cell has the same size positives, but twice as many in a plate as in the B; the negative plates have 24 elements each, ⅛" x ½" x 3". G-type Edisons have the same length positives, but they are ⅛" in diameter. The negatives are thinner than those in an A cell, and not corrugated. The G-type cells are adapted for higher discharge rates, hence are especially good for a transmitting battery. A G9 cell contains 360 positives and 240 negatives.

Everlasting "B" Batteries

Now that we have got all thru dissecting the Edison battery and telling you that it can't be hurt except with an axe you have naturally thought—"Wouldn't it be great if I could use a flock of little Edison Bats for my receiving battery and charge them about once in a flock of months—come to think of it, why can't I make a bunch of those things—another idea, why can't I make a still bigger bunch of them to supply plate power to my sending set and have a real C.W. set?"

Fine! That's just what we are going to tell you how to do.

For the detector battery a pair of B or G type elements will give as good service as any of the heavier elements. For the usual one or two-step amplifier, 2 B negatives, one on each side of a positive, or 2 G positives and a negative (Fig. 1), make a cell of ample capacity. The proper charging rate is around .2 amp. Equally good for the amplifier or 5 and 10-watt transmitting set is a pair of A type elements in ¾" x 6" test tube. 2 G positives with a negative on

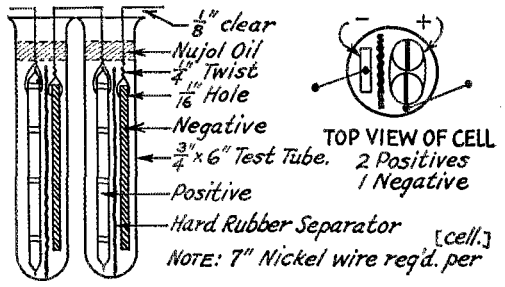


FIG. 1 A CELL MADE FROM G-TYPE PARTS

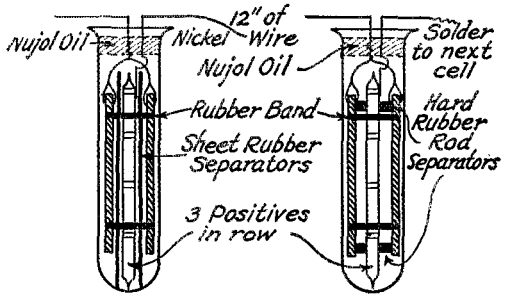


FIG. 2 A HEAVY CELL FOR SENDING SETS

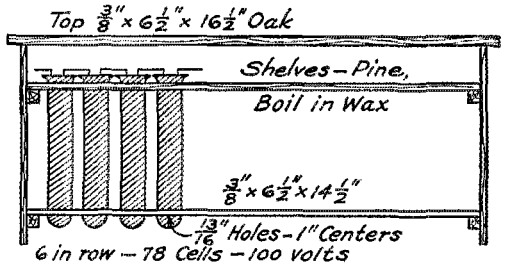


FIG. 3 100 VOLT BATTERY FRAME

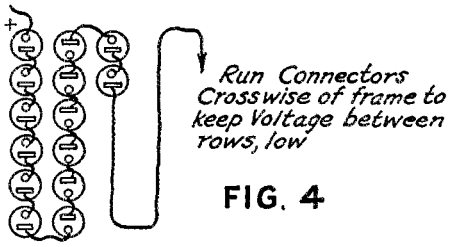


FIG. 4

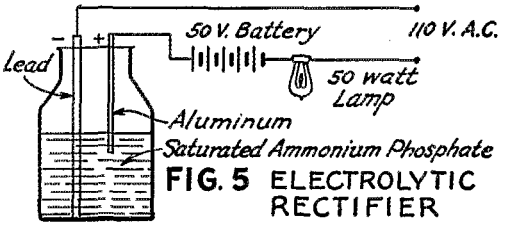


FIG. 5 ELECTROLYTIC RECTIFIER

each side of them can be crowded in the same size and make an even better combination. 3 G positives with a negative on each side of them in a 1" x 6" test tube (Fig. 2) beats 'em all, and has capacity enough to work two to four 50-watt sending tubes. If too many elements are crowded in a small test tube the solution will boil during the operation of the cell due to the restricted opening obstructing the escape of gas.

Battery Jars

Our battery jars are going to be ordinary glass chemist's test tubes—the little round-bottomed fellows—and the size will depend on your elements; do your own guessing after you are ready to assemble and get the local druggist to order them. Assemble the tubes in wooden rack—Fig. 3 tells the story.

Opening the Can

If the cells about to be dismantled contain solution, don't dump it until ready to proceed, then thoroughly discharge the cell as mentioned before, previous to opening up. A hack saw cut about ½" below the top is the easiest way to operate. Do not leave the plates in water too long while washing off the potash, or rusting will set in. Center punch where the holes are to be drilled, the elements being left in the grids for this operation, as it's a ticklish job drilling round positives singly. If they have been separated, hammer a piece of ¼" rod flat into a soft board as a sort of bed for holding the positives. If the elements have been pretty well dried out, soaking them in solution for a day or so will soften them up and facilitate the drilling. A long soak in water will rust them.

Connections

Connections to the little pockets and tubes (each of them is going to be a baby storage battery plate) is made by passing a piece of pure nickel wire thru the end of the element and crimping it in place.

Drilling the elements is about the worst part of the job of assembling an Edison B. The hole should be small, about ⅜" from the end. A ⅛" drill makes the best sized hole, but has more snap in it than 40 degrees below zero. A size or so larger drill will stand the gaff a lot better. Don't but new drills but run in and see Three-Ball Cohen; he has any number of stubs at a few cents each. And let just enough of the drill project from the chuck to penetrate the element. If using a hand drill arrange a rigid support for it along the lines of a drill press, and a mechanism to feed the work upward towards the drill.

Only painstaking care insures a quiet battery. After running through the hole, pull on the wire, give it three or four twists, squeeze against the sides of the element with a good *big* pair of pliers, pull again and add a few more twists. A ¼" to ⅜" twist is enough.

Single element cells can be connected by one piece of wire, while soldering is necessary in multiple element cells. Place a piece of paper under the joint while soldering to prevent anything dripping into the cells. Do not solder the wire to the elements; it introduces a couple which will eat away the joint.

Pure nickel wire makes the best connectors; size 20 B&S soft drawn, 99%-plus pure nickel. An alloy nickel will show black at the negative and shortly corrode and break off.

Separators

Stick to the materials in the original cell in selecting the separators. Celluloid will gum up the whole works and the atmosphere as well. Wood rots in potash. Perforated hard rubber sheet is the choice, cut in strips the length of the positives and a little narrower than the inside diameter of the tube. In the multiple-element cells the hard rubber rods used as separators in the large cells may be cut in pieces and placed crosswise of the elements, which are bound together with rubber bands. These different constructions are indicated in the sketches.

Before filling the cells test out each one with a ringer or a lamp to check insulation of separators.

Fill the cells with solution a good ¼" above the positives, keeping the rubber separators below the top of the solution. It may be necessary to bend the separators by immersing them in hot water and laying across a couple of sticks, and weight them in the middle, leaving in position till cold. Before charging add at least ¼" of white neutral mineral oil similar to Nujol, although a cheaper grade is equally satisfactory. Yellow paraffin oil becomes dirty in a short time. A friend tried castor oil on the advice of the drug clerk. After a few hours charging he dug out 78 cakes of soap from his 100-volt battery; probably castile soap.

For the solution, standard Edison electrolyte is undoubtedly the best. Pure caustic potash in distilled water, gravity 1215 to 1225, is in line, and lye is last and least. A battery with lye solution will often drop its charge in a moment's time. It's a surenuf prevaricator. Read the gravity after solution is cold or you will have creeping salts.

An "A4" Edison cell has 120 pairs of elements, and a charging rate of 30 amperes, which figures out .25 amps per pair of elements, the proper charging rate for your B. If you have no meter, a lively bubbling will indicate the proper rate, but boiling of the solution or overheating is to be avoided. Raise the charging rate where more than a pair of elements per cell is employed. Charging for a couple of hours will not put much energy in the battery. Give it a full meal. Seven hours is the

standard charging time. The charge-discharge curve will enable you to estimate the probable voltage of your battery, and the number of cells you can charge from the available charging equipment. A battery for a receiving set will give a higher voltage under load than will the same battery used on a transmitter, because of the lighter drain. 78 cells will give an average of 100 volts on a receiver, while on a transmitter it is better to provide 80 cells or more for each 100 volts desired. Elements which have been exposed to the air for some time will not reach their full capacity again until charged and discharged a number of times. The harder the battery is worked the greater its capacity.

The Rack

A receiving "B" Edison can be made up in a very compact frame, occupying but little more table space than the block dry battery. A 100-volt 78-cell frame is sketched (See Fig. 3 again). 1" spacing center to center is ample if the tube lips are not too broad, otherwise 1⅛" spacing is advisable.[1] The tube shelves may be of soft wood to reduce sweat radiation losses while boring. If an ordinary bit is used either grind the entering screw to a smooth point, or drill a ⅛" hole to start, if a one-piece shelf is desired. A Forstner bit will cut through without a split. The shelves should then be stained and immersed in hot paraffin, but not long enough to warp them.

For transmitting batteries using 1" tubes, 1⅜" spacing is ample. The upper shelf should be heavier, as well as the ends.

Charging

If you have got along this far without considering the charging problem, time's called. The simplest and worst way to make the bubbles rise is to hook her to an electrolytic wreck-ti-fier. The sketch, Fig. 5, tells the story. If the dishpan doesn't keep her cool, sink it in the bath tub, in which case you will be out of luck Saturday nights.

Vibrating rectifiers are now provided with B-battery charging attachments. A battery with too high a voltage to be charged all at one time may be charged in sections if you are not pressed for time, or a series-parallel switch connected to throw the divisions in parallel for charging, and in series for use on the set; that is, if the charger has ample capacity to deliver the current. Any rectifier deliver-

[1]Mr. Murphy suggests that in Fig. 3 the middle shelf should be dropped about 1½" from the top of the test tubes. This lengthens the leakage path between cells and causes them to hold a charge much longer. Since the tubes then cannot hang by their flanges it will be necessary to put another board, without holes, under the lower shelf shown in the figure, on which the bottoms of the tubes can rest.—Tech. Ed.

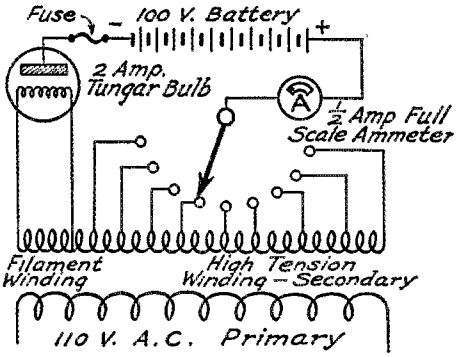


FIG. 6 A REAL RECTIFIER

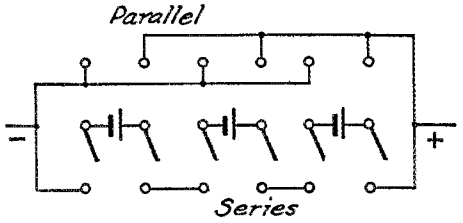


FIG. 7 SERIES-PARALLEL SWITCH

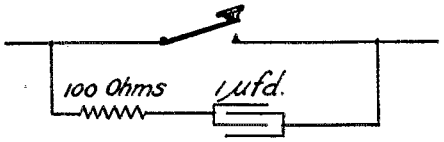
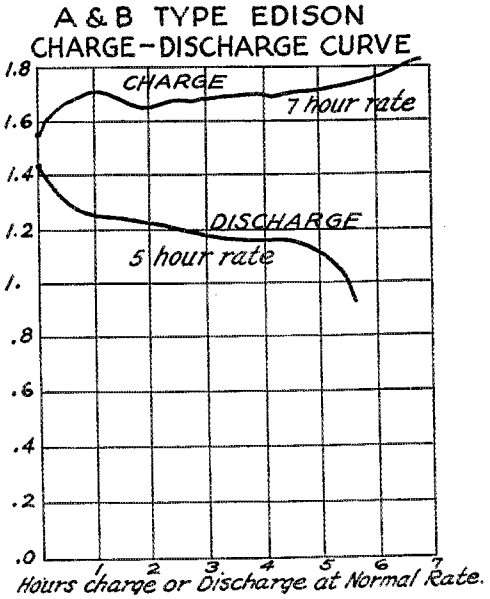
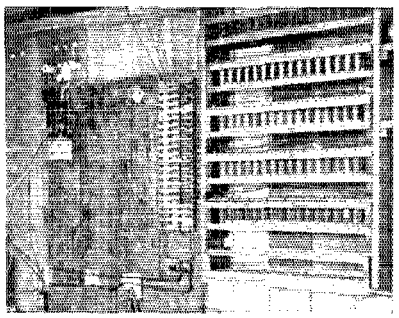


FIG. 8



ing but .1 amp. direct current takes too long to make any impression.

The real care-free rectifier is the Tungar —one with a high voltage transformer provided with a tap switch, Fig. 6, enabling the entire battery to be tackled in one bite, and the charging rate varied as desired. A 100-volt battery requires from 120 to 130 volts to soak up .2 to .3 amps. This is the limit for a single Tungar bulb; above 140 to 150 volts it Aetnaizes blue streaks, and if run awhile in that state of eruption becomes hard and it takes a kick of the last tap on the transformer to start it off, and will no longer function on small charging rates. For higher voltages than 125, additional tubes may be placed in series. It is better, however, to make use of a series parallel switch, Fig. 7, and work the tube to capacity at around 75 volts. The Tungar



A beautiful installation of storage B batteries at 6BIQ.

is very efficient when worked at high voltage, as the tube resistance then more nearly approaches the battery resistance.

A point to be remembered in charging a high-capacity high-voltage storage battery is that the charging voltage may go off. Place a small fuse of a capacity but slightly above the charging rate, and several inches long, in series with the battery. Because this was overlooked 8ACR regards with sorrow the blackened ruins of a transformer, two 6-amp. Tungars with huge dimples marring their rotundity, and a Weston Ammeter with a fused shunt and little else.[1] Such a battery is capable of an immense rush of power. An Edison battery *will not take a slow charge*, not even if you leave it on for months and months. Make the water bubble, but not boil.

[1]And that's a good place to say that the leads to the sending set had better be fused too: use the very smallest fuse that will do the work. A strip of tinfoil six inches long and very narrow will do. *Also, don't get careless about opening the plate switch before touching the set. A 1,000-volt storage battery may not hum as loudly as a 2-K.W. generator but it hits twenty times as hard!*—Tech. Ed.

End Cells

A rheostat is almost universally employed in series with the "A" battery to hold the current constant on the tube filament. The drop in voltage as the battery discharges is but a small amount per cell, and is readily taken care of. On a battery of 50 or more cells this voltage drop is much more noticeable, and frequent charging is necessary to keep it constant. The solution is to provide half as many cells again as needed to produce the desired voltage, and cut in additional cells as the voltage drops, in 5 or 10-volt steps, with a tap switch. Thus a battery to operate a Western Electric Loud Speaker at a constant 120 volts should have from 150 to 175 volts of "B" battery provided, and an additional separate detector battery, of about 20 cells, also equipped with a tap switch. The detector battery will hold up from six to eight months and the amplifier section from three weeks to a month if used nightly.

Transmitting "B" Batteries

The real solution of the amateur's transmitting problem is the high voltage transmitting battery. With the filter described on page 29 of *QST* for July, 1923,* there will be no keying clicks. The absence of blinking lights, buzzing, whining, vibrating generators, A.C. growls on the air, commutator ripples, filter troubles, borax puddles in the room below, poor power from low line voltage, and a whole raft of other pests, will follow the adoption of the storage "B". Absence makes the heart grow fonder; you'll like the "B" the better the longer you use it.

Where the drain is heavy, the send-receive switch may be coupled mechanically to the series-parallel charging switch, so that in the receiving position the transmitting battery is on charge. This calls for a shielding of the rectifier and wiring. For straight C.W., the keying relay is placed in the battery lead, shunted with a 1-mf. condenser which has a 100-ohm resistance in series with it, Fig. 8, to cut the rush of charging current to the condenser and consequent burning of the contacts. Consider the economy of this; no current flows from the battery except when the key is depressed, while with a M.G. the motor buzzes the meter whether you are collecting your wits or pounding the brass.

The Edison battery offers us a helping hand in attaining station perfection, reduces interference with the pleasurable operation of our sets, and, not less praiseworthy, cuts the interference which the operation of our transmitters often causes.

*Can be obtained from the *QST* Circulation Dept. at the regular price.

"What Power Have You?

— Unscrambling The Power Rating of Your Set —

By S. Kruse, Technical Editor

WE are constantly receiving letters that say "I am using 5 watts and putting 1.5 amperes into the antenna." Buncome — the thing can't be done; that amount of current represents abount 30 watts in the average antenna.

"But I'm only using one 5-watt tube!!"

Of course, you are using the thing that the manufacturer calls a "5-watt tube" but you do not understand his method of rating it. You see, the manufacturer once upon a time put a tube on test and discovered that if it was run with low plate voltage and with everything out of adjustment it was still possible to get 5 watts output, so he said to himself, "Let's call this thing a 5-watt tube; then no one can possibly kick on the rating." That was an unlucky day for the radio fraternity, for it started an endless series of misunderstandings.

The Power You Are Really Using

The average amateur tube station is using from 5 to 12 times the power that one would think, if one judged by the tube ratings. This may sound like a tall statement —possibly you will not want to believe it— but it is not hard to prove and I shall give examples a bit later. They are genuine examples too, and every one of these stations is operating today with very little change in adjustments.

How Not to Rate a C.W. Station

At station A there are two "quarter-kilowatt" tubes. The owner of the station is more or less of a dumb-bell and has his set so badly out of adjustment that only about a quarter of the power-input ever gets to the antenna. He knows that this set ought to put 500 watts into the antenna —doesn't the label pasted on the crate say that they are each "quarter-kilowatt output?" So he runs the plate voltage up until he *does* get 500 watts out of the tubes. As we said a moment before, the efficiency of his set is only 25 per cent; to get 500 watts out he must put 2000 watts in. As a result the plates are white hot and about ready to collapse—yet he is operating to the best of his understanding of the tube rating.

At station B there is a quartet of "50-watt" tubes. This chap at B is quite a keen radio man and knows how to adjust a tube set—in fact this one is so well adjusted that only 1/5 of the plate power is wasted in the tubes and 4/5 goes to the antenna. He isn't forcing the tubes; they are running at 1000 volts with a plate current of 150 mils each—600 watts total input. Of this 600 watts he is putting 4/5 or 480 watts into the antenna and leaving 120 watts on the plates of the 4 tubes, 30 watts on each plate.

A Crazy Combination

Now look at the two. Station A is burning up a pair of "quarter-kilowatt" tubes in a wild effort to put the rated power into the antenna. Station B is putting a half kilowatt into the antenna with four "50-watt" tubes without even making the plates glow. Something is dead wrong with a method of tube rating that will call one set a "500-watt set" when its utmost efforts barely equal the rating while at the same time a "200-watt set" is able to turn out 480 watts easily and 600 watts by hurrying up a little.

This same inconsistency runs all the way thru tube operation—we have seen alleged "10-watt" sets that were putting 80 watts into the antenna with the plates of the tubes perfectly cool; and we remember with especial glee a set that used six "5-watt" tubes and put exactly 390 watts into the antenna. The owner of this layout had been telling us what wonderful work he was doing with "a dinky little 30 watts." Wonder how he accounted for the wild dive all the lights in the place took every time the "dinky 30-watt" load came on? As a matter of fact the set drew 480 watts in the plate circuit and the primary of the plate transformer took 580 watts off the 110-volt line. But the tube plates were just a dull red.

Evidently our method of tube rating means exactly nothing—we had better forget all about what the labels on the boxes or crates say and measure what is actually going into the set.

How to Rate a Tube Station

We just spoke of station B at which 4 tubes were operating nicely. Let's see if we can figure out how to rate it. It takes 600 watts to feed the plates, the plates use up 120 watts, the antenna gets 480 watts, and the tubes are rated at 200 watts. Now which of these figures is the right rating for the station? Is it a 600-watt station because it burns 600 watts—is it a 480-watt station because it puts that into the antenna—or is it a 200-watt station because the red labels on the boxes say it is?

Anyone can see that the tube labels do not decide how good the station is—look at

station A that we talked of before. Very well then, is it a 600-watt station or a 480-watt station? In other words, shall we talk about the input to the set or the input to the antenna? In America we have always rated spark sets by the input to the step-up transformer and we do not see why it isn't a perfectly good idea to use that scheme here; if the plate voltmeter reading times the plate milliameter reading is 600 then it's a 600-watt set. There are other reasons for this—it is too hard to measure the output of a set—you have to know the antenna resistance.

How to Rate the Tubes Themselves

Now are these tubes 50-watt tubes or are they 120-watt tubes? The labels on the boxes say they are 50-watters but we find we can run them according to directions and get 120 watts out of them.

What's the matter with the method of rating? What shall we do about it?

Well, let's see. Is there any sense in rating a tube according to output? There is not, and we'll prove it. Suppose we take a Western Electric "VT-2" and put on it the normal voltage of 350 and allow the normal plate current of 40 mils to flow. Now we will adjust the thing very badly and light the filament. When we start reading the meters we find that we have 14 watts going in (40 mils at 350 volts) and 3.5 watts coming out while 10.5 stay in the tube and make the plate dull red. Now we will adjust the circuit a little more carefully and get out 5 watts, while the input rises a little, to perhaps 15 watts. The efficiency is now 33% instead of 25%. Then we will readjust again and finally manage to get the tube to operating at 75% efficiency and by raising the plate voltage a little we get 40 watts into the tube and 30 out of it. Now what is the tube rating—3.5 watts, 5 watts, or 30 watts? Everything seems to have shifted around *except one thing*—did you notice that on each of these adjustments the plate was dull red and that we left 10 watts in it to make it have that dull red color?

A Correct Tube Rating at Last

Long ago makers of tubes discovered that the real way to rate tubes was *to state how much power may be wasted in the plate without burning it up.* According to this method our VT-2 would be a tube with a "safe plate dissipation of 10 watts." It would not matter what voltage you used—that rule would still hold. The only other thing the maker of the tube would have to tell us would be the highest safe plate voltage—the highest voltage that could be used without breaking down the tube seal or the vacuum. With that information our label would read—

Vacuum Tube—Mfd. by the Oscillator Co.
Type XXX
Inspected October 1, 1923
Filament volts—6
Filament amperes—2
Safe plate dissipation—15 watts
Maximum safe plate voltage—500
Do not exceed safe plate voltage as tube seal will be damaged and life of tube shortened.

Why Ratings Have Not Been Changed

Winsor McCay used to say that the biggest power on earth was habit—it is easier to get a nation to go to war than to persuade it to change a yardstick or a pound into something sensible like a meter or a kilogram. And that's why we stick to the American method of tube ratings—we know they don't mean anything, that they are misleading, but we are used to them.

Summary

The way to rate a *tube station* is NOT by what the labels on the tube boxes say but by the actual input to the plates of the tubes—almost all tube stations use 10 or 12 times the power that is stated by the tube ratings. The way to rate *tubes* is not by the power put into them, nor by the power they happen to give out on a particular adjustment, but by the power that it is safe to waste in them—the so-called "maximum safe plate dissipation."

Short Wave Tuner Design

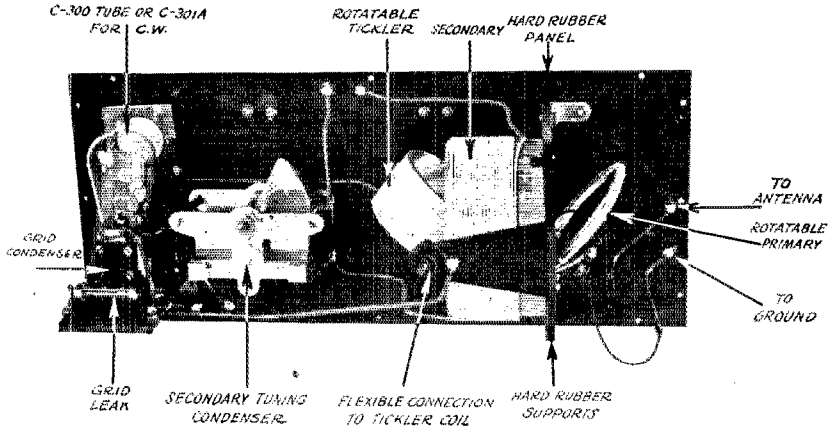
*By K. E. Hassel, 9ZN**

Common sense and tuner design seem to be strangers these days, so there's need for a sermon like this one, with the text, "Put not your faith in new and peculiar circuits but use all your ability to make a fine job of some standard circuit, for in that way real results are obtained."—Tech. Editor.

HOW many times have you visited a radio amateur whose set consisted of bell wire wound on Quaker Oats boxes scattered over the table and wondered why he was getting better results than other fellows using expensive sets in fancy cabinets? There is a reason for such things; the builder of the "haywire" set had unconsciously eliminated a good many losses. It is not the purpose of this article to give instructions for building a definite receiver but to point out some of the things which must not be done.

The present-day tendency in receiver design seems to be toward many stages of amplification rather than tuner efficiency. "If you don't hear the distant stations, use another step of amplification," seems to be the motto. Much amplification is necessary for broadcast reception when it is desired to work a loud speaker but even here the signals will be louder and more stations will be heard if the tuner is good. For amateur code reception with the headphones, one step of the right sort of audio amplification is sufficient and more is of no value —of less than no value, for loud signals deafen the ears to weaker signals.

Many amateurs when conducting experiments toward building a better tuner make this mistake: a certain feature is theoretically better one of two ways but on trying it both ways the experimenter does not *hear* any difference, so he builds it in the conventional way—which is probably the easiest way.



A SIMPLE TUNER POSSESSING GREAT SELECTIVITY

Built in accordance with the principle of this article by our Department Editor, this tuner has held its own against the competition of the best in present-day short-wave tuners.

For tuning range from 95 to 250 meters: Primary coil—5 turns of No. 16 D.C.C. wire wound to diameter of 3 inches and made self supporting by binding with thread. No tuning in this circuit.

Sesondary coil—23 turns of No. 16 D.C.C. wire wound on UNTREATED PAPER tube 4¼ inches in diameter.

Tickler coil—11½ turns of No. 28 D.C.C. wire wound on paper tube 3 inches in diameter.

Variable condenser—All extra plates removed from rotor so that tuner just reaches wave wanted when the condenser is turned to 180 degrees. Note how remaining 5 plates are cut.

Starting Right

The ear is a very poor instrument for comparing two sounds; it will not notice small differences, yet small differences are important. Suppose we make a change that eliminates 3% of the losses; it is impossible to notice the change by listening with the headset, but if we make ten such changes we will have eliminated nearly 30% of the losses and the difference can be very easily heard. But we must depend on the laboratory and not the ear when doing development work.

*Chicago Radio Laboratory.

The "Best Circuit"

Much has been said and written about the super-regenerative, super-heterodyne, the "straight" radio frequency amplifier and the modifications of the latter, but I believe you will find that the amateurs who are doing the real consistent long-distance reception and traffic handling are those using *a good regenerative receiver with not more than one stage of audio amplification.*

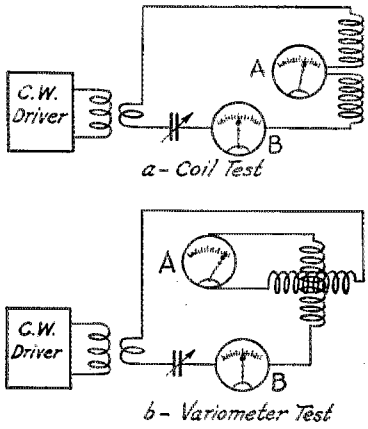


FIG. 1

If selectivity is required, as is the case in most localities, it is advisable to use a coupled circuit rather than a single circuit. While the single circuit is sufficiently selective for C.W. reception it will *not* tune out interference from sparks, nearby broadcasting stations, induction, and the like.

Variometer or Variable Condenser?

We have two methods of tuning the secondary circuit, one using inductance only (variometer) and the other using both inductance and capacity (coil and variable condenser). It will be necessary to choose between these two when starting out to build our receiver. The decision is to a great extent made for us when we know the wave-length range that the tuner is to cover. If it is only desired to cover the range from 175 to 225 meters there is much in favor of the inductance-tuned secondary. On the other hand, if we desire to build a receiver that will cover all wave lengths between 75 and 275 meters, the capacity-tuned secondary is preferable.

We all know that the audion is a voltage-operated device and the higher the voltage we impress on the grid, the louder the signal. When we connect a condenser across the secondary coil (even if it is a perfect condenser with no losses) the voltage across the coil will be lowered; therefore it would seem that an inductance-tuned secondary should give the best results. But this is not true in the ordinary variometer-tuned receiver, which is inferior to a good capacity-tuned set. The losses due to the distributed capacity of the variometer are greater than the losses in a good variable condenser and more than make up for the decrease of voltage caused by the condenser.

It is easy to show that the ordinary variometer has fairly high distributed capacity. If we arrange a circuit as shown in Fig. 1a, meter A will read a *trifle* higher than meter B. Now if we do the same thing with a variometer as at Fig. 1b there will be a *large* difference between the meter readings, A being much higher. This can be explained as follows: the high distributed capacity of the variometer acts like a condenser across the variometer and there is a local current flowing around in this circuit in adition to the current flowing in the main circuit. This additional current does nothing useful but represents a loss of energy.

How to Use the Variometer

If we make the variometer small the losses in it will also be small and our overall efficiency will be high. However, this

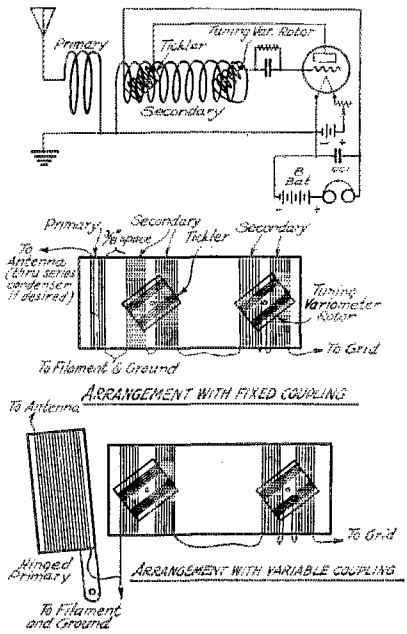


FIG. 2 VARIOMETER-TUNED SECONDARY

limits our wave-length range unless we add a tapped secondary, which again introduces needless losses.

We should make our secondary tuning inductance a straight coil with a tuning variometer in one end (Fig. 2). This vario-

meter should be *just large enough to cover the waves desired.* (Why do most amateurs insist on variometers that go up to 600 meters?—Tech. Ed.) This variometer is made by winding a few turns of wire on a tube smaller than the inside of the secondary coil. This variometer coil should be placed in the grid end of the secondary and a non-metallic shaft used. A fairly hard wood boiled in beeswax is excellent for the purpose. The exact number of turns of wire to be used can easily be determined by experiment. It is *not* advisable to use a ball-shaped tickler to secure closer coupling as this has a tendency to increase the capacity.

How to Make Good Coils

Careful laboratory measurements show that ordinary paper or cardboard tube, (providing it is dry) is far superior to the more expensive materials found in commercial receivers. The paper tube can easily be dried in the oven and then made permanently waterproof by dipping in some lacquer which is suited to radio coils. Such lacquer, on the market under various trade names, is very little different from what is commonly known as "aeroplane dope." (Celluloid dissolved in acetone is good.—Tech. Ed.) When this lacquer dries a very thin layer of the material (similar to celluloid) is left on the surface and this renders the tube waterproof. It is advisable to use about No. 14 wire and this wire should be wound with a slightly greater spacing than the insulation ordinarily gives. The high-frequency resistance of the coil goes down as the spacing of the turns increases but little advantage is gained by spacing the turns more than one half the diameter of the wire. *Solid wire should be used in preference to stranded wire.*

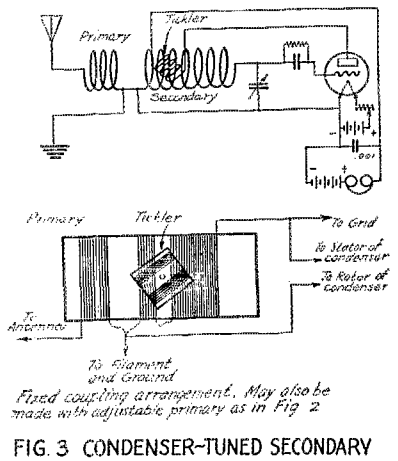


FIG. 3 CONDENSER-TUNED SECONDARY

What Makes a Variable Condenser Good

If our range of wave lengths to be covered is more than 50 meters it is better to make a capacity-tuned receiver (Fig. 3). *It is extremely important that we use a condenser with very low losses* and with a low zero capacity. There are some condensers on the market that fulfill these requirements, but the average condenser employs insulating materials which are very good from a pure insulating standpoint but very poor from the standpoint of dielectric losses. The fact that a condenser (either variable or fixed) will stand 1,000 volts without a breakdown or apparent leakage has no bearing upon the dielectric losses in this condenser at radio frequencies. Very often one of these condensers, when used in a sending circuit, will develop so much heat as to melt or char the insulating material.

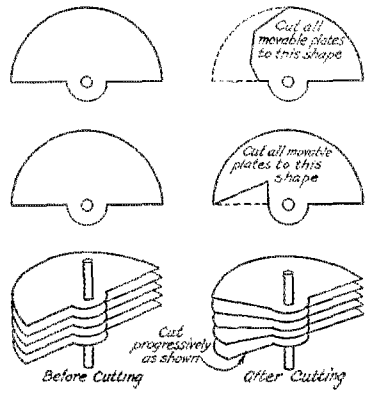


FIG. 4 HOW TO ADAPT AN ORDINARY CONDENSER

It is very desirable to have the movable plates of the condenser cut in such shape that the capacity change at the lower end of the scale is very gradual. If the condenser is not so built it will be necessary to remove the movable plates and cut them in one of the ways shown in Fig. 4.

The capacity of the condenser depends on the wave length range to be covered. (About .00025 for amateur waves, .0005 for broadcasts, is enough.—Tech. Ed.)

By all means put a geared or friction vernier attachment on the condenser instead of using an additional vernier condenser in which the losses will be almost as high as in the main condenser. There are a number of vernier attachments; chose one that gives very fine adjustment.

Capacity Effects

It will be a great aid in eliminating body-capacity effects if we use a condenser that has metal end plates which are connected to the *rotor*, which is grounded by connecting to the filament side of the secondary

circuit. The shaft and mounting screws will now be on the grounded side of the circuit and the high-voltage (grid) side of the condenser shielded completely from the hand. (In one of the author's tuners it is possible to tune in the oscillating beat note of a radiophone station and then to put the hands anywhere on the panel without the slightest effect. This tuner is entirely without shielding of the ordinary sort.—Tech. Ed.)

The Neglected Grid

The grid condenser deserves more consideration than is usually given it; it is very easy to construct a condenser that is more efficient than the average purchased condenser. If you are fortunate enough to have a "blown" Dubilier transmitting condenser you have excellent mica with which to make a good grid condenser. Ordinary mica, such as used in stoves, is *absolutely useless*. The grid condenser should be made by pasting tin foil on a very good piece of India mica, using beeswax to fasten the foil. The exact capacity of the grid condenser will vary somewhat but about .00025 microfarad will suit most tubes. (Try two pieces of foil the size of a 2¢ stamp on mica .001 inch thick.—Tech. Ed.)

The Antenna Circuit

It is advisable to couple the antenna to the low voltage (filament) end of the secondary coil. The exact number of turns will vary somewhat with the antenna and this can best be determined by a little experimenting. For broadcast reception, where there is plenty of time to tune, maximum signal strength will be obtained by using fairly loose coupling and tuning the antenna to resonance; for amateur work, where the wave length is being changed constantly, it is almost necessary to use closer coupling and to leave the antenna untuned.

Ticklers

The tickler coil method of regeneration seems to be preferable, especially for C.W. reception. The tickler usually consists of a small ball or short tube rotating inside one end of the secondary coil, preferably the low-voltage (filament) end, so as to have little tuning effect. For the same reason the tickler should be rather small in diameter. The size of the tube and the coil and the number of turns can be determined very easily by experiment—the better the secondary circuit the less tickler will be needed. No. 22 D.C.C. wire will be satisfactory as the resistance and distributed capacity are not of vital importance here.

The Audio Amplifier

For broadcast reception all the usual precautions must be taken and a multi-stage amplifier built with an eye to freedom from

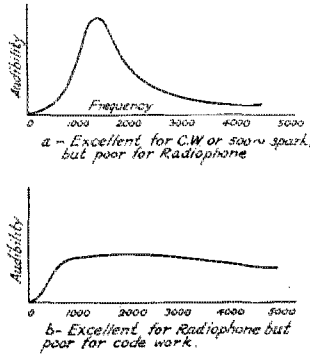


FIG. 5 TYPE OF CURVES GIVEN BY HIGH-GRADE AUDIO AMPLIFYING TRANSFORMERS

distortion. However, in building an amplifier for code work a *high-ratio* amplifying transformer should be used as this will give greater amplification and distortion is more beneficial than detrimental. A transformer with a very decided amplification peak near 1000 cycles (see Fig. 5) will amplify our signals to a much greater extent than it will low-pitched interfering static, strays, and the very undesirable 60-cycle hum caused by the use of A.C. on the plates of tube transmitters. Thus the interference usually will not be amplified very strongly but the note of the received signal can be adjusted to come right on the peak of the amplification curve at 1000 cycles.

The Tantalum High-Voltage Rectifier

A New Chemical Rectifier

By Harold L. Olesen, 9CSR

PROBABLY the most difficult unit for the transmitting amateur to obtain is a good source of high voltage direct current.

The available sources may be divided into three classes:

1. Battery
2. Motor-generator sets
3. A.C. rectifiers.

The first class is the best but obviously out of consideration due to high cost.

The second class is expensive, requires a filter to give pure D.C., and does not yield to expansion. That is, if the amateur starts with five-watt tubes and purchases a motor generator set to meet the requirements of voltage and current for the five-watt tube, the motor generator set will be too small

for the fifty-watt tube that may come later. Conversely the motor generator set for the fifty is too large for the five.

The third class, which is the most common, can be divided into three types:—

(a) Vacuum tubes (Kenotrons, "S" Tubes, mercury arc, etc.)
(b) Synchronous
(c) Chemical

The first type requires a filter to give pure direct current; there is a drop of from forty to several hundred volts through the device; the tubes have some definite useful life; and they are subject to breakage. For small loads at low voltages (less than 200 M.A. at 700 V.) this is a very satisfactory source of direct current, since the pulsating current delivered by the tubes is easily filtered. However, when higher voltages and heavier currents are desired, this source becomes very expensive.

The Synchronous rectifier requires a synchronous motor that stays synchronized. The commutator must be protected from arcs—especially when high voltages are used. This makes filtering impossible[1] except when the circuit of 6ZB (*QST*, Aug. 1923, p. 25) is used, when the efficiency becomes extremely low.

Type (c) can now be divided into two parts:—

1. The aluminum rectifier
2. The tantalum rectifier.

The aluminum rectifier with its arcing and creeping solution is familiar to most amateurs. With great care and much patience this rectifier can be made to operate satisfactorily for a short time at a reasonable cost. It requires almost constant attention, however, and deteriorates rapidly whether used or not, so that, from the standpoint of upkeep, it is an undesirable unit.

[1]—Mr. Olesen means real filters—the sort that deliver continuous current. Personally we have never heard a "sink" that was within a thousand miles of being well filtered—some effort ought to be put on this.—Tech. Ed.

The tantalum rectifier is a new device that is now available for amateur and experimental use. It is a chemical rectifier, similar in action to the aluminum, of long life at a low initial cost, with extremely low upkeep, and requiring no attention, that produces an easily filterable pulsating current. It is a rectifier that is foolproof, that can be used continuously or intermittantly for long periods of time without attention. The cost of upkeep is negligible and far less than the upkeep for any other source of high voltage.

The Cells

The tantalum rectifier for high voltage rectification, like the aluminum, is made up of a number of cells. Each cell consists of a container, an electrolyte, an oil film, a lead electrode, and a tantalum electrode.

The container may be a glass jar approximately two-and-one-half inches in diameter and five inches high. Figure 1 shows a convenient assembly.

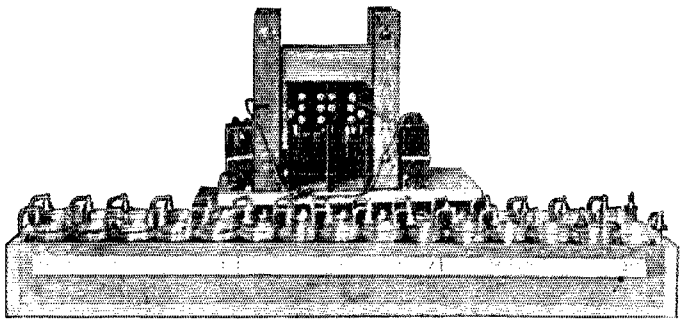


Fig. 1—The Tantalum Rectifier
30 cells assembled in a tray. Filter choke and condensers in the rear.

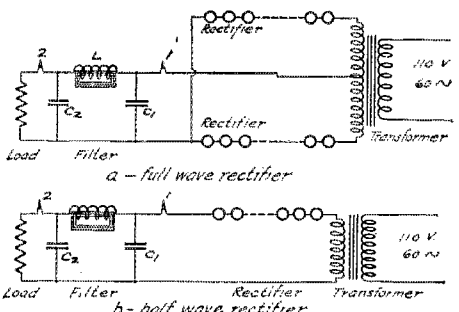


FIG. 2 – RECTIFIER AND FILTER CIRCUITS
OSCILLOGRAPH ELEMENTS SHOWN AT 1 & 2

The electrolyte is a solution of pure sulphuric acid, gravity 1260. This gravity is taken since it is a standard commercial gravity at storage battery stations and because it will not freeze readily. Incidentally the resistance of sulphuric acid is lowest

at this gravity. The container should be filled two-thirds full of acid. To this add from five to ten cubic centimeters of a solution made by dissolving forty grams of ferrous sulphate in two hundred cubic centimeters of distilled water.

Best results will be obtained with the iron by first building the rectifier and connecting it up as in Figure 2a or 2b with no iron in the cells. Use a resistance load made up of lamps connected in series. Increase the transformer voltage until light sparking appears in the cells. Read current and voltage delivered by the rectifier. Shut off and add a small amount of the ferrous sulphate solution to each cell (under the oil). Turn on the transformer and allow it to run for a short time before again reading current and voltage. As the iron is added the current and voltage of the load will increase to a maximum beyond which no further effect will be caused by the iron. The allowable impressed voltage per cell will decrease from some value around seventy-five volts per cell to about forty volts as the iron is increased. Continue adding iron until the best results are obtained; that is, highest D.C. volts for the desired direct current with the lowest impressed A.C.[2]

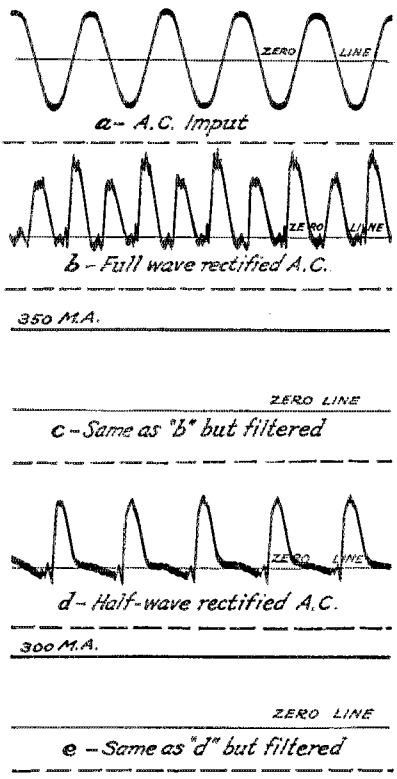


FIG. 3 RECTIFIER OPERATION

Pour over the electrolyte a quarter inch film of some such oil as Sinclair Medium automobile oil. The function of the oil is threefold; first, to prevent evaporation when not in use; second, to prevent a spark at the surface of the electrolyte from igniting the gases given off; and third, to prevent the escape of sulphuric acid gas when the cell is overloaded. The oil does not enter into the chemical action of the cell.

The lead electrode it made of pure lead stock and the tantalum electrode is pure metallic tantalum rolled as thin as possible to reduce cost. The elements available (see Figure 5) are so constructed that the lead rod may be placed in one jar and the tantalum plate in the next. The element then becomes self supporting and the construction of the rectifier is simplified. Rectification takes place on the surface of the tantalum plate, and this electrode is the positive pole of the cell. The odd electrodes for the end cells may be made by cutting one element in two.

Each cell will stand an impressed A.C. of 40 to 75 volts, depending on the amount of iron used, and will deliver as high as two amperes for short periods without overheating. These cells should not warm up appreciably when delivering two hundred and fifty milliamperes continuously.

The life of the cells is unlimited since the electrolyte does not attack either electrode and the solution does not deteriorate whether in use or idle. Tantalum is one of the most chemically-resistant metals known. When in use the chemical action of the cell is such that water is decomposed. Hence after some period, such as a thousand hours, more distilled water should be added to each cell to maintain the level of the solution. It is unnecessary to add more acid or more iron. The gases are given off at the electrodes and escape at the surface of the electrolyte causing the oil to foam. To allow space enough for the oil to foam, the jars are filled only two thirds full.

These cells require no forming. The initial experimental work done while experimenting with the iron forms the cells for all time.

Unlike the aluminum cells these cells

[2]—This seems to explain how the rectifier works and also suggests that the tantalum could be replaced by gold or platinum. A ferrous salt in an acid solution would tend to form a semi-permeable membrane on the surface of the tantalum. This blocks current in one direction but reverse current breaks thru, causing small sparks. This membrane is formed from the solution and does not take material from the electrodes as does the aluminum oxide and hydroxide film when aluminum electrodes are used.

The ferrous solution can be placed below the surface of the solution with a medicine dropper or a fountain pen filler.—Tech. Ed.

should spark when in use, and the impressed voltage per cell should be increased until a medium degree of sparking occurs. Arcing between the tantalum plate and the solution should be avoided as the arc eats into the plate and prevents rectification. Sparking does not injure the plate.

The Filter

By the use of a filter, pure direct current can be obtained readily from the pulsating current delivered from this rectifier when half[4] or whole wave rectification is used. The Brute Force Filter as described in *QST* (Aug., 1923)! is simple and satisfactory.

THE OSCILLOGRAMS

To show the electrical action taking place photographs were taken on an oscillograph of the currents passing in various parts of the circuits.

Full-Wave Rectifier

Curves were first taken with the circuit shown in Figure 2a but with the filter completely removed. The curve at the top, Fig. 3a, shows the voltage impressed, while the curve of Fig. 3b shows the current thru the load (oscillagraph element No. 2). When this load consists of resistance only, the rectified current does not cross the zero axis, which indicates that rectification is perfect. (Take special note that "perfect rectification" is by no means the same thing as D.C. output. It is perfectly possible to

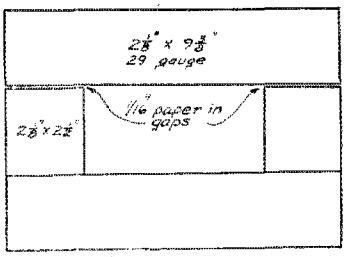


FIG. 4

have perfect rectification and yet have on the station's wave a savage 120-cycle growl. That's what most of us have too.—Tech. Ed.) When an inductance or a capacity is added to the circuit the current line crosses the zero line on the downward swings as shown in Fig. 3b. Note, however, the extremely small amount of leakage. (We doubt if there is any leakage at all. Perhaps this reverse current is simply a discharge from the filter into the capacity of the rectifier. That would not be lost but would be returned on the next quarter cycle.—Tech. Ed.) The varying height of the two pulses delivered by the rectifier is due to a see-saw action between the two sets of cells. For one period the one set would carry the heavier load and then the reverse would take place. The total current delivered remained the same, however. Replacing the filter in Figure 2a caused the delivered pulses to be so smoothed out that

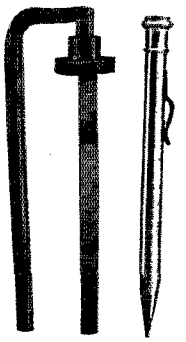


Fig. 5—The electrodes now available for experimental use.

they took the form shown in Fig. 3c. This curve was taken by oscillograph element No. 2. The purity of the D.C. is indicated by the smooth curve.

Half-Wave Rectifier

Figure 3d shows what takes place when one string of rectifier jars is disconnected, making Fig. 2a become Fig. 2b, but without any change in the filter. The D.C. obtained, Fig. 3e, is better than that used by 99% of the amateurs. (Amen!!!—Tech. Ed.) It can be made as perfect as Fig. 3c by readjusting the value of the condenser C_1 in the filter.[5]

Summary of Data

Two rectifiers were made up utilizing double and single wave rectification. These rectifiers were designed to give 250 M.A. at approximately 700 V., D.C. The following data are given:

Half Wave.

Cells—made up as described—30 used.
Circuit—Figure 2b
C_1—8 microfarads
C_2—4 microfarads
L—9000 turns No. 22 enamel-covered wire on core, Figure 4.
Transformer primary, 110 V., 60 cycles
Transformer secondary, 1400 V.
DC—250 M.A. at 700 V.

Figure 3e shows the quality of the direct current obtained.

Whole Wave.

Cells—made up as described—60 used.
Circuit—Figure 2a

[4]—Read that again—no one appears to be making the least effort to filter the ordinary full-wave rectifier properly, yet Mr. Olesen shows that it is perfectly possible to obtain beautiful D.C. from a half-wave rectifier, a much more difficult thing. Isn't it about time for us to stop dodging the filter problem?—Tech. Ed.

C_1—7 microfarads
C_2—2 microfarads
L—550 turns No. 22 on core, Figure 4.
Transformer primary, 110 V., 60 cycles.
Transformer secondary, 1000 V. (each side of wave).
DC—250 M.A. at 700 V.

Figure 3c shows the quality of the direct current obtained.

Other filter combinations that will give the same results are:

2. C_1—7 μf.
   C_2—4 μf.
   L—4500 turns No. 22 on core, Figure 4.
   DC—250 M.A. at 735 V.

3. C_1—4 μf
   C_2—2 μf
   L—9000 turns No. 22 on core, Figure 4.

All other items being the same for the three cases.

Notice that the filter is smaller for the full-wave rectifier than it is for the half-wave.

The purity of the direct current obtainable depends on the filter. It can be made pure by proper construction and adjustment. The Brute Force Filter is the simplest to build and is the easiest to adjust. The telephone method of adjustment as described in *QST* gives only an approximation because the phones cannot be placed on the head, but it is a very close approximation and should be used where more accurate methods are unobtainable.

9CSR

The above rectifiers and filters are in use at 9CSR to supply plate current to four five-watt tubes. This station is maintained chiefly for experimental purposes and information regarding its signals will be appreciated.

The Manufacturer

The tantalum rectifier is covered by patents held by the Fansteel Products Company, Inc., of North Chicago, Illinois. This company manufactures the "Balkite" "A"-battery charger using one tantalum cell. They manufacture and have for sale, at $1.00 each, elements as shown in Figure 5. It is probable that if there is a demand for elements for high voltage rectifiers, the Fansteel Products Company will place on the market a smaller unit especially designed for amateur work and at a lower price. At present these elements can be obtained only from the manufacturer direct.

Acknowledgment

The author wishes to acknowledge the help and suggestions of Dr. E. W. Engle of the Fansteel Products Company and to thank the Fansteel Products Company for the use of their laboratory, equipment, and materials.

Some British Amateur Receiving Apparatus

By H. Chadwick, British 2WT

SINCE the first Transatlantic Tests British amateurs have paid a great deal of attention to short-wave reception, and later, have utilized the 200-meter wave a good deal for transmission. The remarkable success achieved last winter in reception of American amateurs in Europe, which by the way speaks wonders for the great efficiency of American transmitters, will probably have aroused interest in the methods adopted for short-wave reception on this side.

The super-regenerator, dual amplification, double reaction, and similar circuits, freak and otherwise, have been very little used for U.S. reception. All the groundwork has been accomplished on standard gear. The sole purpose of the aforementioned novelties seems to be to reduce the number of valves required to produce a given row under specified conditions. In England it is quite common to find as many as six valves operating in cascade, and this at first was deemed necessary to receive U.S. stations. Possibly overcomplication resulting from unmanageable radio-frequency amplification was responsible for our failure in first attempts. Gradually, however, the gear was simplified, until rock-bottom simplicity was attained and used with wonderful success. This is the single-valve set, and without regeneration of any kind, using an oscillator for C.W., the Atlantic has been spanned in the early hours

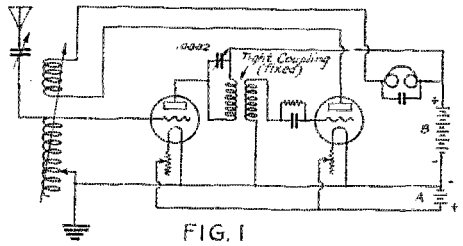


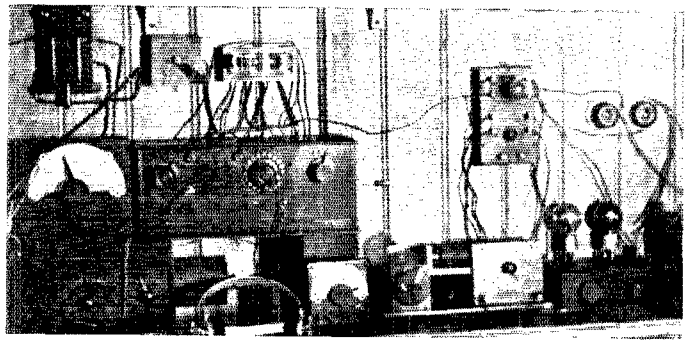
FIG. 1

last winter. Regeneration of course is preferable, but its use is barred on English soil, for, tho popular with the user, the said user becomes very unpopular with his radio neighbors. Nearly every little back street can boast an aerial of sorts, and the autodyne set is efficiently capable of reproducing

a fine imitation of warbling canaries on all outfits within half a mile or so. If selectivity is also required, the usual loose-coupled circuit is used. I may here mention that in most cases experimental work has been carried out with the apparatus in small separate components spread over a table top with all wiring visible.

Now to build up the set into a real sound proposition capable of intercepting U.S. stuff on reasonable occasions with a moderate degree of certainty, radio-frequency amplification must be employed. The original R.F. amplifier used here for short waves employed tuned transformers. The diagram of Fig. 1 indicates the method of wiring up. The only items of note are the transformer windings, which are wound in a narrow slot about ¼" wide and ¼" deep in an ebonite former about 2½" diameter. About 30 or 40 turns of No. 40 S.W.G. insulated wire are put on for the primary, a layer of paper for protection, and then the same number of turns on top for the secondary; the exact number of turns is found by experiment. The primary is tuned by a shunt condenser and the secondary is tuned automatically with the primary owing to tight coupling. Some experimenters have used as many as six stages of R.F. amplification of this type but great difficulty is experienced in accurately tuning more than two stages. For ordinary work I do not advise the use of too much R.F. and one stage is certainly enough to bring in average DX stations and is quite enough to look after when searching for calls. This type of amplification is not now popular except on the longer waves.

Probably the most popular type R.F. coupling now in use is a modification generally known as "tuned anode," as shown in Fig. 2. The coil L_1 is connected between the anode of the first tube and the positive of the B battery, and is tuned to the received frequency by the condenser C_1. This coil may be a honeycomb but for the short waves a single-layer or variometer is preferable. If a single-layer coil is used it should be tapped out to a stud switch. A convenient size is 4" long by 2" diam., wound with No. 24 S.W.G. insulated wire, tapped to a 6-stud switch. With C_1 .00025 mfds., this should tune from about 100 to 450 meters. C_2 is an ordinary grid conden-



The station of the author, British 2WT. This station has copied 1ASF, 1AJP, 2XM, 1AWP, 1CNF, 1AZW, 1XZ, 1YK, 1ANA, 1BDI, 1BRQ, 1CMK, 1BET, 1OR, 1ZE, 1BCF, 1BCG, 1BDS, 1BL, 1BFT, 1CBA, 2NZ, 2ZS, 2ZK, 2BML, 2FP 2CBW, 2AWF, 2AWL, 2MU, 2CQZ, 2GK, 2LO, 2EL, 2CXL, 2CPD, 3BOB, 3ZW, 3HG, 3CC, 3XM, 3ZY, 3HK, 3BHA, 4BX, 4FT, 4ZC, 8ASF, 8BJV, 8AQO, 8BFM, 8BJC.

ser of about .0003 mfds., with a 2-megohm leak R connected to negative of A battery. The regeneration coil RX couples into L_1 and tightening this coupling causes the set to oscillate and reception of C.W. stations may be accomplished. A rheostat is placed in each filament circuit for separate control. As regards operation, when once the circuits have been roughly tuned, all that is

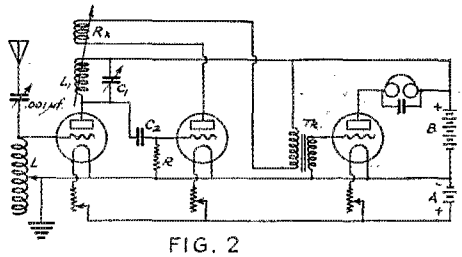


FIG. 2

necessary for searching is to vary the antenna condenser, keeping C_1 in step with it, and slightly adjusting the coupling between RX and L_1. The condensers will allow for searching between 180 and 250 meters without any trouble.

Altho tuning of this circuit is very critical, its short-wave efficiency is very high and great success attended the efforts of those who used it in the last Transatlantics. The writer has intercepted about fifty U.S. stations using the 3-tube circuit shown.

Miles Per Watt

An Argument For The Small Set and For Intelligence In Place of Brute Force; Also a New Efficiency Contest

By S. Kruse, Technical Editor

For the past six months there has been an increasing stream of letters from owners of small stations protesting that it is unfair to compare their work with that of the wealthy station-owner who has anything from a quartet of 50-watt tubes to a trio of 250-watt tubes. Here is a suggested remedy.

WE like to pretend that we are making steady progress in this radio game, but in the business of comparing station records we are not nearly as well off as we were some years ago. In the days when everyone had a spark set we knew what power we were using; most of us knew pretty accurately and the rest had some sort of information. When a record was made we could tell how many miles-per-watt it amounted to. The man that covered 1000 miles with 250 watts had something to be proud of; that was 4 miles per watt. But there was nothing to make a noise about when some big "thunder factory" covered 1500 miles by burning 1500 watts, that was only 1 mile per watt. This system gave everyone the same chance, in fact it gave the little fellow slightly better chances for if two sets are equally good the one with twice as much power will not work twice as far.

Our first tube men were all mixed up as to the amount of power they were using; in fact there are men today who talk about a "50-watt tube set" when they are really burning 250 watts and ought to rate the thing as a quarter-kilowatt set.

There is no excuse for this—it is perfectly easy to determine the input of a tube set, it is just as easy as it was to determine the input of a spark set; also it will be good for the souls of a lot of us to discover that our wonderful efficiency isn't nearly as wonderful as we have thot.

Let's find out what input wattage our sets are taking by the only sensible method, measuring it, and then let's play fair with the other fellow by talking miles-per-watt.

Fair Play

In the automobile game it is admitted that you can drive a Fierce-Harrow further than a Phord before either of them starts to fall apart. But the Phord has a comeback—it goes further in miles-per-gallon. It's a perfectly good advantage; the thing is more economical, it is a more efficient transportation machinc, it hauls more people-miles with a gallon of gas than the Fierce-Harrow does. It's the same way with the radio set; doesn't more credit belong to the man who hauls signals 50 miles per watt than to the one who has to use greater power to haul them only 25 miles per watt? What if man number two does have a stable full of "quarter-kilowatt" tubes and a young central station full of transformers and rectifiers, what if his brute power does let him cover 4000 miles, isn't he still inferior to the other man who handled his power correctly and went *twice as far per watt?* Give the man with the radio flivver a square deal—let him play the game on even terms—and your ether-buster will have to be improved a great deal to show up as well as the little "pickle bottle set."

Measuring the Power You Really Use

This mill has just hammered out another "squib" on the business of rating tubes and tube sets, so we will not go into details on that. However, it seems worth while to explain how to measure the power to a tube set. We have said that you can't measure it by reading the tube labels—any more than you can tell how many people there will be in a street car just because it happens to have seats for 34. Here are your methods:—

1. With the set in normal adjustment, hold the key down and read the plate voltmeter and the plate milliameter. Supposing the readings are 700 volts and 50 milliamperes, the input is (700) x (50/1000) or 35 watts. This is about what the average "5-watt" set takes.

2. If you have no plate voltmeter use the above scheme with a home-made plate voltmeter. A description of a static voltmeter that does not use any power at all, appeared in the October issue.

3. If you have neither a plate voltmeter nor a plate milliameter then it isn't quite so simple but we can still get a fair idea. First turn off all the lights, flatirons, fans, and other current-consuming devices in the house. Make sure of it by watching the house watthour-meter for several minutes. Now plug an extension cord into a socket near the meter and put into the socket a lamp of known wattage. They are all labeled and it is best to use a *new* lamp of a size larger than 25 watts. Hold the lamp up in front of the meter and, by turning the socket-key on and off, "baby" the meter-disc around until the mark is at the front. Now turn the lamp on for exactly one minute and count the turns the meter-disc makes. If you used a 100-watt light and

the disc made 20 turns you know that 20 turns per minute means 100 watts load. 40 turns per minute means 200 watts load, 5 turns per minute means 25 watts load and so on. Now let's get at the set. First start up the filaments and the rectifier with the positive lead of the high voltage supply disconnected from the tubes and count the turns of the meter-disc for one minute. Say it makes 31 turns. Now connect to the plates and count turns for another minute. This time the disc turns say 65 times. The plate load made the disc turn 65 – 31, which is 34 *additional* times per minute, and the added load was accordingly

(34 x (100/20) or 170 watts.

Now we are not real sure that all this additional load went to the plate; some of it probably stayed in the rectifier and the transformer, but as they are part of the set and should be reasonably efficient it isn't so very unfair to charge the whole business to the plates as input.

4. With a motor-generator Method 3 is no good; sometimes the plate load hardly increases the input at all. The only way is to use Method 1. However, the owner of an M.G. set is usually prosperous enough to own meters.

The Acid Test

The real test of a set isn't "How far have you reached?" but "How far do you work consistently?" and the best way of determining the consistent range of a set is daylight work. The Technical Editor would like to publish some records along this line —let us know what work you have done in watts-per-mile. We will prefer daylight work because that's a thing most of us don't know much about, but night records are interesting too. Any work done within 90 minutes of sunrise or sunset will be counted as night work—don't try to slip over some work at half-past-sunrise as daylight work: you could never do it at noon.

Send in Your Records

Just the same we are also interested in records and would like to hear about them. In either case, daylight or dark, here's the information which we need for printing in *QST*:

1. Station call.
2. Address (*make it complete.*)
3. Station owner.
4. Operator on duty when work was done.
5. Date or dates on which work was done.
6. Station or stations worked (*calls and locations*) (Note:—*Worked*, not *Heard At*).
7. Exact time (standard) when work began and ended.
8. Log of traffic handled (*must be complete enough to show the nature of the work carried on; it really should give complete text of the conversations*).
9. Watts input to the tube-plates.
10. What instruments were used to measure the input (*give complete nameplates of each*).
11. What wave length the work was done on.
12. What tubes you were using (give complete information).

We must have *all* the above information, and it will facilitate our work a great deal if you will give us the dope in the order mentioned above with the identifying numbers in the margin opposite each statement. Support this with all possible logs, letters from the station at the other end, etc. Mail to the Technical Editor marked "Station Efficiency Contest."

Jes' Reminiscing

An Old Ham Talks Over His Experiences Back In The Spark Days

By "R. B."

WHEN I first moved into the city I greatly disappointed the family by dragging home an incipient antenna pole. Disgusted with lights that ducked and spluttered, telephone calls that weren't phone calls, and weird noises at night, they had hoped I had given up this radio stuff.

However, once a radio bug always a radio bug, and a day later I had hoisted 53 feet of insecurity into the air. That night we were visited by a gale and the next morning I woke to find the result of my work lying inside an ex-hotbed. This time my father declared vociferously that this radio business must stop. Nevertheless, inside of a week my receiver was going and the spark set was under way.

As soon as I could listen in I discovered that I was not the only amateur in the city —not by a long shot. After working the brothers in the game I set out to visit their stations.

The first member of the clan was a nice scientific-looking young fellow, with glasses and suspenders. I was led upstairs. Pawing away twenty catalogues and radio magazines he showed his receiver-transmitter, which was composed of six variable condensers and an acre of bellwire. His receiver was not working now, he explained, because he had unfortunately dropped a monkey-wrench on the detector tube. His transmitter was working, however. Hauling six wires from holes in the table and hooking them on the posts of a

variable condenser he gingerly pressed a key on the back of the table. There was a tremendous meter on the wall, with a scale of 0-7 amperes—it was the size of a snare drum.

That dawgone meter went up—past 2 amperes, past 3 amps., past—why the darn thing went to *six amps* without the little 5-watt tube even getting excited. The boss of the works explained that he had hooked the meter from G.E.—it was really a hot-wire voltmeter and the scale of 7 amperes really was equal to about 7/10 of one ampere. I felt better—it was a crime to have a liar like that hanging on the wall to delude strangers.

He said his name was Charley Evans, and he would be glad to have me come around some time and see him working DX around the city. I moved on.

The next amateur I visited was a relief. Warren Chambers was his name; he had a very nice ½-kilowatt spark with which he had worked 8ZL and 8ZW and his receiver boasted a WSA 2-step amplifier. He said he had brought it out of the Navy; it evolved that the quenched gap had once been used by the U.S.A., ditto the mica condensers, but he was rather reluctant about admitting that the VT-2 tubes had also been paid for by the Navy. He was a very interesting fellow and we had a mighty nice time chewing over wartime affairs.

Others I saw too. They were an amicable bunch and used to spend the evenings at each others stations, chewing the rag and the weed.

Some of the gang were over at Estabrook's shack one night. We had been looking over the description of 8ZR in a *QST* and Warren spoke the "sense of the meeting" when he said "Fellows, why in blazes don't we get together and build a whale of a set?"

So in November, 1921, we found ourselves settled on the top floor of an office building, with a 6-wire cage antenna 30 feet above us, a 1-kilowatt spark set looking pretty on the table, and a ground lead exactly 60 feet long. After great effort we worked a station 4 miles off. He said that we were "QRK on waves from 400-1220 meters". We constructed a counterpoise, blessed it, and connected up, getting 5 amperes on 200 flat, and began to reach out.

One frosty morning in January, 1922, most of the bunch was sitting around in the lab hashing over the results of the first Transatlantic Test. Evans was staring gloomily at his C.W. set which was sitting over on the table, busy in looking as dead as possible.

"Damnation", broke in our man of science, "that fool thing has no sense. I put in the 1DH circuit and get 1.4, then I put in one of Reinartz' circuits and get 1.2, then I change back to 1DH and it gives me 1 flat, and then finally I change again and it refuses to oscillate."

Silence followed.

The kid wandered in with the evening mail. The first card was from a station in Kansas that heard our fone QSA three weeks before we had a station, the second was from Michigan and stated that we were "QSA very but not sure of your call" and the third was an ad for a patent fone jack that was obviously no good.

We cussed the mail till Evans again rose above the noise with a demand for aid with his superheterodyne receiver. Three of us carried the mammoth over where he could reach the antenna switch and then sat around waiting for results. Evans said it would work as soon as he got the 6th, 11th and 14th tubes to stop squealing.

Estabrook sneaked out into the hall about this time; a moment later Evans flung the fones on the table and howled "She WORKS!!!!, there's 1AFV way back east in Salem, Mass." And for a fact—you could hear the little high-pitched "dit-dah-dah-dah-dah dit-dah dit-dit-dah-dit dit-dit-dit-dah" percolating from the Baldies—by the gods you could hear it all over the room!! We nearly tore the roof off and Evans pointed to the C.W. set. For once in its life the thing oscillated and a whole amp and a half went up the antenna. Evans started calling 1AFV 1AFV 1AFV -------1AFV 1AFV and so on for about ten minutes. He sined off at least twenty times and then slammed over the switch and listened.

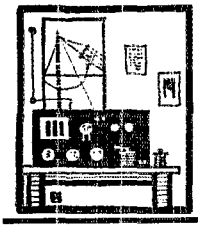
May I be everlasting QRM'd if that sweet high tone didn't come back!! We goggled at each other while Evans scribbled away radiating joy and triumph. We spark hounds meekly stole to the operating table and looked over Evan's shoulder to see what he was scribbling---"GE GE you QRZ but readable FB FB wonderful wonderful work work".

Well, we enjoyed a first-class thrill while we worked him for half an hour and finally when we had shot messages clear across without repeats and said *GN* and *CUL* and patted 1AFV on the back and turned the tubes off-----Estabrook came in quietly from the hall, *carrying the test buzzer behind him.*

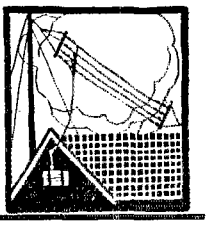
Evans stormed home to write all the radio big-bugs to tell them about this achievement. He departed with his head in the clouds but we did manage to find out where he had heard 1AFV before he tore down the stairs.

When the C.W. engineer was gone Estabrook dragged out the test buzzer and explained. We wanted to murder him at first but wound up by laughing ourselves into exhaustion and deciding that Evans was a simple sort of egg to fall for this stuff—

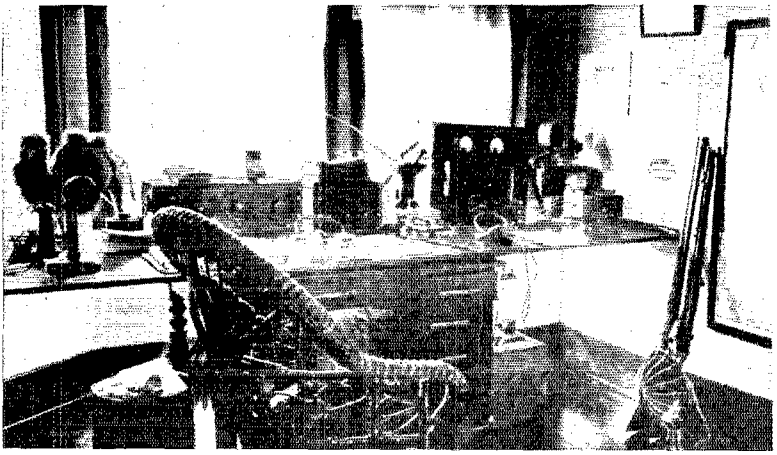
(Concluded on page 67)



Amateur Radio Stations



Some Prominent Canadian Stations



9BP, PRINCE RUPERT, B. C.

Everyone will recall 9BP as being the station that has maintained regular working schedules with WNP for the past two months while the "Bowdoin" lies frozen in the ice, 2000 miles to the northwest of Prince Rupert. To better fix 9BP's location in your mind, Prince Rupert is the western terminus of the Canadian National Railways and is situated on the coast 500 miles north of Vancouver, B. C.

Jack Barnsley, the owner and operator, reservedly assures us that 9BP is not a wonder station. It's many good DX records speak for themselves, however. The best transmission, prior to working WNP, was to Canadian 3NI, Ft. Williams, Ont. Mr. Barnsley also has a card from Ithaca, N. Y., reporting his signals and has worked stations as far south as 6ZH, near the Mexican border. 9BP has been the western terminus for several all-Canadian trans-continental relay tests and it was on one of these occasions that a message was sent from Prince Rupert at midnight and an answer received back from Toronto in six minutes! Being the only relay station for many hundreds of miles around, 9BP is due to become a strong link in future relay routes to Alaska.

The transmitter will be recognized as being a duplicate of 6ZAC's old transmitter that was described in the May, 1922, issue of *Radio*. Two 50-watt tubes are

Jack Barnsley

used in a full-wave rectification circuit with 1500 volts on the plates. The reversed feedback circuit is used instead of the Hartley circuit employed in 6ZAC's transmitter. The present antenna current is only three amperes but efforts are be-

ing made, from time to time, to increase this value.

The receiver at 9BP is a Paragon RA-10 regenerative tuner with a Paragon DA two-stage audio amplifier.

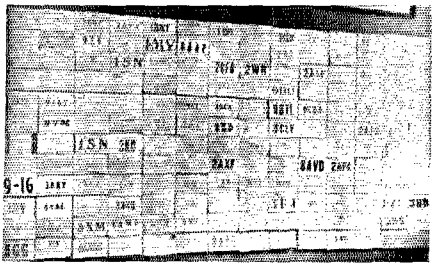
There is nothing unusual about the antenna. It is of the conventional inverted-L type consisting of a cage 75 feet long and 63 feet high for the top part, with a lead-in 45 feet long. A counterpoise of 12 wires 85 feet long and fanned somewhat is located directly beneath the antenna.

For some years Jack Barnsley has been more or less connected with radio. He was first bitten by the bug in 1910 and now laughingly relates how his first set consisted of a bit of haywire, a homemade coil and detector, and a telephone receiver borrowed from one of Mr. Bell's telephones. It was in 1914 that he started out as a commercial operator and worked on all of the coasting steamers operated by the Union Steamship Co. of B. C., Ltd. He then made several trips across the Pacific, joined the Royal Air Force during the war, and finally returned to Prince Rupert where he is now agent for the Union Steamship Co.

In recognition of his splendid accomplishment of being the only amateur station to successfully communicate with WNP after a long period of silence, he was presented by the Chicago Radio Laboratory with a complete Zenith receiving set, which he prizes highly.

2BN, MONTREAL, QUE.

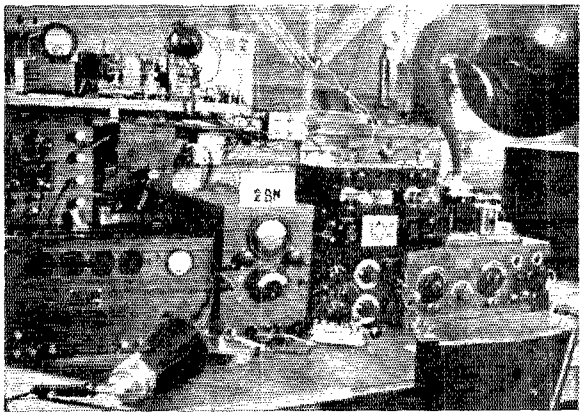
Canadian 2BN is another station whose signals are consistently heard over the greater part of the United States and Canada. The operator is Mr. J. L. Miller,



2BN Has Three More Walls Like This.

who has had considerable experience as a commercial operator and handles traffic in good style.

There are two transmitters and two receivers at this station. In the upper left-hand corner of the photo is the transmitter that utilizes one 40-watt (input) French tube, arranged in bread-board fashion. 1500 volts of chemically rectified current is supplied the plate circuit of this transmitter. The note is smoothed somewhat by a 5-microfarad condenser across the line although it is not pure D.C. Although this set has only been in a short time it has been heard at points 1500 miles distant on several occasions.



Canadian 2BN

The other transmitter, shown on the left of the table in the picture, is a Westinghouse TF set using four 5-watt tubes for C.W.; or, two as oscillators and two as modulators for phone. The antenna current is 3.4 amperes on C.W. This transmitter is the one mostly used and has been heard in all districts of the United States and Canada. Plate current is furnished through a Kenotron rectifier system which may be seen just to the right of the TF transmitter in the picture.

On the table to the right of the picture is a Reinartz receiver and next to it a single-circuit receiver with a stage of audio amplification. A Magnavox power amplifier and loud speaker may be seen above this.

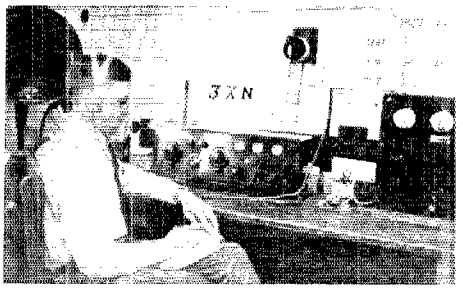
There is nothing unusual about the antenna system at 2BN for it is of the conventional flat-top inverted-L type, 65 feet high and 75 feet long with a counterpoise suspended beneath it.

3XN—9CF, LONDON, ONT.

The first C.W. set at 3XN-9CF used two 5-watt tubes with 10 volts on the filament, 1000 volts on the plate and 4.9 amperes in the antenna. This transmitter lasted one month! The present set uses two 50-watt tubes in a Hartley circuit, with 2000 volts of chemically rectified 25-cycle juice on the plates. The antenna

current is 4 amperes with 200 mils on the plates. The best transmissions have been made to France, Porto Rico, Hawaii, and the S. S. China when 1100 miles west of San Francisco.

The receiver is a Reinartz set with three stages of audio amplification. One stage,



of course, is sufficient for most work.

Turning to the radiation system, the antenna is an inverted L, 60 feet long and 55 and 40 feet high at the ends. It consists of two 4-inch cages with six wires in each cage. A network of wires, fifty by twenty feet, and fifteen feet high forms the counterpoise.

Mr. C. H. Langford, the owner of the station, is prominent in Canadian amateur radio. He is City Manager for the A.R.R.L., Government Radio Inspector, and also sells radio apparatus. He is always willing to check any station's wave length as the Government has furnished him with a good wavemeter for this work.

1AR, DARTMOUTH, N. S.

Clear across the continent from 9BP is station 1AR; another of Canada's better amateur stations. 1AR is situated at Dartmouth, 100 miles east of the eastern tip of Maine, near Halifax. Mr. Joseph Fassett, who runs the station, has long been in the radio game and still refers occasionally, with a smile, to the magnetic detectors and other crude apparatus used in the early days.

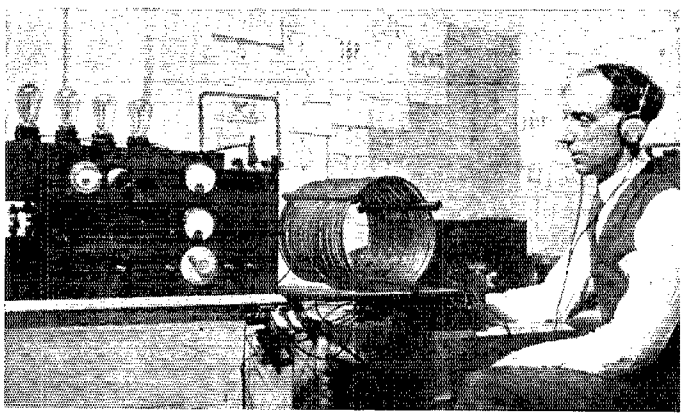
It was a great surprise to learn that his transmitter employs only four 5-watt tubes. The familiar Hartley circuit is used and most of the parts are homemade, including the transformers, grid leaks, tuning inductances, blocking condensers, and filter chokes. An electrolytic rectifier of 20 one-quart jars supplies current to a filter consisting of a 50-henry choke with a 4-microfarad condenser across the rectifier side of the supply and a 2-microfarad condenser across the supply next the plates.

The receiver is a three tube regenerative set using "peanut tubes" run from dry batteries and performs very satisfactorily.

The antenna system consists of a flat-top 55 feet high at the far end and 25 feet high at the lead-in end. This flat top is 100 feet long and 12 feet wide. The counterpoise is 100 feet long, 15 feet high and is also 12 feet wide, located directly under the antenna. Both the antenna and counterpoise are carried directly to the walls of the house where the set is located and thus there is practically no lead-in. Because of the high antenna capacity the normal current in it is around six amperes.

Mr. Fassett now has a 500-watt tube and in a very short time expects to have it on the air and receive signal report cards from the greater part of the world. He tells us that his station is not much for looks, but we know from the way he comes in that it is built with the idea of getting results; and it sure does!

(Concluded on page 62)



Canadian 1AR

New Zealand Tells How Yanks Are Logged

— U. S. Signals Fade As Daylight Sweeps Continent —

By F. D. Bell, 4AA, Palmerstown South, New Zealand

HERE we have a country about the same size as Britain, with a population of over a million, not counting a few Maoris, who are as white as the rest of us in everything except complexion. If the snout of New Zealand were tied to the door knob of the *QST* factory, its tail would be getting very damp in the Gulf of Mexico. But we are not quite so uncivilized as some of you think—very few of us use our wigwams now! In the cities are to be found ice cream sodas, trams (trolley cars), lifts (elevators), traffic cops, bad whisky, central heating, and lots of other things dear to the American heart. However, the Editor wants me to tell you what's doing on the ether hereabouts, so here goes.

Ship operators tell us that conditions for reception out here are better than anywhere else in the world. Such stations as LY at Bordeaux, POZ at Nauen, UFT at Sainte Assise, IDO at Rome, and the big American stations, are easily readable on one valve. I have copied a lot of the lower-powered European arcs, such as HB, OHD, BUC, OSM, GBL, FUT, LP, ICI, etc., using a detector and two-step, with a separate heterodyne for the fainter stations. On 600 meters spark my best records are KHK and NPM in Hawaii, JOC at Otchishi, and KPH and KFS at San Francisco, but others have heard coast stations working a lot farther away than these. Mr. Steel, of the government radio station VLB, at Awarua, has easily the best sheaf of DX records. Using a single valve he has heard 600-meter spark stations in U.S.A., Canada, Japan, India, South Africa, and Egypt, in fact all over the deck. Besides logging many of you Yank amateurs on C.W. he has heard the voice of Mr. Leonard at 9KP, and also music from the New York broadcasting station WHAZ.

Amateurs Getting Louder and Louder

As regards you amateurs—well, your sigs seem to keep getting louder and louder, although I don't think anyone has been quite as noisy as 6KA and 6JD during the recent tests. It's a treat to hear the QRM among the Yanks some nights. Our hats are off to you fellows, and it is our ambition to push our signals over to you some day, although it will be a much harder job for us than for you, owing to inferior conditions for reception in U.S.A. We hope, however, soon to be QSO Honolulu, which would pave the way for a real 'round-the-world amateur relay!

Here in N.Z. we are restricted to only fifty watts *input*, and we work from 140 meters to 180 meters. So far there are about fifteen of us transmitting, but many more sets are in course of construction. Owing to the Post & Telegraph Department being a government monopoly, we are not permitted to handle traffic for third parties, like you folks, as this might entail beating the government for the nine-pence it would have cost the sender had the message been sent by ordinary tlegraph. Consequently our work consists solely of yarning among ourselves or conducting tests. Those of us with phone sets use them to work throughout New Zealand, and we have no difficulty in working the Australian amateurs on key under average conditions, and on really good nights we can work two-way voice tests. The distances vary from 1200 to 1600 miles. My speech has been picked up in New South Wales, Victoria, and Tasmania, and the C.W. has been copied in Samoa, 2000 miles, with about 1.7 amperes in the aerial. This is half way to Honolulu, so we're getting on!

Over in Australia the amateurs mostly work around 400 meters, but probably later on they will join us on the shorter waves. Those near the government radio stations are restricted to ten watts input, but at greater distances from such stations they can use up to a kilowatt if they like. I don't think any very powerful sets have been constructed yet—the largest I know of is that of Mr. Maclurcan, 2CM, Sydney, 100 watts, which nearly raises the roof over here. He at any rate should be QRK in

Honolulu. I believe that Mr. Howden, 3BQ, Melbourne, has invested in a 500-watt tube with which he means to have a shot at the Pacific Coast some time.

World's Record Broken

On their ten watts input some of the Australians come in surprisingly QSA over here, so loudly in fact that it occurred to me that it would be possible to receive them on much lower power. Accordingly I got into touch with Mr. Jack Davis, 2DS, Sydney, whose ten-watt ether-buster provides us with some of the loudest signals that we receive from Australia. After several nights we have what we claim to be a real world's record for low power valve transmission, namely:—

1200 MILES ON LESS THAN ONE WATT C.W.!

A few extracts from the tail end of my log of the night of Aug. 17th tell the story. Mr. Davis had just succeeded in getting speech and key over to me with 1.4 watts input to his set, using twenty milliamperes at seventy volts on the plate of his single five-watt (input rating) B.T.H. transmitting valve.

4AA to 2DS: QRP to one watt and ask a question.

2DS to 4AA: Wl go as low as I can. QRP nw. Sec.

(Called up again and asked on key) What is ur power?

4AA to 2DS: My power input forty five watts. Wat's urs?

2DS to 4AA: LESS THAN ONE WATT!

At this stage Mr. Davis was using only sixty-five volts on the plate. The receiver here employed two stages of tuned high-frequency amplification and a two-step audio. The aerial was a seventy-foot twin cage.

To return to American amateur sigs. I have put in only one whole night listening on 200 meters for you chaps, since sending in my last list of calls to *QST*. This was Monday, September 10th (Sunday with you) and proved to be rather a "freak" night, as Eastern stations came in as loud as the 6's, of whom, curiously enough, only three were logged. 78 calls were heard, coming from 27 different transmitters, every district being represented except the third. The QRM among you fellows was so bad that it was only possible to log the louder ones, otherwise many a five-watter might have been heard by someone in N.Z. that night. As the evening advanced it was interesting to notice first one district fade out and then another, as daylight swept over the continent, until at last the 6's fizzled out just after midnight our time.

I daresay you would like to know what are the loudest and most consistent stations. This is a hard question to answer, as not only does signal strength vary greatly from night to night, but with a tricky receiver like mine, one is never quite certain that one is exactly tuned to the incoming signal. The single-valve boys should be able to give you a better idea. However, for steadiness, strength, the amount of traffic handled, and in fact for everything *except* the style of his sendin, I should hand the biscuit to Mr. Duncan, of 6ARB. Close to him come 6AWT, 6BJQ, 6BVG, 6BVS, 6CGW, 6CMR, 6CFZ, 9ZT.

Loop Receiver Picks Up U. S. Hams

One staticy night last week Mr. Orbell, of 3AA, Christchurch, decided to have a shot at the Yanks with his four-foot loop. No trouble was experienced in logging several! This achievement he reported to me by radiophone the same night. Much incensed at Mr. Orbell having got in on this stunt ahead of me, I dug up an old two-foot loop, put five turns on it, and extracted 6ARB out of the ether at once. Next night was also noisy, and on a larger loop several of the louder stations were more readable on the loop than on the 70-foot outside aerial. Mr. Orbell's receiver and also mine consisted of only two H.F., detector, and two L.F. valves, so the credit lies with the boys who pushed out the good sigs. I found that it made no difference to signal strength whether the outside aerial was earthed, insulated from ground, or tuned to 200 meters, so I reckoned that the loop was doing the trick all right. All this should give you some idea of the strength of some of the signals. Were I to tell you how many hundred feet from our loud speakers we have heard your signals on good nights, you would just laugh at me! Of course it is not every night that we get you well. Sometimes we get a week or more of fierce static through which it is quite impossible to read calls, let alone messages, although we can generally heard the signals squeaking away merrily behind all the racket.

How You Can Get Across

Now here's a tip for those hams who have not yet landed a QSL card from Australia —*when you are working late on a Saturday night send your call signs slowly and clearly.* The reason for this is that Saturday night with you means Sunday with us, which is our favorite evening for indulging in a little quiet Yank Logging, and you must remember that some of us are no great shakes at receiving fast code, especially if it is badly spaced, as it often is. Then there are others of you who are good operators, but who use two-way keys, or some similar abomination, and who send their dots like a burst of machine-gun fire. This style of sending is OK close at hand but N.G. at a distance—1BRO please note!

My list of Yanks heard during the last

(Concluded on page 62)

The Junior Operator

SOME POINTERS ON TUBE TRANSMITTERS—II

The Seventh of a Series of Articles of Helpfulness and Practical Value to Those Just Entering the Amateur Radio Game.

By H. F. Mason, Department Editor.

Prolonging the Life of the Tube

THE filament inside of the vacuum tube is one of the most delicate and precious parts of the transmitting set. Having as it does, only so many hours to live, everything should be done to make its living easier. There are several ways in which this may be effected and the more important methods will be explained here.

It has been found that the life of a filament will be considerably lengthened if it is heated by A.C. instead of D.C. For this reason the filaments of the transmitting tubes in amateur stations almost invariably are heated either by a step-down transformer or by equipping the plate transformer with a special winding.

To increase the filament voltage beyond its rated value means an early death to the tube without any material increase in output. A filament voltmeter should be in view of the operator at all times showing the exact terminal voltage of the tube. If it be of the tungsten filament variety, operation at 95% of the normal filament voltage should double the life of the tube.

The simplest way of obtaining the correct adjustment of the filament is to connect a rheostat in series with it. The rheostat should be made of quite large wire as the currents to be carried are usually fairly heavy. It should be located in the circuit as shown in Fig. 4. Another good arrangement is to connect the rheostat in series with the primary of the filament transformer, although a different size of rheostat will be required. As another alternative, four or five taps may be taken from the primary of the filament heating transformer and connected to a switch for adjusting the filament in steps of ¼ volt or less.

With tubes of fifty watts and larger the life may be considerably lengthened by turning the filament on an off gradually instead of applying the current all at once. This can be done very conveniently by connecting a fixed resistance in series with the filament, in addition to the regular rheostat, that will at first allow it to burn at but half brilliancy. This resistance can be shorted by two of the contacts on the send-receive switch when it is in the transmitting position.

To conserve the life of the filament, it must be heated uniformly throughout its entire length. This ordinarily would present no difficulites, but in a vacuum tube there is current flowing from the plate to filament and between the filament and grid which must be considered, independent of the regular filament heating current. This additional current flow is almost evenly distributed over the filament; that is, an

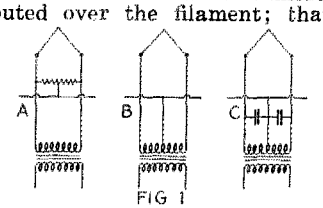


FIG 1

equal part flows to each part of the filament. Now in order to remove this current from the filament without causing more current to flow in one part of it than in another it would be necessary to attach a heavy lead to each part of the filament. This is obviously impossible as we can only connect an external circuit to the filament at its ends. In a receiving set that is what is done; the negative terminal of the B battery and the grid return wire are almost always connected to one of the filament terminals. This causes a crowding of current in the filament at the end next to this terminal, which, although it causes no harm in a receiving tube because the current is so small, is a thing to be considered when planning a transmitting set. The effect is, of course, to overheat that part of the filament where the current is greatest, causing it to burn out at that point long before it should.

When supplying the filament of a transmitting tube with A.C. and the plate circuit with D.C., another undesirable thing

will happen if the negative side of the high voltage supply and the grid return wire are connected directly to one of the filament terminals. There will be, as explained above, a crowding of current in the part of the filament next this terminal, but in addition the alternating filament-heating current in this part of the filament will alternately aid and oppose the plate and grid currents. As a result the plate and grid currents will be modulated or varied. This

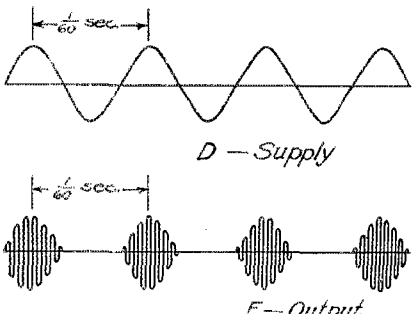


FIG. 2

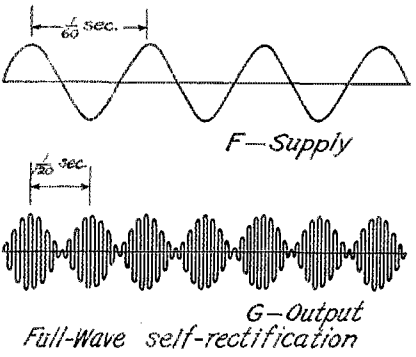


FIG. 3

will cause the station's emitted wave to have a decided A.C. hum, even though pure D.C. is used for plate supply.

The Center Filament Tap

An almost ideal remedy for the two troubles mentioned above would be to connect the negative plate supply terminal and the grid return wire to the midpoint of the filament. This would cause the plate and grid currents arriving on the two halves of the filament to become balanced so the alternating filament current would no longer modulate it. The crowding of current at any one point on the filament would also be much less.

Vacuum tubes are not made with a tap brought out from the center point of their filament, however, so some external means must be provided to accomplish this same thing.

The simplest method is shown in Fig. 1-A. A resistance is connected across the filament and the midpoint of this resistance is connected to the grid return wire and the negative terminal of the high voltage supply. The resistance should be large enough so as not to draw much currrent from the source of filament current but not large enough to hinder the passage of the high-voltage current to any noticeable extent. Figure 1-B shows another way of doing this same thing; this time being done by connecting the grid return and negative high voltage wires to the midpoint of the transformer winding that supplies the filament with heating current.

Both methods have their disadvantages. You will recall that the plate current is a steady D.C. with a radio frequency current superimposed on it, while the grid current may be either a radio frequency alternating current or a direct current pulsating at a radio frequency. It is not desirable to deliberately insert a resistance in the plate and grid circuits as in Fig. 1-A: neither is it desirable to let radio frequency current enter the transformer as in Fig. 1-B, for punctured insulation in the windings is a likely result of this practice. Figure 1-C overcomes both of these difficulties. Here by-pass condensers detour the radio frequency energy around the halves of the filament transformer winding while the direct current passes through the winding without any trouble. The by-pass condensers may be anywhere from .002 microfarad capacity upwards. The by-pass condensers should be located as near to the tube sockets as possible so the paths for radio frequency current will be short and direct. The above method is the one most commonly used to obtain the "center tap" on the filament.

Meters

The number of meters on a C.W. set is usually governed by the size of the builder's pocketbook. If only one meter can be afforded it should by all means be a filament voltmeter. It is a good investment and will save you the price of a tube later. The relative values of antenna current can always be obtained by rigging up an improvised hot-wire meter or by shunting a small flashlight lamp across a few feet of the antenna lead, hence an antenna ammeter is not an absolute necessity at the outset.

The antenna ammeter is next in importance, however, to the filament voltmeter. Contrary to common opinion, the antenna ammeter does not show the actual radiation; neigther does it show conclusively how the signals are reaching out. Its only uses are to tell whether the set is working normally or not and to indicate *improve-*

ments in adjustment. It is true that an increased antenna current usually means greater radiation, but only where the wavelength, the antenna system, and the location of the meter remain the same.

A milliammeter in the plate circuit is very useful, although not a necessity as the plate current can be roughly estimated by noticing the heat of the plate. If the plate of the tube is no more than a dull red, speaking of a tungsten filament tube, the normal plate current is not being exceeded much. On the other hand, if the plate is a bright red bordering on white heat, the plate current is far greater than it ought to be and the trouble should be remedied at once. The real value of a plate circuit milliammeter is in adjusting the set for

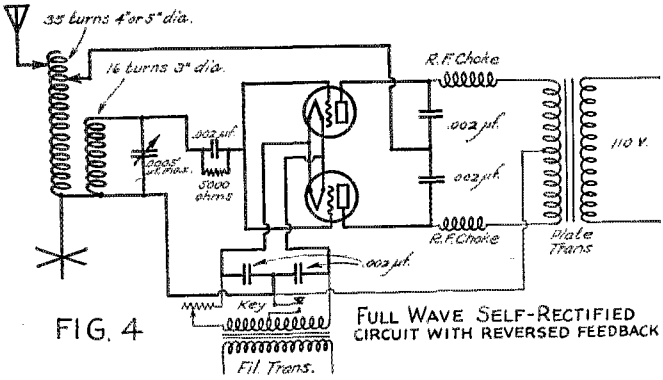


FIG. 4 FULL WAVE SELF-RECTIFIED CIRCUIT WITH REVERSED FEEDBACK.

the highest efficiency. This means that the set should be adjusted so the greatest possible power (watts) in the antenna will be obtained with the least power being taken from the supply. As the antenna ammeter and plate milliammeter usually will show relatively when this condition is obtained, these meters come in very handy when making adjustment.

Other meters, such as a voltmeter for measuring the plate voltage and a milliammeter for grid current, are handy but by no means essential. They are classed as luxuries by the average amateur.

Inductances

Inductances for the radio frequency circuits of tube transmitters are either of spiral or helical form. Spiral inductances usually take the shape of a piece of copper or brass ribbon wound in slots on a spider-web like form while the latter may be anything from a layer of cotton covered wire on a cardboard tube to a winding of copper tubing or edgewise wound strip on a special framework as a form.

Some of the radio frequency current, in flowing through transmitting inductances, is bound to be lost by leakage through the insulation. To cut this loss to a minimum, only the beast insulating material obtainable should be used. Glass, porcleain, good hard-rubber, and wood boiled in paraffin are all satisfactory. To further cut down the leakage through the insulation the conductor should touch the insulating material only where absolutely necessary. For this reason an inductance wound on a skeleton framework is much superior to one wound on a piece of tubing or other solid mass of material. In all cases, no matter whether the inductance be of spiral or helical form, the turns should be spaced a distance equal to the diameter of the conductor. If the conductor is a strip of metal, space the turns a distance equal to the width of the strip.

No doubt the best cheaply-made inductance is the kind made by winding common antenna wire, No. 14 bare copper, on a cardboard tube such as a Quaker Oats box, spacing the wire by winding a layer of string along with it. The wire can be pinched up with a pair of pliers at every turn so that clips can be readily attached. Such an inductance is almost ideal for use with one 5-watt tube. Furthermore, the loss through the dry cardboard insulation is slight because heavy currents are not being dealt with. For larger sets, an inductance of copper or brass strip is customary, wound on a slotted frame work.

Self Rectified Sets

Although pure continuous wave transmitters require a source of steady D.C. from which to supply the plate circuit, it is possible to use vacuum tubes for transmission directly from an alternating current supply without any separate rectifier and filter. The note given out by such a set is not so pleasing to the ear as that from a D.C.-operated tube but is widely used because of its simplicity and convenience.

In the September issue of *QST*, in this department, it was shown how the plate current in a vacuum tube will flow from

the plate to the filament but will not flow from the filament to the plate. From this it can be seen how, if an alternating current be supplied the plate circuit, only the halves of the cycle where the current flows from the plate to filament will be used and converted into oscillating radio-frequency energy. This is shown graphically in Fig. 2. The A.C. supply is shown at D. Only the positive halves pass through the tube and are shown at E in the form of radio frequency oscillations. The other halves of the cycle are suppressed and do no useful work. This method is commonly called half-wave self-rectification because one half of the wave is used and the tube, in suppressing one half of the cycle, really is changing A.C. to pulsating D.C.; and then it changes the pulsating D.C. to radio frequency oscillating energy, all in one process. Thus no external rectifier is necessary as the tube automatically rectifies the supply. A set of this type differs from one using D.C. supply only in the nature of the current supplied the plate as the wiring is exactly the same.

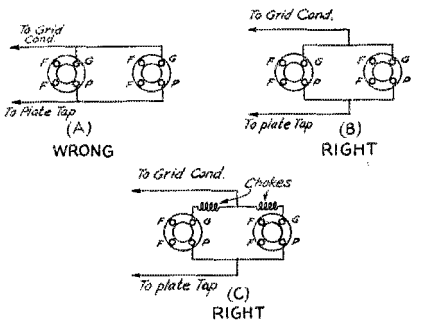


FIG. 5

There is a further modification of the self-rectification principle that is used in many stations. It is possible, by using two tubes and a plate transformer with two windings, to supply alternate halves of the A.C. wave to alternate tubes and then feed the output of the two tubes into a common oscillating circuit. In other words the tubes are connected "back to back." Fig. 4 is a diagram of such an arrangement. It is here shown in connection with the reversed feedback circuit but can be easily changed for use with any other circuit. The output of this set would appear as at G in Fig. 3; both halves of the A.C. wave being used. This is called full-wave self-rectification.

Figs. 2 and 3 will show that the output of a half-wave self-rectified set consists of groups of oscillations occurring every 1/60th of a second. It is therefore a 60-cycle note. The output of a full-wave self-rectified set consists of a group of oscillations every 1/120th of a second, thereby making it a 120 cycle note, even though the A.C. supplying the set is at 60 cycles. This is a point that is often not clearly understood.

Location of Key

In order to send out telegraphic signals from a tube transmitter a key is connected in the circuit so as to start and stop the oscillations. The requirements to be met are: that the sparking at the contacts must not be excessive, that there be no voltage surges caused and no key clicks radiated, that the signals be clean-cut and not blurred, and that the wave not change. So far no means of keying has been found that will fulfill all of these conditions simultaneously.*

Below are given some of the methods in use today. To find the best method for your particular case our suggestion is that you try all of them. In each case, arrange the circuit so the lever of the key will be at ground potential; that is, so there will be no voltage between the key lever and the ground. Sparking at the contacts of the key may be lessened by connecting a resistance and a condenser in series around the key. If the sparking takes the form of a snappy, crackling spack, there is too much condenser and not enough resistance; if it is more of an arc, insert more condenser or lessen the resistance. Values of 100 ohms and .01 microfarad are all right for a first trial.

With a self-rectified set, the position of the key shown in Fig. 4 is good; or, it may be connected in series with the primary winding of the plate transformer if separate plate and filament transformers are used. Where the plate supply is D.C. the key can be connected, on small sets, directly in series with the negative lead of the plate supply, with a resistance and condenser around the key to lessen sparking as shown above. Another way is to connect the key in series with the grid leak. On larger sets a one-microfarad condenser can be connected in the grid lead next to the grid and the key connected around it. This is in addition to the regular grid condenser and leak. Where the key opens the grid leak circuit or disconnects the grid from the rest of the set, the negative charge piles up on the grid until the plate current is reduced to nearly zero and the tube stops oscillating.

Tubes in Parallel

If one tube is to be used in parallel with another, it is best to get the set working properly with one tube, and then add the other. When both tubes are working to capacity, the antenna current should be

(Concluded on page 62)

*Further comparison of keying methods is given on the article "Why Inflict Keying Thumps on Your Neighbor" on page 29 of the July, 1923, issue of *QST*. (Obtainable from the Circulation Department at regular price.)

Strays

At the last meeting of our Board of Direction, Karl W. Weingarten, 7BG of Tacoma and A.R.R.L. A.D.M. for Washington, was appointed Director from the Northwestern Division. At the request of the Board the Executive Council of the 7th took a test vote of the amateurs in the Northwestern and 7BG was a big favorite, whereupon the Council recommended his appointment. Thus the Northwestern again has a representative on the Board, filling a vacancy caused by the resignation of Lt. Comdr. Stanley M. Mathes, late of 7OE but now aboard the S. S. "Shawmut" off the East Coast.

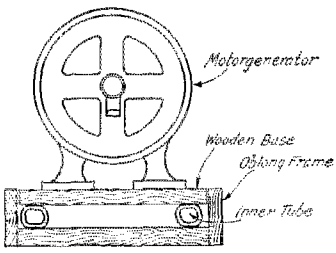
At the same Board meeting the new Canadian General Manager, A. H. K. Russell, 9AL, was appointed to the Board vice W. C. C. Duncan, resigned.

Russell and Weingarten are fine men, well qualified to represent the membership in their territories, and big assets to the Board in the determination of A.R.R.L. policies.

STATION KINKS

A Vibration Proof Mounting

Here's a good method of mounting a motor-generator suggested by 1AFN. The plan calls for an oblong wooden frame to

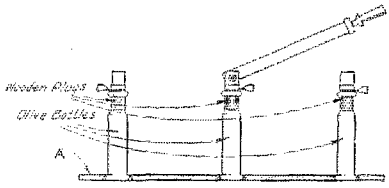


SECTIONAL VIEW

hold the motor generator in place, with an inflated Ford inner tube for it to rest on. The sketch shows how it is made.

Good Insulation for Your Lightning Switch

In the sketch, A is the asbestos composition base of a standard lightning switch. The parts have been removed and the three holes in the base reamed out with a large plumber's reamer until a conical hole is



formed that will fit the olive bottles as shown. The bulge at the bottom of the bottles hold them in place. The blades and switch contacts are then bolted to wooden plugs that are made to fit tightly into the tops of the bottles. The Underwriters require that the break distance between the blades be at least four inches and the blade should measure at least ⅛ by ½ inch in cross section. All current-carrying parts should be at least five inches from the building.

—*1AMI.*

Need some covering for the pigtails on your new receiver? Cut up that shoestring that broke this morning when you were trying to dress in a hurry.

—*9YU.*

When figuring the required area of aluminum for your rectifier by the June, 1922,* Rectifier Symposium, remember that the area of the plate referred to therein means the area of one side of the plate. In other words "area of 2 sq. inches" means 2 sq. inches of material.

A Zenith 1-R receiver will tune nicely from 100 to 200 meters if a tap is taken from the secondary winding at the tenth turn. Approximately 70 feet of wire are then used in the secondary coil.

Toothpaste makes good filler for the engraving on your panel.

*Can be obtained from the *QST* Circulation Dept. at the regular price.

A good 0-25 milliampere D.C. meter can be made by removing the shunt from a Weston 0-100 milliammeter. Then divide the scale reading by four to get the new reading.

The Eternal Battle

High note vs. Low note.
Synk vs. Non-synk.
Spark vs. C.W.
D.C.C.W. vs. A.C.C.W.
B.C. vs. Ham Radio.
More Regs. vs. Fewer Regs.
Single Circuit Tuners vs. 3-circuit Tuners.
Kilocycles vs. Wave-length.
Radio Frequency Amplification vs. Regenerative Sets.
Where! Oh, Where!

5TM.

1KX runs a five-watt tube in parallel with a fifty-watter and gets away with it.

There are two kinds of C.W. sets; good sets, and haywire sets. Which is yours? Good one are neatly wired and always work; haywire sets work part of the time and require constant tinkering. The difference is a matter of workmanship.

—*Kickbacks.*

One of the Washington, D.C., gang has a receiver so sentitive that every dot when heard in the phones sounds like this: "Pr-r-r-r-r-r-r," as the signal goes around the world seven times in a second!

Some good records in transcontinental work are being made. On Sept. 23d a message was relayed from 6BVG to 1BCF through 9ZT and an answer relayed back to 6BVG in a little over 9 minutes. F.B., OM.

M. B. West, designer of the transmitter on WNP, has left the employ of the Chicago Radio Laboratory and is now engaged in business in his home town of Lima, Ohio.

Johnny Clayton, 5ZL, the first radio man in Little Rock and a charter member of the A.R.R.L., had a narrow escape on Aug. 17th while at sea as operator on the S. S. Coldbrook. He was standing on the deck talking to a seaman when a wave washed the seaman overboard and knocked Clayton against the rail, breaking his arm and causing other injuries. He is now back in Little Rock but expects to go to sea again soon.

WWV

The gang razzed us for fair when WWV did not transmit the amateur schedule on Oct. 8th. Sorry, fellows, but it was due to a mix-up in interpreting schedules. We all agree that these standard waves mean as much to us as time signals do to a navigator and are doing all we can to have them continued.

Wouldn't it be wonderful if 9DGV didn't ride a kiddie car when sending those official A.R.RL. broadcasts on Saturday and Sunday nights?

—*Kickbacks.*

The City Manager of Lima, Ohio, James Lisk, 902 S. Elizabeth St., Lima, is confined to his bed but is on the job regularly with a ten-watt set. He would appreciate a line from the gang.

A. H. Babcock, California Director of the League, served as chief of the radio end of the Lick eclipse observation expedition on the occasion of the recent eclipse of the sun.

Good phones have more to do with good DX reception than most hams imagine.

H. L. Owens, 9EL, just wants to notify the gang that he's just got a new J.O. out there who is going to make a good brass pounder in a few years.

Many of the gang are at sea as to what is a proper filter for a motor-generator. Prof. Dellenbaugh, to whom we are indebted for the excellent filter article in the July and August, 1923, issue of *QST*,* tells us that the "brute force" filter in Fig. 21 on page 24 of the August *QST* is just the thing for the job. In this case a single tuned traps is next to useless, as a whole family of frequencies are present.

The Horne Verni-Tuner is a piece of apparatus that will come in handy around any station. It consists of a coil with a variable condenser of .00025 microfarad capacity mounted inside of it with a separate fixed coil coupled to the main coil. Its many uses in receiving circuits or as a wave trap will at once be apparent. The Horne Electric and Mfg. Co., of Jersey City, N. J., are the manufacturers.

The Globe Combination Jack Binding Post is an ingenious variation of the usual type of binding posts. In appearance it is like a small drill chuck with a polished nickel finish. Connections are made by plugging straight in, similar to a telephone jack, and made permanent by a slight twist of the knurled cap. The Globe Phone Mfg. Co., at Reading, Mass., will gladly supply additional information.

Were you ever at a radio banquet where some of the hams *didn't* unknowingly put sugar in their boullion cups and then complain of bum coffee?

Some of us spit on the cat to raise the DX. 7BJ sez its sure luck if you eat onions for DX lunch. Puts lots more kick in your sigs.

*Can be obtained from the *QST* Circulation Dept. at the regular price.

Regarding the *care* of electrolytic rectifiers, 8BTO uses nursing bottles for his rectifier. Anything more appropriate?

Did'ja ever hear of the ham that went to a bakery and asked for bakelite? Neither did we.

Canadian 2BN says, "Every card I get has scrawled across the bottom 'what does N.D.G. mean?,' then a 'hi'. Well, it means Notre Dame de Grace, which is a suburb of Montreal. Now then, I feel better."

9AZG is wondering how the B.C.L.'s expected the No. 38 wire, which he found draped and twined abundantly around his antenna and counterpoise, to carry the current from his set without fusing.

The German scientist who claims he can cure paralysis by auto suggestion might try his ability on some of our fifty-watt bottles that have become afflicted with this malady.

—*Porto Rico Radio News.*

Quaker Oats used to be the main article of food in a radio family. Since the advent of the pickle bottle insulator and the olive bottle lightning switch, pickles and olives rank the highest.

You fellows that are worrying about a series condenser might try pasting tinfoil on each side of the window to your shack, connecting the outside coating to the antenna and they inside coating to your set. Saves a lead-in bushing, too.

A method of modulation used quite extensively abroad is to use the plate to filament resistance of the modulator tube as the grid leak of the oscillator tube. A receiving amplifying tube will modulate several five watters OK by this method. Don't forget to let *QST*'s experimenter section have a report of your results.

Why not bring taps out on the secondary of amplifying transformers so that high and low ratios can be obtained without having to buy several transformers?

A Westinghouse RC tuner may be immensely improved in the following manner. Disconnect the antenna and ground from the regular posts first; then wind a single turn of heavy insulated wire around the outside winding of the variometer and connect the antenna and ground to this single turn. The set will now be highly selective and really makes a good ham tuner.

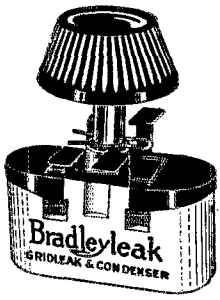
—8CXT.

Anyone using mercury arcs for rectification of plate supply? What is your opinion of them? Aren't they worth passing along the dope for the benefit of the rest of the gang if you are using one in your own station?

The Theory and Operation of Reflex Circuits is the subject of a booklet just issued by the Wireless Shop, 1260 West Second St., Los Angeles, Calif. It describes in detail the construction of six different sets, including the neutrodyne, and is a real aid to users of these types of receivers.

The Bradleyleak

The Allen-Bradley Co., of Milwaukee, Wisconsin, manufacturers of the Universal Bradleystat and Bradleyometer, have added another item to their line of graphite disc radio products. The new device is an adjustable grid leak known as the Bradleyleak



which was developed to meet the demand for a high-grade dependable grid leak. It is similar in external appearance to the Universal Bradleystat, and can be adjusted between the limits of 250,000 and 10,000,000 ohms, or, as usually stated, between ¼ megohm and 10 megohms, by turning the knob. Intermediate values of resistance can be quickly and accurately obtained at any time. The base of the Bradleyleak is recessed to receive a .00025 microfarad fixed condenser, which is furnished as an extra attachment if desired.

A very useful accessory just put on the market by the Illinois Radio Co., of Springfield, Ill., is a shockproof mounting for a tube socket made of pure gum rubber. It is not merely a pad or washer but is made so the tube socket floats on the rubber cushion, entirely preventing mechanical vibrations from reaching the tube.

Mr. H. N. Umbarger, 65 North Diamond St., Mansfield, Ohio, has been appointed by the Ohio Brass Co. as their factory distributor for their radio insulators described in the May, 1923, *QST*. All inquiries that would ordinarily go to the Ohio Brass Co. should be sent to him.

How to Get Transformer Steel Cheap

We now answer a question that is often asked. Climb into your old clothes and flivver and make for the junkyard. Eleven

times out of ten, you'll see tons of old transformer cores lying around that can be had "all-you-can-carry" for 50¢. If there is no junkyard in your town, try the electric light company's shops, entering by the back way. They'll most likely have some old burned out instrument transformers that you can easily build over into a good C.W. transformer with the help of Mr. Babcock's article in the December 1922 issue of *QST*, page 14: "Notes on the Design of Small C.W. Transformers." If you get the core material at a junk yard, take it to a tinsmith who has a foot or power shears and if he does not let you cut the pieces of core material to the required size yourself he certainly cannot have the nerve to charge you over a dollar for doing the job for you.

9AOG has dropped his wave down to about 170 and stays there all the time—even for calling. Of course this raises none of the "boots" that work on 230 meters but it does get the experienced fellows that have found out how good the short waves are. 9AOG seldom is left without someone to work and always the work proceeds with no QRM, no QSS, and much less QRN. That last is something to worry about in a Kansas summer.

Quinby of Omaha sez that the waves from these southwestern fives *ought* to make long jumps; why not, when they have a chance to brace their feet against the Rockies?

In reply to a request for information made by one of our members, the Department of Commerce advises that a holder of a commercial first-class license will, if he so desires, be issued an amateur extra-first-grade license as a renewal without re-examination, provided that he has operated his station continuously during the two years previous to the expiration of his license.

5ADV blew his three five-watt tubes just before the Daylight Transcons, but that did not prevent him from putting two UV201-As in the sockets and working 300 miles to New Orleans in daylight with .5 amperes in the antenna.

8CPY-8DKC wishes to get the opinion of the gang as to whether they would be interested in a book illustrating possibly a thousand of the best amateur stations in the country. How much co-operation could be expected from the leading amateurs by way of photos and descriptions of stations? This is not something for someone else to do, but if there is a demand for such a book to be published, 8CPY is willing to do the hard work. It all depends upon your getting in touch with 8CPY immediately. Address Jas. A. Wilson, 318 N. Church St., Kalamazoo, Michigan.

Those who have antennas full of ohms will do well to procure a Reid-Hight (4KU-4BQ) Limburger Cheese Insulator. This particular insulator, a sample of which was presented to FS at the convention, has strength—oh, my gawd, it has! It darn near jumped thru the suit case on the way home and the Pullman conductor threatened to put the owner of the skunk off the train if he could get a gas mask to wear while he made an inspection of the car. Whew!!!!

A small neon tube consuming about .1 watt is just the thing for a wavemeter indicator or as a radiation indicator for your transmitting set. For use as the latter, it should be connected in series with an inductance and condenser tuned to the transmitted wave located near the transmitter within constant view of the operator. The neon tube may be taken from an Airco Ignition Gage, or a Westinghouse Spark-C; both devices using a neon tube for testing automobile ignition systems, and costing in the neighborhood of $1.50. Such a radiation indicator is a handy addition to the equipment of any amateur station as any unevenness in the antenna current or fluctuation of the transmitted wave immediately manifests itself to the operator by a flickering of the light of the neon tube. The neon tube is nothing more than a small glass tube with an electrode sealed in each end, filled with neon gas, which glows when a radio frequency current passes through the tube.

My Rotary

(*With apologies to the writer of "The Rosary"*).

The hours I spent with thee, dear spark,
Brought many DX cards to me
And many a trick you turned when all was dark;
My Rotary!
Each hour a call, my old non-sink,
From Coast to Coast a fading song you've sung.
And when we managed East and West to link,
A DX record hung.
Oh, midnight oil and toil and dripping sweat,
Oh, barren gain and bitter loss;
The "bottle workers" soon forget you were the first,
The continent to cross.

Submitted with misgivings, by C. S.

INTERNATIONAL AMATEUR RADIO

(Concluded from page 50)

six weeks appears in the "Calls Heard" section of this issue. I would greatly appreciate cards from anyone who can confirm my receptions of their signals, especially from those using low power.

We hear rumors of another Trans-Pacific Test. Well, we're ready when you are. This time a few of the louder fellows with pure D.C. notes like 5ZAK, 6RM, 6ARB, and 9ZT might try to push a little speech over. I don't say we'll get it but we'll try.

The British Wireless Relay League, an independent association of radio amateurs corresponding to our A.R.R.L., was recently absorbed by the Radio Society of Great Britain, a technical body, and became known as the Transmitters and Relay Section of the Radio Society of Great Britain. The position of the amateur in Britain has been in some danger for some months past and it is believed that this union will greatly strengthen the prestige of amateur radio in England. The Transmitters and Relay Section is now busy on plans for the coming transatlantic tests and is making preliminary range tests for the purpose of selecting the stations to do the transmitting during the final tests in December.

THE JUNIOR OPERATOR

(Concluded from page 54)

1.4 times the current with one tube. One might think that the antenna current would be doubled, but such is not the case. However the *power* in the antenna is doubled when the current is 1.4 times what it was before, and that is what we are after.

Failure to obtain this increase when adding the second tube may be due to several causes. If the characteristics of the tubes are widely different, as they sometimes are, it will be difficult to realize full benefit of parallel operation. The wires leading to the grids of the tubes, and sometimes the plate also, must be of the same length; or, small radio frequency choke-coils may be connected next the grid terminal of each socket, as shown in Fig. 5C. Each of these coils should consist of about ten turns of wire wound on a tube one inch in diameter. By carefully adjusting the length of the wires leading to the grid terminals, or by adding the small choke coils, it is practically always possible to make the tubes pull together and put their combined output into the antenna, *providing* the plate transformer is large enough to hold up its voltage under the increased current consumption of two tubes.

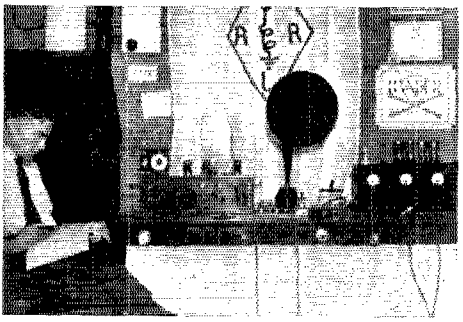
AMATEUR RADIO STATIONS

(Concluded from page 48)

4BV, Loreburn, Sask.

4BV is not on the air at present but will be remembered by hundreds of amateurs as one of the first successful Canadian amateur stations in the West.

It was in December of 1920 that the "Yankee Rock Crusher" first pounded in on a famous old style audion tube at this station. The first attempt to transmit was made shortly afterwards with a Ford coil. Gradually the set was added to until in its final form it consisted of a single



circuit tuner and two stages of audio amplification. A C.W. set was installed and enlarged upon until the capacity of the plate generator was reached at three 5-watt tubes.

The transmitter, as operated all of last year, used three 5-watt tubes in a reversed feedback circuit with a maximum antenna current of 2.8 amperes when the batteries that furnished the power supply were on charge. The normal working antenna current was about 1.5 amperes. Power was supplied by a 32-volt Fairbanks-Morse farm lighting plant. The antenna system was a four-wire inverted L, seventy feet high at each end. A nine-wire circular counterpoise was used.

4BV holds some good records. The first cards and letters came from the U. S., then old 6ZAC reported signals QSA in Honolulu. A little later 4BV was the only Canadian station to be reported as heard by Mr. Steel at Invercargil, New Zealand. This latter distance is about 8500 miles. At the time 4BV was closed its DX record represented 6 provinces, 36 states, and a number of ships at Sea. 4BV's piping signals were constantly reported up and down the east and west coast throughout the radio season.

HOW DO YOU LIKE THE AMOUNT OF GOOD DOPE IN THIS ISSUE, FELLOWS?

Radio Communications by the Amateurs

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

Message Delivery.

Kansas City Mo.

Editor, *QST*:

Just a little squawk prompted by the most emphatic howl of OM Hatry, 5XV, regarding the non-delivery of messages. I certainly agree that it is a disheartening experience to promise a citizen message sender that his message will be delivered, and then to have the guy on the relaying end fall down. I am in receipt of a kick from Dr. Klenk, A.D.M. of Missouri, in regard to sloppy relaying and failure of messages to get through wherein he proposes a system of relaying back an acknowledging message to the station of origin. I hardly think this is workable, unless hams were operating under navy discipline and could be sent to jail for failure to comply with the regulations.

However, some one else may have a better scheme of checking up on it. To get started it seems that there are about six main causes why we are up against the non-delivery problem something like this:

1. The message falls into the hands of some fellow who has no sense of responsibility and the message hangs on his hook a week, or perhaps dies there. This kind of a fellow is often so careless that he loses a message in the waste basket which was received OK and had a chance of getting on.

2. The writer of the message had zero ideas in his think tank when the notion struck him to send a message by radio and couldn't concoct a message that had sense. This sort of thing ought to be nabbed by the originating operator. It would be FB if every ham would censor messages before accepting them. This sort of message falls victim to the kind of operator described in the paragraph above.

3. The message reaches its destination but the local fellow is too lazy or indifferent to attempt delivery. This is of course similar to the condition stated in paragraph one but is unpardonable. A lot of rubber stamp messages get flagged out by this kind of operator.

4. The message gets lost between stations usually due to carelessness in assuming that the receiving operator has given a proper OK, often due to QRM or QRN, and instead of asking for a QTA of the QSL, the operator gives an SK and starts to work someone else, when a minute's listening might reveal the receiving operator calling his head off for a QTA of perhaps *one* word, which would perhaps hold up the whole message, and it *would*, if the operator stuck to commercial rules

5. The operator who originated the message permitted the writer to get away without giving good and sufficient address. Again, censorship by the operator first accepting the message for transmission would remedy the difficulty.

6. Finally the message gets so badly garbled in relaying that the address and sometimes the whole message is so badly chewed up that the relaying can go no further and the message cannot be delivered to the proper party.

Right here let me take a large swat at the *amateur* who addresses a message to a station merely by the *call*. Why isn't it plain to a ham that with continual reissuance of calls and call books that the only proper way to give the relayers a fair show is to give also the *name and address* of the addressee?

Now that I have this off my chest I'm going to QRX. Let's have some *real suggestions* from the gang as to methods to eliminate these things that reflect on every one of us in the minds of the public!

L. B. Laizure, 9RR,
Div. Pub. Mgr. Midwest Division

The "Ham" Spirit

Brooklyn, N. Y.

Mr. H. P. Maxim,
President, A.R.R.L.

Dear Sir:

Just a few lines to let you know how your members are working for the uplift of amateur radio. I recently came across an article in the Radio World, and it said "Amateur Hears France Daily."

I wrote to this fellow and asked if it would be possible to get the hookup of the set, never expecting to hear from him. A few days later, to my complete surprise, I received a neat, hand drawn copy of the hookup, together with a letter telling me the different parts to use and at the end of the letter was "If any more information is needed, just write, Radioly, E. Laufer, 2AQP."

So knowing what A.R.R.L. meant by reading *QST*, I thought it is my duty to give him all the credit afforded him by writing you this personal letter.

—John Timmons.

By Way of Explanation

Melbourne, Australia.

Editor, *QST:*

I enclose the copy of a letter to *Radio Journal* re the early report of the Transpacific Tests printed in your paper. I wish to point out that *I* wrote the original letter to Mr. R. J. Portis and it was his reply which started us off on the tests. Will you kindly make this clear in the U.S.A.

Yours Faithfully,
H. Kingsley Love.
Chairman, T-P Test Committee,
Wireless Institute of Australia.

Melbourne, Australia.

The Editor, *Radio Journal,*
Los Angeles, Calif.

Dear Sir:

I have just received an advanced copy of the story of the Transpacific Tests printed in *QST*, which was sent to Mr. Malone of the Commonwealth Radio Department. I am very sorry indeed to note that this magazine states that Mr. Portis conceived the idea of the Transpacific Tests. I wish to emphatically deny this statement, and to point out that the Tests were conceived and put into operation by myself alone, Mr. Portis very willingly undertaking to organize the American end. I do not wish to appear selfish from this point, but I will not stand by and see my work pirated by anyone.

I would ask you to protect me at your end in this matter. I am sending a copy of this letter to *QST*.

Yours Faithfully,
H. Kingsley Love.

Try It

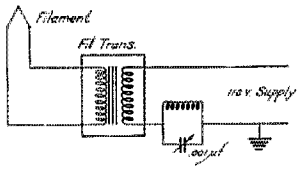
Marquette, Mich.

Editor, *QST:*

The articles in the August *QST* on "nodal points" and "antennas" are the best dope I have seen in a long time and if the amateurs will follow the advice given they will surely get out with their sets. The nodal point article set me to thinking. I knew the nodal point in my set was two turns above the filament tap, and I had often wondered about how much energy I was losing on that account. I had about concluded that I would let it stay as it was until I read the article about nodal points and that started me to thinking again. Why not put a tuned radio choke in each lead of the filament transformer primary? I tried it first in the "live" side of the 110 volt supply with no results. Then in the grounded lead and—*it worked!*

The tuned radio choke was 16 turns of No. 18 d.c.c. wire on a three-inch tube with a .001 microfarad variable condenser connected across it. To be more exact, this was my wave-trap, built for my receiver, in a new hole. The transmitter uses four five watt tubes with plate current furnished by a motor-generator set.

Without the tuned radio frequency choke coil the input to the plates (plate voltage



multiplied by plate current) was 210 watts. An antenna current of 1.8 represented 81 watts in the antenna. When the tuned radio choke was inserted in the circuit as shown, the antenna current went up to 2.0 amperes, which represents 100 watts in the antenna. That makes a nice little contribution of 19 watts in the antenna that were previously going to waste; and no need to monkey with the antenna or counterpoise either.

—R. S. Rose, 9DRR.

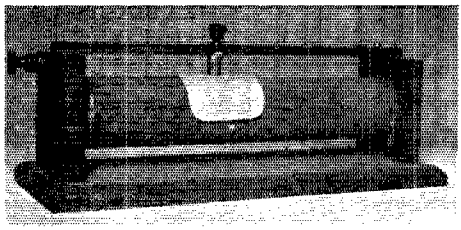
Resonance Wave Coils

New York City, N. Y.

Editor, *QST:*

The article on resonance wave coils in the August *QST* has been read with interest, and remarks carefully noted regarding the work that has been conducted on this type of coil.

The writer conducted a series of tests during the early part of 1916 on resonance coils to ascertain their properties.

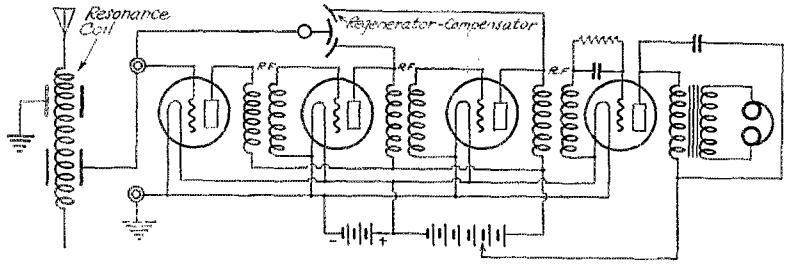


Enclosed is a photograph of such a resonance coil used in September, 1916, for short-wave reception. The circuits you describe were used with the exception of the rejector circuit. However, later on, during 1921 this circuit was also utilized and very good results obtained, particularly for the elimination of interfering signals.

You will also note that radio frequency amplification was utilized. One of the great difficulties encountered was to make the

natural period of the coil equal to the frequency of the incoming signal. However, when an efficient resonance coil is obtained, some remarkable results can be accomplished. It is possible to make several resonance coils of small physical dimensions and connect them to a set for efficient reception of signals of different frequencies.

Halliwill Electric Co., Inc.
Samuel Cohen, Chief Engr.



CIRCUIT USED IN RESONANCE WAVE COIL TESTS

Fine Business

Witchita, Kansas.

Editor, *QST:*

Since the quiet hours have been in effect, I have been called up by BCL's here time and time again, asking who the fellow is who is sending and busting up the air. I have gone to my set and listened on these occasions but could not hear any amateurs, except 6's, and I knew they were not causing any interference in this town.

Last night I was roused again and accosted with this query. It was late and I was sleepy but I wanted to see what was wrong over at friend BCL's place; or whether he was just plain crazy. Upon arriving I was escorted into his radio corner and asked to listen in. His set was a famous home-made single circuit tuner and as I tuned around with it, battling for dear life to separate the stations, I ran onto a dear old spark. It sounded just like the old days. He was sending a QST message from a ship about an approaching storm. When he signed off I found that he was a ship a good ways out in the Atlantic. I then stuck to the helm for over an hour and called out the call letters of the ships as I copied them while the owner of the set stood by and looked them up in the call book. Fifteen turned out to be ships listed on the east coast, twenty in the Gulf region, and three on the West Coast.

He asked me what he should do. I told him that unless he could get Uncle Sam to make the ships quit using radio he was out of luck. I also asked him to come over to my station and I would show him a set that was selective. He agreed to the latter and came over early the next evening. We listened till late and did not hear even one ship. Needless to say, I gave him the circuit for the set and sent him home happy.

L. J. Simms,
A.D.M. for Kansas.

JES' REMINISCING

(Concluded from page 48)

all right in theory but otherwise dumb. So we skinned out of the cellar window and went home with our hearts full of joy and our coat collars full of falling snow.

This thing should have ended there and we would have been happier if it had. But one night about a week later Evans walks in and nonchalantly tosses us a smudged postal card. "Here's the card that Estey promised us," he says.

By ginger it was!! A perfectly good typewritten card with "1AFV" printed on it in blue ink. It was dated from 2 Mt. Vernon Street, Salem, Mass., and said "Great pleasure and surprise to work you tonight, especially as it was only 7 P.M. eastern time."

Well we were down and out; we were off a lee shore with our bearings lost and drifting. It was an awful kick-back after we thot we had buncoed Evans to find that he actually *had* been working across the continent. Estabrook had nothing to say, even such DX was no compensation for his *big joke* gone wrong.

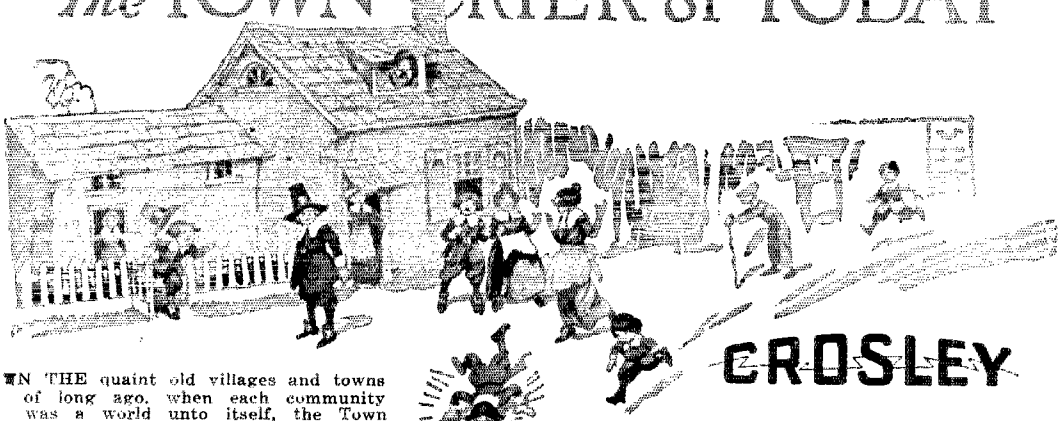
We tried to hide our consternation before Evans but I saw him look at us rather queerly. Maybe he *was* a dumb egg but he was a lucky one. Finally we said GN to the worker of the super-het (which had refused to work since the night of the

great event) and wandered over to Ford's shack to talk it over.

I sat down on Jake Ford's spare chair—the soap-box one—and tried to figure it out, idly fingering the postcard from Massachusetts. I rubbed the postmark aimlessly; it smudged. I examined it closely; the postmark had been made with a pencil.

Evans isn't such a dumb egg; he's a smart amateur.

The TOWN CRIER of TODAY



IN THE quaint old villages and towns of long ago, when each community was a world unto itself, the Town Crier played an important part in the affairs of the day. With clanging bell and stentorian voice, he broadcast the news, perhaps weeks old, that occasionally drifted in from outside places.

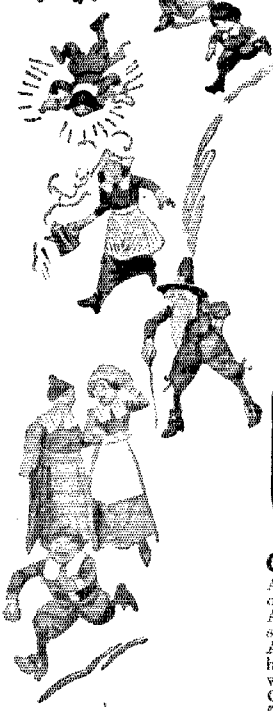
Today news from all parts is immediately available at your fireside. No matter how isolated your abode, Radio binds you to civilization. By a turn of the dial, the happenings, entertainments and amusements of the world are yours to command.

The Crosley Manufacturing Co., has done much towards bringing this new wonder within the reach of all and has made Radio a living, tangible thing—something to use in daily life, in business or pleasure.

Popularly priced, these famous receivers give perfect performance. Unsolicited letters are received daily from owners telling of satisfaction and new distance records.

Everyday tests prove to us that Crosley instruments are the most simple and efficient Radio receivers ever offered to the public, regardless of cost.

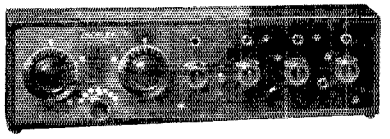
For Sale By Good Dealers Everywhere



CROSLEY

Model X-J

$65



CROSLEY MODEL X-J $65

A 4 tube radio frequency set combining one stage of Tuned Radio Frequency Amplification, a Detector, and two stages of Audio Frequency Amplification. A jack to plug in on three tubes for head phones, the four tubes being otherwise connected to loud speaker, new Crosley Multistat, universal rheostats for all makes of tubes for dry cells or storage batteries, new condenser with molded plates, filament switch and other refinements add to its performance and beauty.

Nowhere can a better receiver be purchased at any price.

Cost of necessary accessories from $40.00 up.

List prices on our equipment west of the Rockies 10% higher. In Canada add duty.

The Broadcasting Station WLW is maintained by Crosley Manufacturing Co.

CROSLEY

Better-Cost Less

Radio Products

Mail This Coupon Today.

Crosley Manufacturing Co.,
1218 Alfred St., Cincinnati, O.

Gentlemen: Please mail free of charge your complete catalog of Crosley instruments and parts together with booklet entitled "The Simplicity of Radio."

Name .....

Address .....

Write for complete catalog. This fully describes the Crosley line of Radio parts and receivers which range in price from a 2 tube set at $30 to the new beautiful Consolette Model at $140.

CROSLEY MANUFACTURING CO.

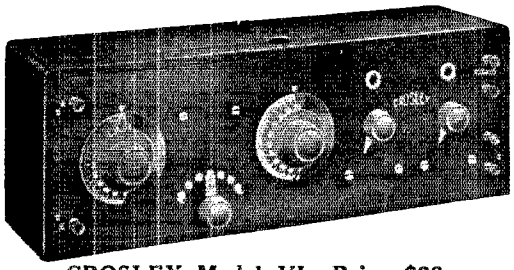
Powel Crosley, Jr., President

1218 Alfred Street, Cincinnati, O.

Crosley Radio Parts and Sets

Popularity Proves Their Worth

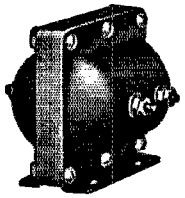
The fact that innumerable favorable comments are received daily from people everywhere who have used Crosley parts and sets with entire satisfaction leads us to believe that you too will find that they will fill your every requirement.



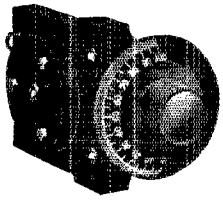
CROSLEY Model VI—Price $28

This Model contains the stage of tuned radio frequency amplification brought to 100% perfection by the Crosley Company. For its price and size, it gives surprising results in long range reception. Hundreds of testimonials have paid tribute to its efficiency.

The Crosley Sheltran is a completely shielded transformer. Embodied in it are all the characteristics so essential to obtain maximum amplification from the modern vacuum tubes used in radio work. Tests have proven the design to be correct to insure maximum efficiency.



CROSLEY
Sheltran Transformer
Price $4.00



CROSLEY
Amplifying Tuner
Price $4.00

The Crosley Radio Frequency Amplifying Tuner consists of an inductance coil and a Crosley book type variable condenser. It can be tuned to any wave length between 200 and 600 meters. When used with non-regenerative sets it will increase the range many times.

For Sale By Good Dealers Everywhere

CROSLEY
Better-Cost Less Radio Products

List prices on our equipment west of the Rockies 10% higher. Add duty in Canada.

CROSLEY MANUFACTURING COMPANY

Powel Crosley, Jr., President

1218 ALFRED STREET, CINCINNATI, O.

Pleasant Evenings Visiting

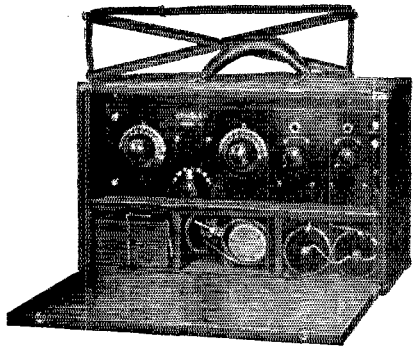
With a Crosley Portable

No matter how far into the wilds you may be touring or at whose home you may be visiting you can keep in intimate touch with the outside world and enjoy its pleasures in the evening.

Crosley Portable Radio Outfits have made this possible. Being absolutely complete in their compact cases, they are easily carried and quickly set up.

After the routine happenings of the day, motoring, visiting or what not, it is pleasant to sit down in the warmth and glow of a fireside and listen to music, plays and the innumerable other interesting things that are being broadcasted.

Get a Crosley Portable and take it with you on your trips or your visits to friends. It will afford you the least expensive pleasure you have ever enjoyed.



CROSLEY Model VI Portable
(Above)

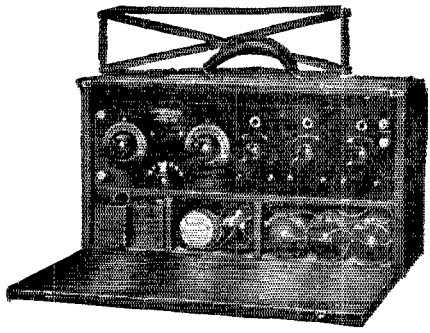
Consists of detector and one stage of tuned radio frequency amplification. Compact compartments are built into this set for batteries, phones, etc. Thousands of users have testified as to its satisfactory performance.

Price, without tubes, batteries or phones, **$40**

CROSLEY Model VIII Portable
(At Right)

Consists of one stage of tuned radio frequency amplification detector and one stage of audio frequency amplification. This set has the same general construction as Model VI Portable, but performs even more efficiently.

Price, without tubes, batteries or phones..**$60.00**



Free Catalog on Request

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List prices on our equipment west of the Rockies 10% higher. Add duty in Canada.

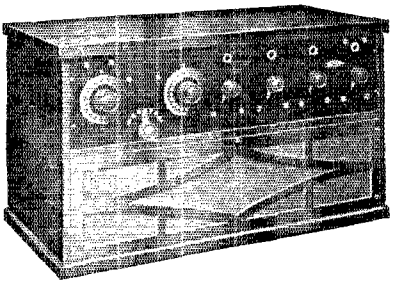
CROSLEY MANUFACTURING COMPANY

Powel Crosley, Jr., President

1218 ALFRED STREET, CINCINNATI, O.

Three Beautiful Cabinet Models

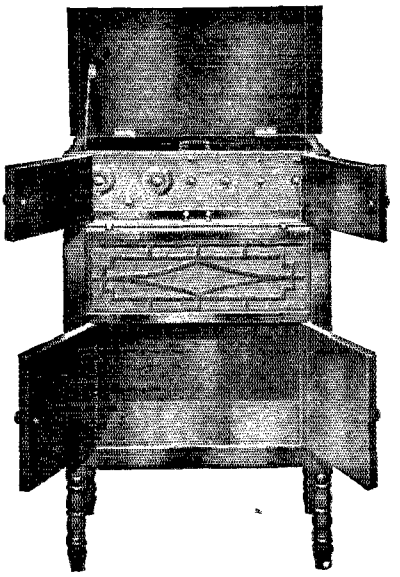
The Last Word in Crosley Efficiency



CROSLEY Model XV
(At Left)

The receiving apparatus in this model is the same as that in our cabinet Model XX. The cabinet contains no place for the batteries, however, placed on a mahogany table or stand, it forms an attractive piece of furniture.
Price, without tubes, batteries or phones.....**$70.00**

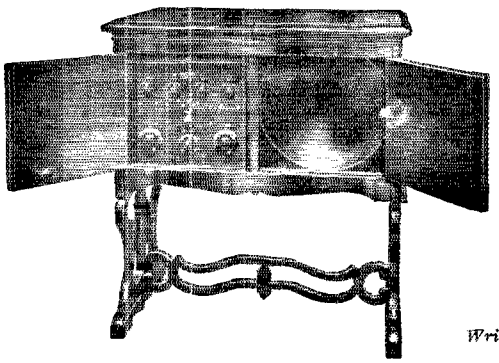
CROSLEY
Model XX
(At Right)



This attractive model is our model X built into a highly polished mahogany cabinet. A hinged lid, when raised allows the operator access to every part of the receiving apparatus. A sliding board under the receiving apparatus forms a desk for the operator when desired. The lower compartment is made to take care of the batteries and the middle compartment contains a loud speaker which makes it possible for music, speeches, etc. to be heard clearly by everyone in the room. As a beautiful piece of furniture, this model is an addition to any room.
Price, without tubes, batteries or phones.....**$100.00**

CROSLEY Model XXV
(Below)

We can conscientiously recommend this console model as the most beautiful and efficient model offered today. The receiving apparatus contains the same units as our Model X though differently arranged. The cabinet, of mahogany, exceptionally well finished, is arranged to take the model R-3 Magnavox and also contains space for "A" battery, "B" battery and battery charger if desired. Guaranteed to bring in broadcasting stations 1000 miles or more distant so that they may be clearly heard all over the room.
Price, without tubes, batteries or phones.....**$150.00**



CROSLEY

Better-Cost Less Radio Products

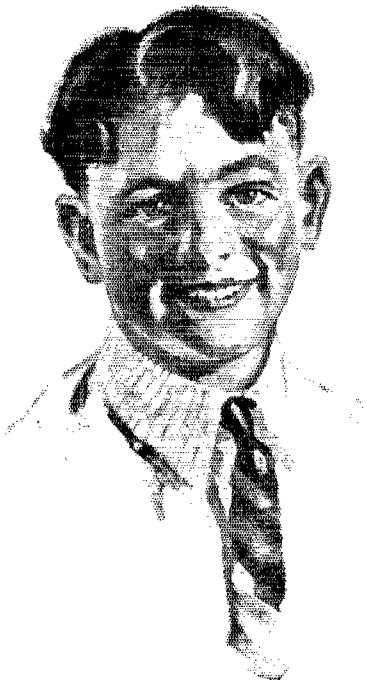
List prices on our equipment west of the Rockies 10% higher. In Canada add duty.

Write for Catalog

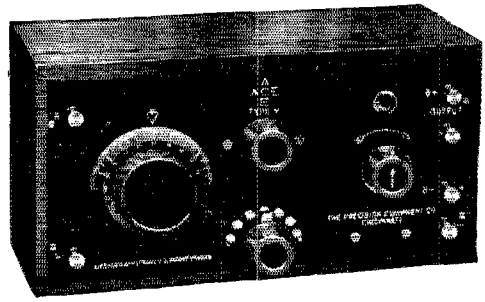
CROSLEY MANUFACTURING COMPANY

Powel Crosley, Jr., President

1218 ALFRED STREET **CINCINNATI, O.**



Make Him Smile on Christmas Morn



ACE TYPE V

Armstrong Regenerative Receiver

Licensed under Armstrong U. S. Patent No. 1,113,149

This set sells for $20.00. It's low cost together with efficiency and simplicity makes the great demand for it increase daily.
A long range Armstrong receiver. Stations from coast to coast can be heard distinctly. An Ace Two-step Amplifier in connection with this set at $20 makes use of loud speaker practical. Has Crosley Multistat, which permits use of any make tube.

Then there is the Ace 3B an Armstrong Regenerative Radio Receiver which combines detector and two stages of Audio frequency amplification. This set sells for $50.00. Prices do not include batteries or tubes.

"List price west of the Rockies 10% higher. In Canada tariff added.

The Precision Equipment Company

Powel Crosley, Jr., President

1218 Vandalia Ave., Cincinnati, O.

MAKE him happy — give him a real gift that will be enjoyed by both young and old — give him an Ace Radio Set.

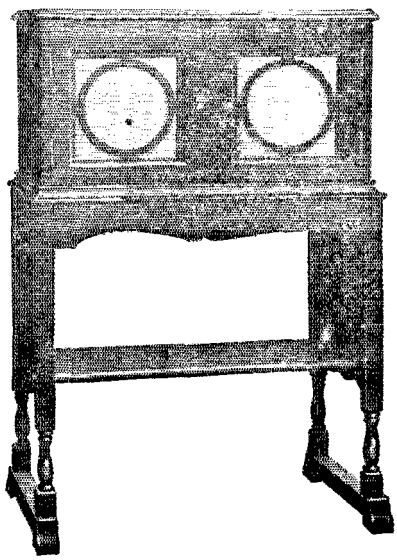
The new Ace Type 3C Consolette shown in the lower right corner is a comparatively new addition to the Ace Family. It has beautiful solid mahogany, wax finished cabinet and greatly adds to the appearance of the finest home.

This set consists of a regenerative tuner, detector and two stages of amplification, with built in loud speaker. The tuning circuit is licensed under the Armstrong U. S. Patent No. 1,113,149 and due to the particular method of winding Crosley coils it is exceptionally selective. Has sufficient room inside cabinet for dry batteries, making a complete self-contained long range receiving outfit. Has phone jack for tuning with head phones. Crosley multistat; filament switch; Crosley moulded condenser, beautifully engraved formica panel. Uses all kinds of tubes. Price $125.00. With stand, as shown at the right, $150.00. Prices do not include batteries or tubes.

Let an Ace Radio Set bring happiness to someone on Christmas morning.

If your dealer cannot supply you order direct mentioning his name.

ACE TYPE 3C CONSOLETTE



The Precision Equipment Company

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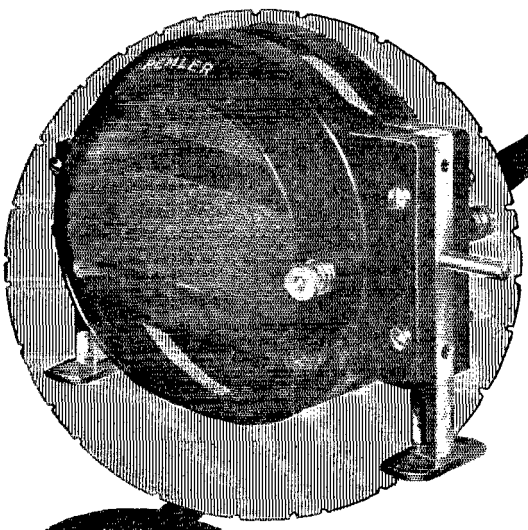
1218 Vandalia Ave., Cincinnati, O.



Enthusiastic Approval of National Scope

Stamps the New Remler Variometer as the Most Highly Efficient Radio Item on the Market

TYPE 500 WITH CLOSED ROTOR $7.50

Remler VARIOMETER

WITH INTERNAL PIGTAIL CONNECTIONS

Wave Length Range 180 to 570 Meters Positively Guaranteed

Seldom, if ever, has there been more genuine enthusiasm shown over any radio apparatus as has been demonstrated by everyone who has examined and placed in operation this new and improved Remler Variometer.

Its low minimum and high maximum wave length—the *greatest ever obtained in a variometer* and the wave length variation is exactly proportional to the reading of the dial scale. When used with any variocoupler it will cover the entire range of amateur and broadcast wave length. A wave length range of 180 to at least 570 meters is guaranteed when used with a *Remler* vario-coupler. Pigtailed connections are used between stator and rotor resulting in perfect contact and quiet operation. All metal parts are buffed and nickeled; green silk wire is used on both stator and rotor. The general appearance and quality of the bakelite molding is the best obtainable, making it a leader in appearance as well as performance.

If your dealer cannot supply you, send the attached coupon direct to us with express or postal money order.

REMLER RADIO MFG. CO.,
182 Second Street, San Francisco, Calif.

Gentlemen:

Please send me by return parcel post one new and improved Remler Variometer Type 500 for which I enclose Seven dollars and fifty cents ($7.50). If for any reason whatsoever I am not satisfied with this Variometer, I can return it to you express collect and you will refund my seven dollars and fifty cents in full.

Name .....

Address .....

Remler Radio Mfg. Co.

Home Office:

154 W. Lake St. Chicago — **182 Second St.** — 30 Church St. New York City

SAN FRANCISCO

How Lively Is Your "B" Battery?

THIS IS NUMBER THREE OF A SERIES

Some people buy Eveready "B" Batteries oftener than other people. This is because each fan has different tastes and desires in radio receiving. Those that demand maximum volume—and to get it use many tubes, forcing them to the limit with high voltages on the plates—are eager and frequent buyers of these batteries.

Others renew them less often. They are the ones that are content with smaller volume and employ fewer tubes at lower plate voltages.

Furthermore, every radio fan, regardless of the tubes he uses, has his own ideas as to when it is time to strengthen the signals with fresh "B" Batteries. Some will long enjoy concerts that others would not consider loud enough. Just what is "too weak" is purely a matter of personal opinion.

These, then, are the things that determine how long you use your "B" Batteries—

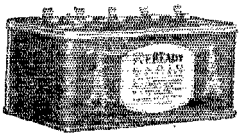
1. *The number and kind of tubes.* The more tubes you use and the greater their power, the more current flows from the "B" Battery and the shorter is its life.
2. *The "B" Battery voltage.* The higher it is, the more current flows from the battery.
3. *The amount of negative grid bias ("C" Battery voltage) on amplifiers.* The greater the bias, the smaller the "B" Battery current.
4. *The life put into the battery in the first place by the manufacturer, and the freshness of the battery when you buy it.*
5. *The signal strength you wish.* The smaller the volume of sound you can enjoy, the longer you can use your "B" Batteries.

The life of any "B" Battery you can buy is affected by the above factors. Subsequent advertisements will set forth each factor in detail.

* * *

Eveready "B" Batteries predominate. There is more life in them—*they last longer!* Blocks of large cells, packed with energy, made especially for radio use, delivered fresh to your dealer, give you the most power for your money—power you can use loudly and swiftly, or softly and slowly, as you wish—*Eveready for Everybody.*

"the life of your radio"



The Metal Case Eveready "B" Battery, No. 766. The popular 22½-volt Eveready Battery in a *new* handsome, durable, waterproof metal case. At all dealers, $3.00.

Eveready "B" Battery No. 767. Contains 30 large size cells, as used in the popular No. 766. Voltage, 45. Made especially for sets using detector and one or more stage of amplification. The most economical "B" Battery where 45 volts are required. At all dealers, $5.50.

Eveready Radio Battery No. 771. The Eveready "Three." The ideal "C" Battery. Voltage, 4½—three terminals permitting the use of 1½, 3, or 4½ volts. The correct use of this battery greatly prolongs the life of the "B" Battery. At all dealers, 70 cents.

Manufactured and guaranteed by

NATIONAL CARBON COMPANY, Inc.

Long Island City, N. Y.

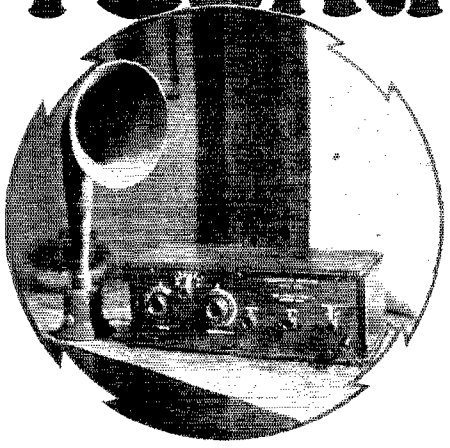
EVEREADY

Radio Batteries

—they last longer

Note: This is Number 3 of a series of informative advertisements, printed to enable users to know how to get the most out of their receivers and batteries. If you have any battery problem, write to G. C. Furness, Manager Radio Division, National Carbon Company, Inc., 124 Thompson Avenue, Long Island City, N. Y. Write for special booklets on "A," "B," and "C" Batteries.

TUSKA RADIO



TUSKA POPULAR
No. 225

3-bulb Regenerative Receiving Set. Piano finish mahogany cabinet. Amplifier switch. Concealed binding posts. Armstrong circuit, licensed under Patent No. 1, 113, 149. Price $75, without bulbs, batteries or loud speaker.

Ask for special circular No. 18-H describing this set.

Your entertainers are ready

Singers, bands, orchestras, speakers, organists, humorists—an unlimited host of performers are yours to command when you own a Tuska Radio. A simple adjustment of dials, and you can choose between them. Dozens of programs are in the air. Your Tuska will bring in whichever entertainer pleases you best and shut out all others.

Tuska owners are not obliged to tinker incessantly and add devices to correct construction faults. Their pleasure is unmarred by troubles. Every Tuska set is finished with exacting care by painstaking New England workmen—the best that live. Then it is examined and tested on distant signals by inspectors who are keenly critical. Both manufacturing and testing are under the personal direction of C. D. Tuska, a pioneer radio engineer.

For a dozen years before general radio broadcasting began, Tuska-made instruments were famous among radio experimenters for skillful design, superb workship and high efficiency. In the past two years, the demand for Tuska Radio has grown enormously. Each set in this increased production of today is as perfectly built as the finest Tuska instrument ever made—and yet, the prices are remarkably moderate for high-grade radio receivers.

Ask any first-class radio store to show you one of the models of Tuska Radio, priced **$35.00** upward.

The C. D. TUSKA CO., Hartford, Conn.

Ogden, Utah receives Troy, N. Y.
"In one evening, using Tuska 225 with one amplifier only, I received 18 stations, including San Francisco; Calgary, Alberta; and Troy, N. Y. Conditions were not abnormal, and the same stations were received again last night.

W. D. Garner."

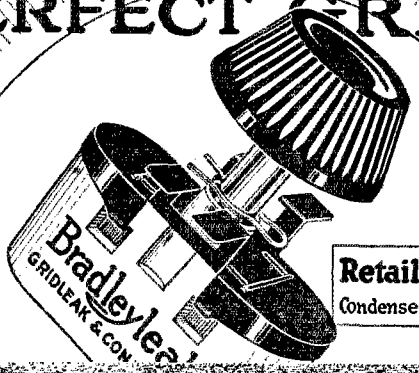
TUSKA TRADE MARK REG. U.S. PAT. OFF. RADIO

Picks up Davenport the first time he tunes.
"I never had my hands on a set until my Tuska came Saturday. First evening, I tuned in Pittsburgh, New York, Richmond, Ind. and Davenport, Iowa. It certainly was great.

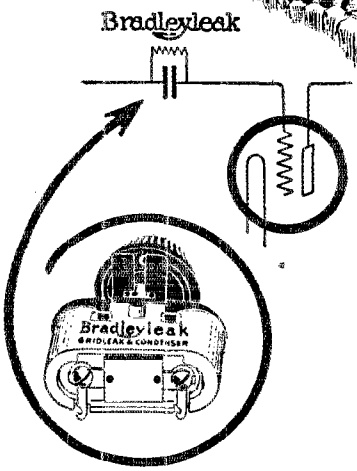
Wm. Parsons, Salisbury, Conn."

Bradleyleak

THE PERFECT GRID LEAK



Retail Price $1.85
Condenser (.00025 Mf.) 35¢



The Dawn of Better Radio

Long distance records in radio reception depend upon the precise adjustment of several elements in the radio set. Too often, the correct adjustment of grid leak resistance is considered of minor importance and frequently it is much too high or too low for the best operation of the detector tube.

The new Bradleyleak adds the final touch of perfection to the radio set. When substituted for the ordinary grid leak, it enables you to get the precise value of grid leak resistance which your detector tube requires. Any resistance between ¼ and 10 megohms is obtained without noise, steps or jumps by merely turning the Bradleyleak knob.

The volume of the detector increases gradually as the proper amount of grid leak resistance is approached, and if the Bradleyleak knob is turned too far, the volume again diminishes. Nothing could be simpler. Try it on your radio set, tonight.

The Grid Leak Is Important!

The following table gives the approximate values of grid leak resistance recommended by vacuum tube manufacturers:

Audion (DeForest) DV-6,	2 Megohms
C-200	2 Megohms
C-299	2 to 5 Megohms
C-301-A	2 Megohms
UV-199	2 to 5 Megohms
UV-200	2 Megohms
UV-201-A	2 Megohms
WD-11	3 Megohms, or more
WD-12	3 Megohms, or more

Install the Bradleyleak and work your tubes at highest efficiency

Allen-Bradley Co.
Electric Controlling Apparatus
277 Greenfield Avenue - Milwaukee, Wis.

The Allen-Bradley Co. has built graphite disc rheostats for over twenty years

To Our Readers Who Are Not A.R.R.L. Members

Wouldn't you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only national 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 of 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 *QST* delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

.....1923

American Radio Relay League,
Hartford, Conn.

Being genuinely interested in Amateur Radio, I hereby apply for membership in the American Radio Relay League, and enclose $2.00 in payment for one year's dues. This entitles me to receive *QST* for the same period. Please begin my subscription with the.....issue. Mail my Certificate of Membership and send *QST* to the following address.

.....

.....

.....

Station call, if any.....

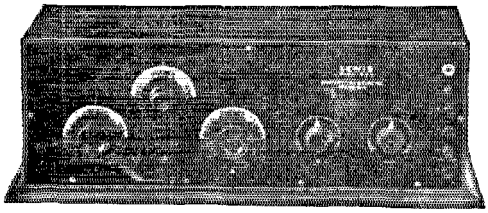
Grade operator's license, if any.....

Radio Clubs of which a member.....

Do you know a friend who is also interested in Amateur Radio, whose name you might give us so we may write to him too about the League?.....

.....Thanks.

The Most Practical Set For Low Wave Specialists



Are you having trouble getting short wave signals? The WC-5-SW shown above picks up signals on wave lengths from 90 to 380 meters sharp and clear. It is built by and for short wave specialists. The price is $85.00.

WC-5-SW

Built especially for Transmitting Amateurs

The WC-5-SW is a 4 tube set. One stage of tuned Radio Frequency amplification is employed ahead of the detector to make it supersensitive. Two stages of audio frequency are used to bring up the signal strength. Uses any type of tubes. Gives perfect control of audibility. Detector rectifies only. Uses antenna compensating condenser. Only two control adjustments. Pure negative biasing on all tubes, thus marked saving B Battery current, Tuned Radio Frequency sharpest known and most selective principle ever adopted. Plate potential non-critical. Mono-block tube socket. No grid plate leads on audio amplifiers. Audio amplification absolutely necessary when using low efficiency receiving antenna, i.e., underground or indoor. Mahogany cabinet, piano rub finish. Rabitted-in panel. Split lid cover.

Write for complete description and illustrated folder on this practical set for low wave specialists. All transmitting amateurs will be interested in this literature..

OTT RADIO, INC.

224 Main St., La Crosse, Wis.

For All Batteries

The Valley Type ABC Charger

The one charger which recharges all radio storage batteries. It's the Valley Type ABC Battery Charger made to charge

2-volt Peanut Tube Batteries
6-volt A Batteries
12-volt Batteries
1 to 4 B Batteries

Bakelite panel, glass top. Made so that it fits in with your radio equipment. In fact, it harmonizes with any receiving set.

Plugs into regular electric light socket. Takes about a dime's worth of current for an average charge.

A lot of people were disappointed last year because we could not make enough Valley Chargers. We are making more this year, but with the improvements, they are in greater demand. Don't miss out. At all good radio dealers.

VALLEY ELECTRIC CO.
3157 S. Kingshighway, St. Louis, Mo.

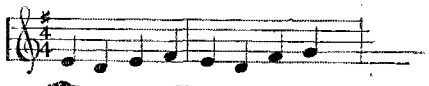
Valley Battery Charger

Your Kellogg Radio Christmas

Here is a way to get a wonderful receiver of Kellogg parts that most radio fans will tell you, are the most reliable, durable and efficient on the market. In several million families this year, each of us will be racking our brains to think of some Xmas present to please each member of the family.

Forget all this trouble and work, and plan a radio Christmas. Ask the boy or dad to make up a list of reliable parts for a simple set; then each one buy one part for someone in the family, and you will have a receiving set that will bring Christmas carols, and the world to your fireside, if you have efficient Kellogg parts carefully put together.

Such assembling is an easy matter with Kellogg radio equipment. There are thousands of circuits, some very efficient, both as to distance and selectivity, that require only a condenser, coupler [or variometer], tube socket, fixed condenser, grid leak, tube, dials, and a few other inexpensive parts. You don't need to buy an expensive cabinet to have a good radio set.

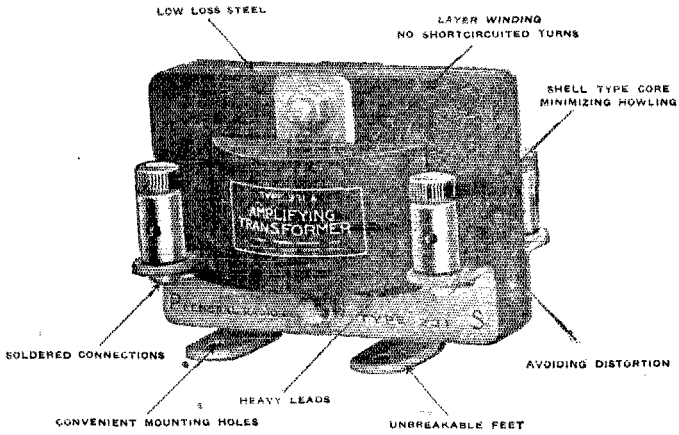


If your dealer does not handle Kellogg, send us his address. We will send you our helpful and valuable radio hand book. Start today on your Christmas receiving set, and make every member of the household happy.

KELLOGG SWITCHBOARD & SUPPLY COMPANY

CHICAGO, ILLINOIS

Quality Amplification



Radio, like many other lines of industry, is influenced by propaganda. There have been the advocates of a high ratio of turns in amplifying transformers and the advocates of a low ratio. Unfortunately for radio most of the arguments have been based on individual opinions instead of engineering design. Even manufacturers have shifted according to the dictates of local popular opinion.

The General Radio Co. was the first company to supply commercially a closed core amplifying transformer. It was a pioneer in advocating the use of a shell core. With a decade of research behind it, the General Radio Co. offers an audio frequency amplifying transformer embodying the best in construction and which will give the maximum of amplification possible without distortion. It is an engineering designed transformer and not one built on a popular whim.

Turns ratio..... 3.7:1

Impedance ratio.....10 :1

Price, Completely Mounted $5.00

Send for Educational Folder "Quality Amplification"

GENERAL RADIO CO.

11 WINDSOR STREET

CAMBRIDGE 39 , MASSACHUSETTS

A. R. R. L. Station
Alwzys GLAD to Q. S. R.

Clinton, Iowa
728 Bluff Blvd.

Sept. 29, 1923.

Electric Specialty Co.,
Stamford, Conn.

Gentlemen:-

It has been sometime since I have written you, but want to let you know that the 500 Watt, 1000 Volt Motor-Generator Set of your make, I bought one year ago, has given perfect service. Have gotten all districts - Mexico, Cuba and Canada with it. People marvel at the quality of modulation. All say I sound like a Broadcasting Station.

I work New York City often, also Oil City, Louisiana. All report that I sound like I am using battery for plate, instead of Generator.

Thought that I would let you know of the success of this outfit, as I believe in letting the manufacturer know of the fine points as well as the poor ones.

Yours Very Truly
F. E. Phillips
Opr. ex 9HK.

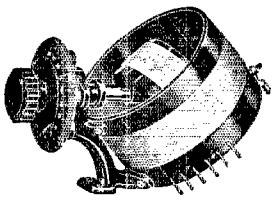
For Superior Performance

The genuine Kennedy parts which are now available to the amateur and experimenter assure the same superior performance as those that have made Kennedy radio equipment nationally famous. Each part has been designed by the Kennedy Engineering Staff—and, as each part is made in the Kennedy factories under strict supervision and inspection, every detail is electrically and mechanically accurate.

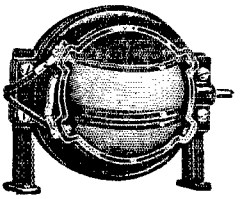
The use of genuine Kennedy parts is a guarantee of superior performance! Insist on them—if your dealer cannot supply you, write us, giving his name.

THE COLIN B. KENNEDY COMPANY

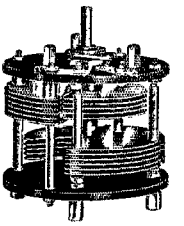
SAINT LOUIS SAN FRANCISCO



Variocoupler—Black Bakelite shells. 180° variation. Primary taps connected through inside of tube. Pigtailed connections. Without knob or dial $7.50



Variometer—Black moulded Bakelite shell and rotor. Minute clearance. Pigtail connections. Table or panel mounting. Without knob or dial.$8.00

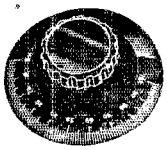


Balanced Condenser—0.0006 mfd. Rugged construction. Perfect balance. Adjustable tension on end thrust ball bearing. Pigtailed connection. Without knob or dial.$8.00

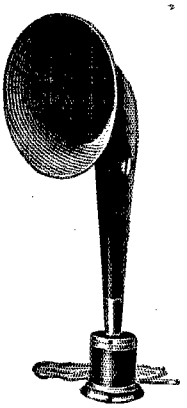
Head Phones—Extremely sensitive on weak signals. No rattle or blare on loud signals. Light, comfortable 3000 ohms....$9.00

Vernier Condenser—Two plates. Pigtailed connection. Has subpanel and small Kennedy Bakelite knob with white arrow.$1.50

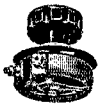
Non-Microphonic Socket—Cushioned type. Moulded Bakelite base. Shell and cup nickel plated. Positive side-contact contact springs $1.50



Dial—100 division. 3 inch. Black oxidized metal finish with silver etched figures. Kennedy type fluted Bakelite knob $0.75



Loud Speaker—Faithful reproduction. Ajustable damping of diaphragm. Polished nickel base and trimmings. 10-inch bell or horn.....$30.00



Rheostat—Suitable for all new type tubes—dry cell or storage battery. Bakelite shell. Positive contact. Has Kennedy Bakelite knob with white arrow....$1.10

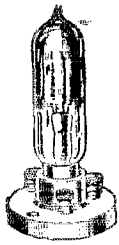
KENNEDY

The Royalty of Radio

ELECTRAD PRODUCTS

$2

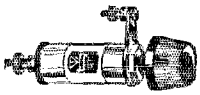
Socket 50c



Write for FREE Cockaday Diode Reflex Circuit.

The NEW DIODE

A revelation for all reflex work. Replaces the crystal and overcomes all former difficulties of reflex circuits. Requires no adjustments for change of wave lengths. Gives you the clear reproductions of a crystal with the sturdiness and reliability of a tube. No "B" batteries required. Operates on less than ¼ ampere from single dry cell. Easily adapted to Erla and all other circuits.



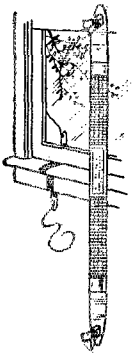
75c

The NEW VARIOHM

The latest invention in variable grid leaks. Each movement gives a definite new resistance. Positively does the work where others fail. A gradual resistance over entire range of ½ to 10 megohms. Eliminates circuit noises, is moisture proof and non-microphonic. Ideal for use in Miloplex and other circuits. Guaranteed.

The LEAD-IN

Fits right under closed window. Can be bent into any shape to fit ledges. Covered with fire-proof insulating material which prevents grounding of circuits on wet window sills. Takes the place of ungainly porcelain tubes and holes in the window sash. Always presents a neat appearance.

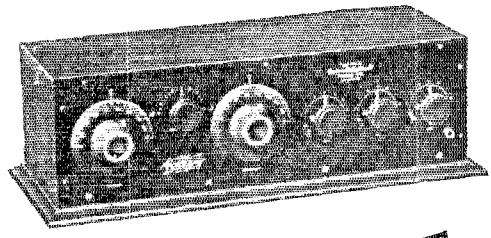


40c

All products at your dealers, otherwise send purchase price and you will be supplied postpaid.

ELECTRAD, Inc.
428-G Broadway
New York

When Other Types Are Useless



WL RADIODYNE

"The Voice of the Nation"

When interference, strays, static, etc., make other types of reception utterly useless the RADIODYNE picks up broadcast programs clear and distinct.

Stations within a radius of 2000 miles can be picked up on the loud speaker; any wavelength from 200 to 700 meters.

Price $150.00

For use in apartments, boats, automobiles, railroad trains, etc., the RADIODYNE is enjoyable where other types of receiving sets would not be practical.

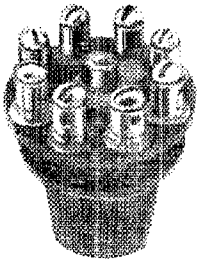
The RADIODYNE is operated by simply grounding to a water pipe or radiator, and throwing a few feet of wire on the floor. No outside antenna, or loops are necessary.

TO THE A.R.R.L.

We appreciate your efforts in boosting W. C. sets and are always pleased to furnish full information about them to members who have not yet had the opportunity to operate a W. C. 5. We want every member to know the merits of this efficient outfit. If you are interested we will gladly send you a complete description of the W. C. 5 together with information as to where you can see one in operation.

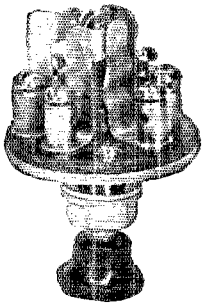
Just drop us a line and we will see that your enquiry gets prompt attention

WESTERN COIL AND ELECTRICAL CO.
305 Fifth St., Racine, Wis.



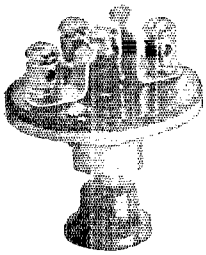
Inductance Switch

Price $1.50



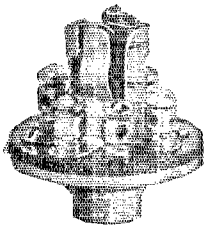
Detector Amplifier Switch

Price $1.50



Single Pole Double Throw Switch

Price $1.25



Double Filament Control Jack

Price $1.25

JOSEPH W. JONES

One of America's leading inventors, and who has been granted over 300 patents.
Inventor of the method now used for making Disc Phonograph records.
Inventor of the pioneer Speedometer and the Best, The Jones.
Inventor of the Jones Victometer, or Aeroplane Tachometer, used by the U. S. Army and Navy.
Inventor of the Jones Motrola, which eliminates the need of phonograph winding.
Inventor of the Jones Electric Drill.

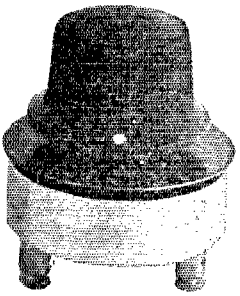
JOS. W. JONES RADIO TRADE MARK

Invented these

IMPROVED ANTI-CAPACITY

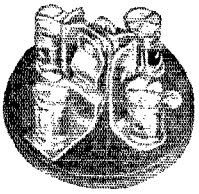
Radio Jacks and Switches
To Save Your Time and Money

HERE is a line of radio jacks and switches radically different in design and construction from any similar product. They are *not* telephone fittings modified for radio use, but are designed especially to meet the exacting requirements of the radio enthusiast who knows what he wants.
They save drilling and soldering—give you better results by eliminating capacity effects—give you a neater set, because they eliminate contact points on front of panel—they save your time, temper and money.
Most radio dealers have these little round jacks and switches with the red button. If yours hasn't, send us his name and ask for folder describing the entire line.



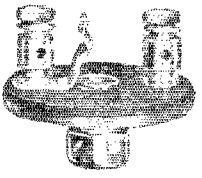
Grid Leak

Price $1.50



Double Circuit Jack

Price $1.00



Open Circuit

Price 70 cents

Single Filament Control Jack

Price $1.00

RADIO IMPROVEMENT CO., Inc., 25 W. 35th, New York

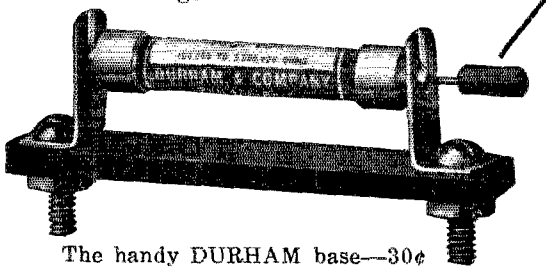
Agents in 26 Principal Cities

A folder *free* for the Juniors

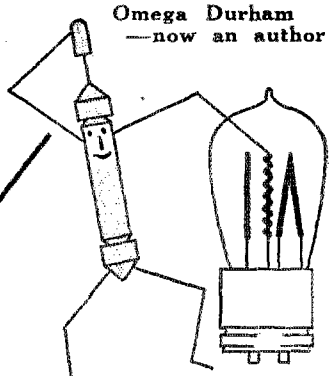
Many people write to little Omega Durham wanting to know just how he improves reception. So he's prepared a folder. And you'll want a copy. It tells why your grid leak should be *variable*—and suggests other uses for *variable* high resistance. Your copy is FREE. We'll mail one to all A.R.R.L. Juniors—but it's quicker to get the DURHAM Variables folder from your dealers.

The No. 201-A Special

This DURHAM unit is specially adapted to UV201-A, C301 and WD12 tubes—they work best with a *variable* grid leak of from 2 to 10 megs.



The handy DURHAM base—30¢



Omega Durham —now an author

Buy from your dealer

Durham Variables—75c

No. 100—1,000 ohms to 0.1 megohms
No. 101—0.1 megohm to 5 megohms
No. 201A—2 megohms to 10 megohms

Manufactured by

DURHAM & CO.

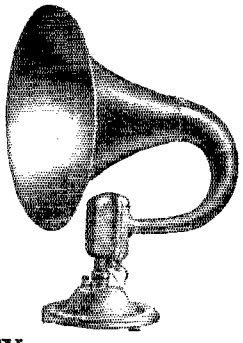
1936 Market St., Philadelphia

Dealers:—The Junior A.R.R.L. members of today are your steady source customers for the future. Help them get the free folder mentioned above by ordering your supply now.

TRADE MARK

AUDIOPHONE

REG. U. S. PAT. OFFICE



QUALITY

of Reproduction is the first consideration in a loud speaker.

You have a radio set to hear music and speech—why connect a loud speaker with volume alone as a best virtue when you can get real quality and ample volume with an AUDIOPHONE?

No battery required for field excitation.

Audiophone Sr.....Price $32.50
Audiophone Jr.....Price 22.50

THE BRISTOL COMPANY

WATERBURY, CONN.

Approved!

A FISCHER Product

Even the Experts Look No Further --- *They Know*

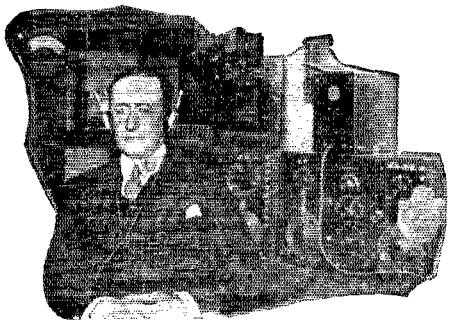
This 180° Multi-Coupler is splendidly built, Bankwound, with a wave length of 800 Meters, 5 Soldered Leads, Bankwound Stator on genuine Bakelite Tubing, Kiln Dried Rotor, Fahnestock Spring clip Connections, Aluminum Mounting Base, Non-conductive Adhesive.

20 Diagrams $4.50 Free with Each

For sale at your dealer's—otherwise send the $4.50 directly to the Manufacturer and you will be supplied postpaid.

G. H. FISCHER & CO.

123 LIBERTY ST., NEW YORK CITY



Guglielmo Marconi, as he appears today. Signor Marconi is Honorary Chairman of the Radio Institute of America.

Know More About Radio

Write for information today

Do you know radio fairly well? Take the advanced home study course that experienced amateurs and advanced radio students have been clamoring for.

Learn the details of C.W., I.C.W., and telephone and radio measurements. Learn to make fine adjustments. Understand radio constants. Make clear and simple the intricacies of tube transmitters and complicated receivers. This course offers the expert instruction for which the Institute is famous. The school is conducted by the Radio Corporation of America, the world's greatest radio organization, and has already graduated over 6,000 students, with commercial license certificates. The advanced course is as well planned as the

COMPLETE COURSE
for BEGINNERS

From the beginning of electricity to operation of commercial equipment of the latest type, the Complete Home Study Course prepares the beginner for a position as radio operator—and a big future in radio. Write for more information.

Radio Institute of America

(Formerly Marconi Institute)
Established 1909.

324 A Broadway New York City

Indicate by a cross (x) the course you are interested in:

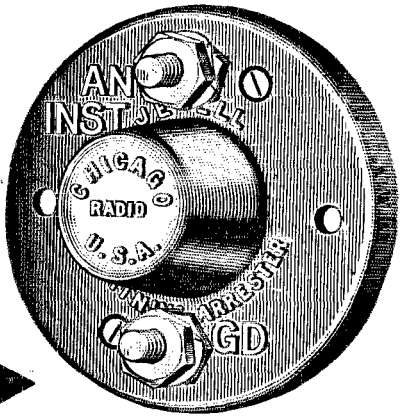
RADIO INSTITUTE OF AMERICA,
324 A Broadway, New York City.

Please send me full information about your

COMPLETE RADIO COURSE [ ]
ADVANCED RADIO COURSE [ ]

Name .....

Address .....



JEWELL LIGHTNING ARRESTER

APPROVED BY UNDERWRITERS

The latest regulations of the National Board of Fire Underwriters call for a lightning arrester on every building having an outside aerial.

The Jewell Arrester has passed all the Underwriter's tests and carries their approval.

The case is made of porcelain with a brown finish that harmonizes with interior woodwork. The price is right.

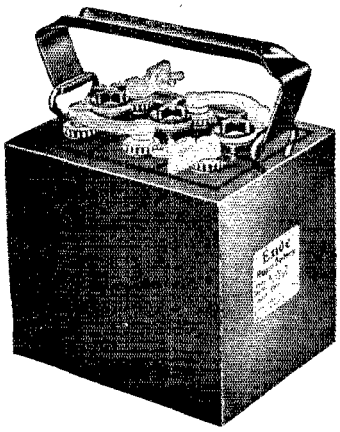
PRICE $1.10

ORDER FROM DEALER

JEWELL ELECTRICAL INSTRUMENT CO.

1650 Walnut St., Chicago

Will your battery stay for the concert?



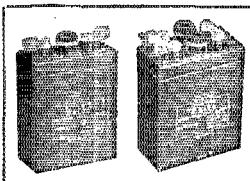
THERE is nothing more exasperating than a battery that "signs off" just when you are enjoying a splendid radio concert.

A good A battery should supply uniform filament current during a long period of discharge. Frequent recharging and replacements take all the fun out of radio receiving.

When you hook up your set to an Exide A Battery you'll appreciate what ungrudging battery service means. You'll be impressed time and again with the value of its ample capacity-rating and the smooth, unvarying flow of current that it delivers to your tubes.

Features you will appreciate

From its heavy, well-made plates to its convenient terminal binding posts, every detail of the Exide's construction is designed to help you get better reception. Vent plugs that may be inserted or removed by a single twist of the wrist make it an easy matter to add water or test the battery. A deep sediment space in the bottom of each cell eliminates danger of internal short circuits or reduced life. Wood separators of the same fine quality that are found in the Exide automobile batteries insulate the plates from one another and also contribute to the battery's long life. A stout detachable handle across the top of the battery makes it extremely easy to carry.



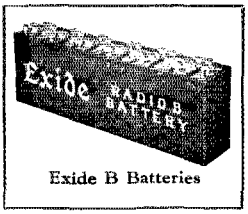
Two- and four-volt A Batteries

Two low-voltage A batteries

The Exide line has been extended to include two low-voltage A batteries, consisting of one and two cells. They are designed specifically for WD-11 and UV-199 vacuum tubes, and are right in line with recent developments in radio receiving.

The two-volt Exide A Battery will heat the filament of a quarter-ampere tube for approximately 96 hours. The four-volt Exide A Battery will heat the filament of a 60 milli-ampere tube for 200 hours.

Exide B Battery



Exide B Batteries

Current from the new Exide B Battery is full-powered and noiseless. It is free from fluctuations that cause hissing and crackling sounds in your phones. When you tune in distant stations you know that your satisfaction will not be marred by imitation static that sounds as though a heavy electrical storm were in progress.

You don't have to put up with a battery that discharges quickly. Go to any radio dealer or Exide Service Station and ask for Exide A and B Batteries.

If your dealer cannot supply you with free booklets describing the complete Exide line of radio batteries, write to us.

Exide
RADIO BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, PHILADELPHIA

Oldest and largest manufacturers in the world of storage batteries for every purpose

Service Stations Everywhere — Branches in Seventeen Cities

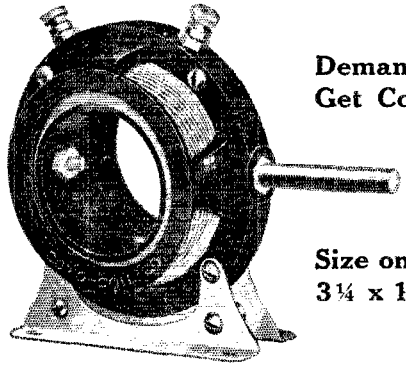
Coto

"Built First to Last"

Build Your Radio Set Coto Compact and Portable

Thousands upon thousands of radio listeners have learned the past summer that the static scare is a bugaboo. They listened in and enjoyed radio nearly every summer night.

Build your set now for portability. Make it an all the year set with Coto Compact parts.



Demand Coto!
Get Coto!

Size only
3¼ x 1¾ x 3¾

New Coto Compact Moulded Bakelite Variometer

Notice the Honeycomb wound stator. By this means a range of 200 to 600 meters is obtained in unusually small space. Here is a Variometer positive in action. Pigtail connection to rotor prevents clicking contacts. Mounts either on panel or base. Once you handle it you will take it home. Type 8000. $5.00.

JOBBERS! DEALERS!

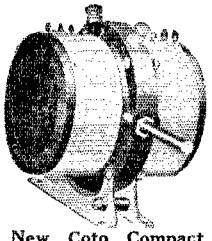
The radio parts business is the foundation of your success. Coto offers you salability and reliability. Write for descriptions and price lists.

COTO-COIL CO., 87 Willard Ave., Providence, R. I.

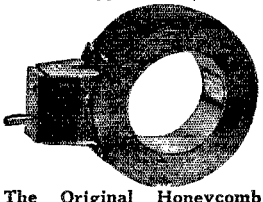
Pacific Coast Branch
329 Union League Bldg., Los Angeles

Northwestern Branch
Geo. F. Darling, 705 Plymouth Bldg., Minneapolis

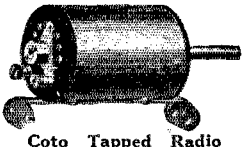
Southeastern Branch
C. P. Atkinson, Atlanta Trust Co. Bldg., Atlanta



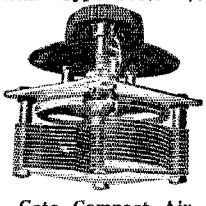
New Coto Compact Moulded Variocoupler
Companion piece of the Variometer. Size only 3¼ x 3 x 3¾ inches. Range 200 to 600 meters. Base or panel mount. Type 9000. $5.50



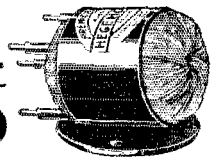
The Original Honeycomb Wound Coils
Popular low priced favorites of the amateur and experimenter. Maintained at a standard of excellence second to none. Sold mounted or unmounted.



Coto Tapped Radio Frequency Transformer
Efficiently covers the whole broadcasting range because it is TAPPED. Just turn the switch. Type 5000. $7.50



Coto Compact Air Condenser with Vernier
Only 2¾ inches square. Rotor plates soldered to shaft. Stator plates soldered at three points. .0005 Mfd. $5. .001 Mfd. $6.

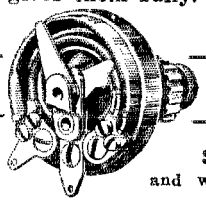


$3.50 Cut One half Actual Size

HEAR THEM ALL CLEARLY
WITH A PREMIER
"HEGEHOG"
Trade Mark

Audio Transformer

Little but mighty—a wizard for volume and tone quality. Look at the cut. It shows the "HEGEHOG" one half actual size. "Small," you say. Yes, but inside this "Little Wonder" you will find more efficiency, more reproduction volume, and less distortion than found in any other Transformer regardless of size, price, or design. The secret is in its patented construction. *It is shielded 100% against foreign noises.* Fully guaranteed. **Ratios 1 to 3, 1 to 4, 1 to 5, $3.50; 1 to 10, $4.50.** You'll want them in your next "hook-up," so get all the facts NOW. Our Free Bulletin No. 91 gives them fully. Send for it.



A Super Vernier Rheostat **$3.00** and worth it

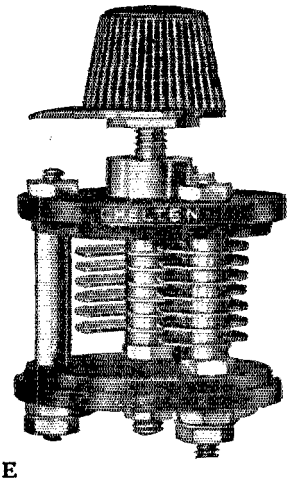
100% EFFICIENCY
FROM YOUR TUBES WITH A PREMIER
MICROSTAT
Trade Mark

There is no substitute for the Premier "MICROSTAT"—no other instrument that gives such perfect control of the current delivered to the filament of radio tubes. New principle—two windings parallel—one 6 ohm—other 40 ohm. Absolutely noiseless. Infinite control—handles any tube—Cap. 3 Amp. Bakelite moulded—silver etched dial. Do not install a rheostat until you know all about the "MICROSTAT." Our Bulletin No. 91 explains it in detail. Send for it. It's FREE. *Ask for and insist on "HEGEHOG" and "MICROSTAT" at your dealers.*

Premier Electric Company

3811 Ravenswood Ave. **Chicago**

CHELTEN RADIO SPECIALTIES



PRICE **$1.50**

Actual size of the Midget Condenser
Patents Pending

This is the Low Capacity CHELTEN MIDGET variable condenser for Vernier regulation.

Other New Type Chelten Condensers

MICROFARAD, JR.
CHELTEN VERNET
RADIOSCOPE
CHELTEN SPECIAL

(*For Radio Frequency Circuits*)

Distributing Jobbers Catalogue for 1923-1924 is now ready

Amateurs Catalogue mailed on request

Chelten Electric Company

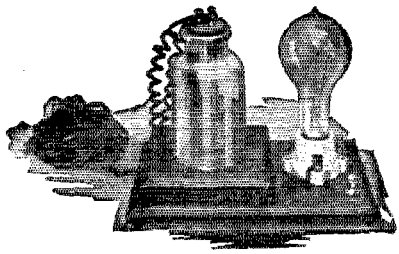
PHILADELPHIA

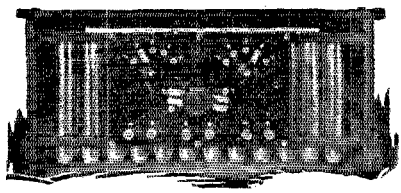
Eastern Sales Agents

H. N. SHEBLE CO.

4859 STENTON AVE. PHILADELPHIA

CHELTEN RADIO SPECIALTIES





100 Volt Panel Type

Trinidad Government Pleased With KICO Efficiency

"We are ordering this battery on behalf of the Trinidad Government whose wireless officer was impressed with the efficiency of the Kico battery we are using with our receiving set." The above extract is only one of the many endorsements we are receiving of Kico Batteries. Alkaline type, won't sulphate or buckle. Life unlimited. Not harmed by short circuiting, overcharging, idleness. Panel switches give single cell variations. Recharge from any 110-volt A.C. line with small home rectifier. Charge lasts 3 to 6 months in detector plate circuit.

GUARANTEE

Your money back on any KICO Battery if not satisfied within 30 days' trial. Write for full information on "A" and "B" Batteries

Unmounted Rectifier **$1.00**

Mounted Rectifier **2.50**

Cells	Volts	Price, Plain	With Panels
16	22	$5.50	
24	32	7.25	$11.75
36	48	9.50	14.00
50	68	12.50	17.00
78	100	17.50	22.50
108	145	23.50	28.50

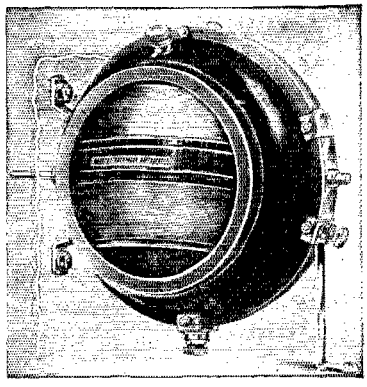
An Ideal Christmas Present for the Radio family.

KIMLEY ELECTRIC COMPANY, Inc.

2665 Main Street **Buffalo, N. Y.**

KICO

Storage "B" Batteries—long service, low cost



UNIVERSAL VARIOMETER

SPLIT WINDINGS

The instrument you will NEVER DISCARD, for its uses are without number. LIST $7.00

L & K moulded HARD RUBBER variometers and variocouplers are made in seven styles, an instrument for every use.

Descriptive Folder on Request

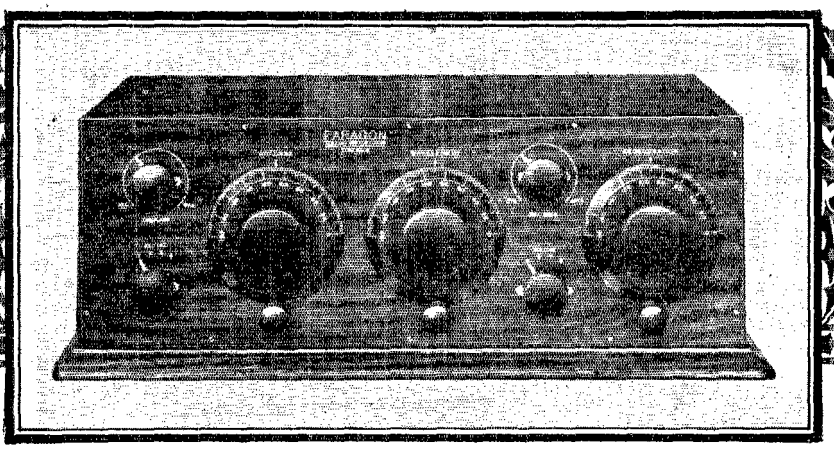
LANGBEIN & KAUFMAN

654 Grand Ave., New Haven, Conn.

BRANSTON RADIO

"Standard of the World"

Look for This Trade Mark Card In Your Dealer's Window or Salesroom



Type RB-2 Price $135.00

Announcing a *New Paragon Receiver* —the Ideal Family Christmas Gift

What could be a more wonderful Christmas gift than a radio receiving set that you *know* is the best money can buy? Think of the pleasure it will bring to every member of the family, young and old. Think of the happiness it will mean to you every night of the year.

PARAGON Radio Receivers are famous as the three circuit pioneers which have proved their superiority by eight years of practical operation.

The newest PARAGON, pictured above, is the last word in sensitivity and selectivity. The superiority of this type over all other classes of receiving equipment has been thoroughly proved by the long list of distance records which it holds. Included in these records are the reception of the first transcontinental amateur message, the reception of the first trans-Atlantic message, and the unbroken communication which it has maintained with the McMillan Expedition frozen in above the Arctic Circle.

The operation of the new PARAGON receiver is so materially simplified that even in the hands of a novice it equals in every way the performance of the older type in the hands of an expert.

All cabinet work is of mahogany with a brown mahogany finish. All metal parts showing, inside as well as outside of the cabinet are nickel plated. 98% of the wiring is invisible. The whole outfit is compact, neat, solidly built, and finely finished. It is the ideal Radio receiver and the ideal holiday gift.

An illustrated catalog of Paragon Radio Products is yours for the asking

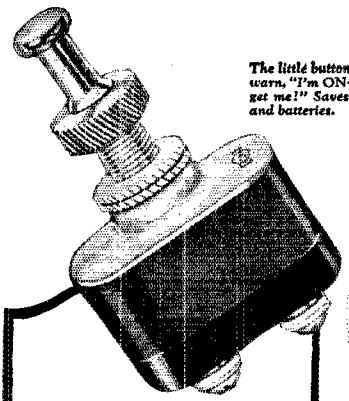
Dealers: We believe in the proper distribution of Paragon Radio Products. Our Exclusive Distributors are particularly interested in territorially protected dealers, who will concentrate, solicit and serve the consumer in the sale of Paragon Radio Receivers. If interested, write us for details.

ADAMS-MORGAN CO., 4 Alvin Avenue, Upper Montclair, N. J.

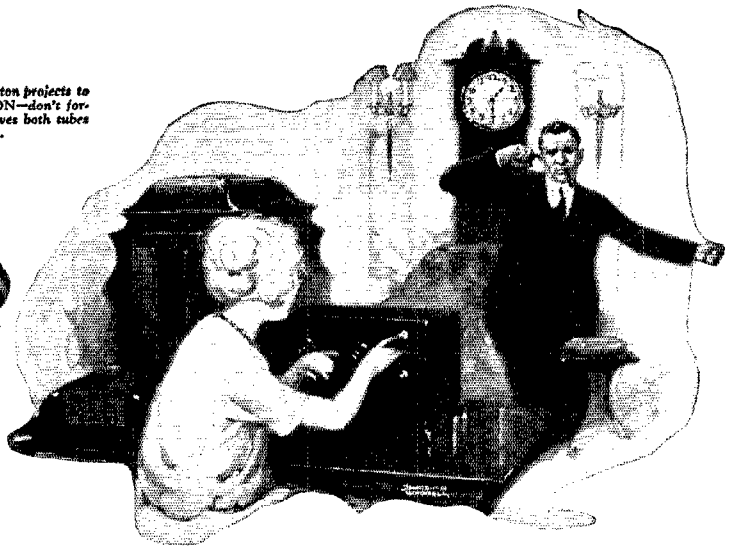
PARAGON

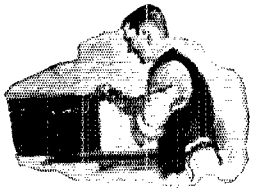
Reg. U. S. Pat. Off.

RADIO PRODUCTS

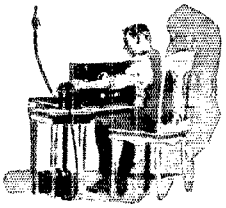


The little button projects to warn, "I'm ON—don't forget me!" Saves both tubes and batteries.

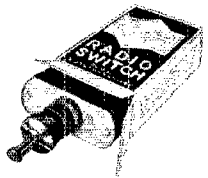




The C-H Radio Switch can be installed on any panel in only a few minutes. Just one 7-16 inch hole is required. Large, convenient binding posts with cupped washers make wiring easy.



The heavy capacity of the C-H Radio Switch makes it suitable for a great number of radio control applications. Its perfect mechanism is the result of more than fifteen years' development by the famous C-H engineers, specialists in electrical control.



The Genuine Cutler-Hammer Radio Switch is sold only in the orange and blue carton, marked plainly with the C-H Trade mark. There is no substitute —even the Cutler-Hammer engineers could not build a switch to meet radio requirements and sell for less.

If You Use the New Tubes You *Certainly* Need This C-H Switch

There is No Filament Glare to Remind You When the Current is ON—The Little Nickeled Button Takes Its Place

There is no easier, safer way to protect *any* tubes than by placing a C-H Radio Switch directly in the "A" battery circuit. Then you can always be certain, when you push in the sparkling nickel button, that the current is *completely off* throughout the set.

But with the new tubes, this little convenience becomes a necessity. There is no filament glare to remind you, and unless a C-H Radio Switch button projects to say, "I'm *On*, don't forget me," you may easily do so at the cost of tubes and batteries.

See your dealer today. Have him show you the Radio Switch in the orange and blue box—and look for the C-H trade mark. Then you can be sure that it has the famous C-H wiping knife-blade contact that cleans itself and holds a perfect connection so as not to introduce microphonic noises when used in the most delicate circuits. It only takes a few minutes to install on any panel and adds hours of pleasure. If your dealer is not yet stocked, send 60c plus 10c for packing and you will be supplied promptly.

THE CUTLER-HAMMER MFG. CO.
Member Radio Section, Associated Manufacturers of Electrical Supplies
MILWAUKEE, WISCONSIN

C-H RADIO SWITCH

A.R.R.L Members -- What about your friends?

You must have a friend or two who ought to be members of our A.R.R.L., but aren't. Will you give us their names, so that we may write to them and tell them about the League and bring them in with the rest of us? The A.R.R.L. needs every eligible radio enthusiast within its ranks, and you will be doing your part to help bring this about by recommending some friends to us. Many thanks.

.....1923

American Radio Relay League,
Hartford, Conn.

I wish to propose

Mr.....of.....

Mr.....of.....
Street & No. Place State

for membership in the A.R.R.L. I believe they would make good members. Please tell them the story.

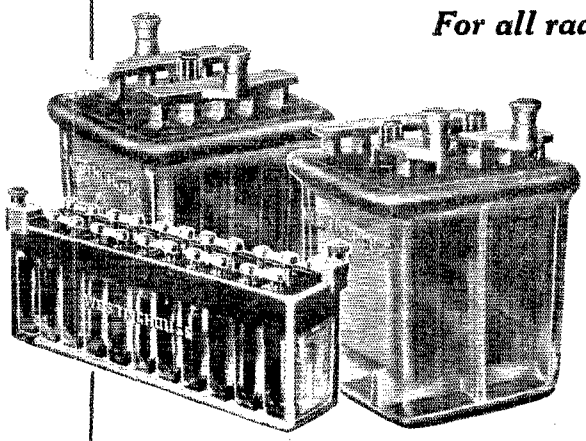
.....

.....

WESTINGHOUSE

CRYSTAL CASE "A," "B" and "C" BATTERIES

For all radio requirements

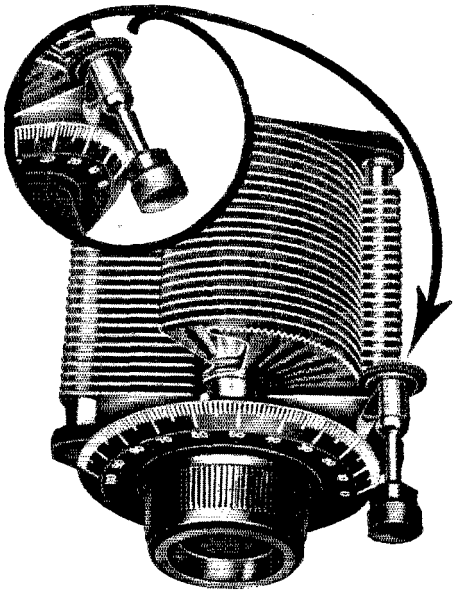


Better Batteries— Better Radio Reception

Every radio fan knows the importance of sustained battery voltage in a radio receiving set. A sudden drop in filament voltage, for example, is exasperating. Right here the name Westinghouse becomes significant. As in automobile batteries, Westinghouse Radio Batteries are the finest Westinghouse can build. The new CRYSTAL CASE types are especially efficient. Even-powered, slow-discharging, you'll quickly note their superiority for fine tuning, signal holding and sound volume. So economical too! They last indefinitely and are easily recharged at a few cents' cost.

CRYSTAL CASE *"A" Batteries*—One-piece glass case with solid glass cell partitions and plate rests. Visible interior. 2, 4 and 6-volt sizes. CRYSTAL CASE *"B" Batteries*—The 22-MG-2 (22 volts) is a wonder for steady, noiseless, full-powered service. Rechargeable, of course. Larger types, too. Also "C" batteries in 6-volt units.

WESTINGHOUSE UNION BATTERY CO.
Swissvale, Pa.



Heath's
Radiant Condensers

HEATH Radiant Condensers will tune as perfectly years later as they do the day you install them. The plates, (which in other condensers buckle and get out of alignment) in *Radiant Condensers* are *permanently* FLAT by a patented process. They are pressed into *absolute* flatness and then tempered, so that they can *never lose that flatness!* Look for the Radiant trademark, impressed on every rotary plate of Heath's Radiant Condensers.

Vernier, Geared Like a Watch

Adjusting knob geared to vernier plate so that an ordinary turn is reduced to micrometer fineness. Positive, accurate, durable. No play. Separate tension adjustment.

Write for illustrated booklet and the name of the nearest Radiant dealer.

LIST PRICES
VERNIER TYPE

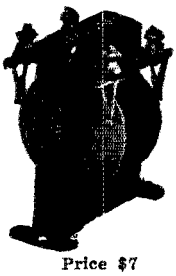
18 Plate including 2⅞" dial and knob..$5.00
25 Plate including 2⅞" dial and knob..$5.50
45 Plate including 2⅞" dial and knob..$6.50

HEATH RADIO
& Electric Mfg. Co.
207 First St.,
Newark, N. J., U. S. A.

"Where ignorance is bliss 'tis folly to be wise"

but that is no excuse for not using the acknowledged best audio transformer—

The AMERTRAN
AUDIO TRANSFORMER



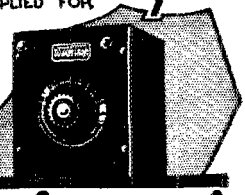
Price $7
Ask your electrical dealer, or sent carriage charges collect. (Wt. 1 lb.)

acknowledged by professional radio engineers to be the STANDARD OF EXCELLENCE for audio amplification. The reason for this is apparent in the Amplification Chart shown in our Circular No. 1005.

Turn ratio, 5:1. Amplification ratio, 30-40 times audibility in the flat part of the curve.

American Transformer Company
Designers and builders of radio transformers for over 22 years.
176 Emmet St., Newark, N. J.

FERBEND
Wave Trap
TRADE MARK
PATENT APPLIED FOR



The *Original* Wave Filter
Stops Interference!

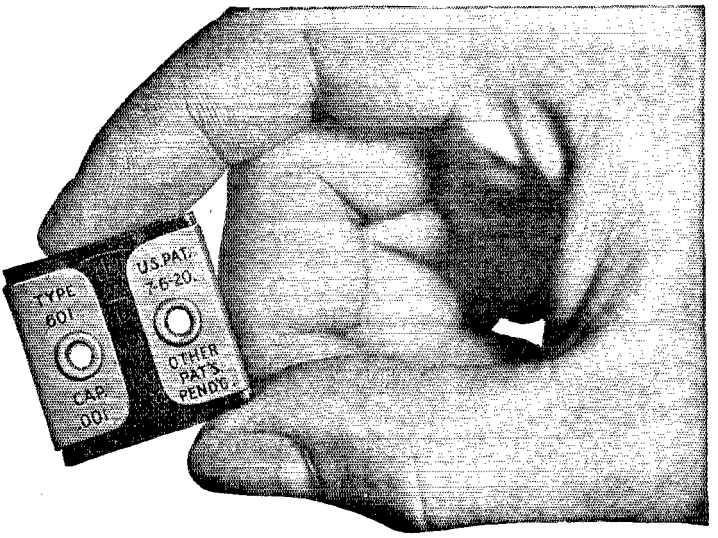
Eliminates interfering stations.
Improves the selectivity of the set.
Eliminates local broadcasting.
Selects between conflicting stations.
Simplifies tuning.
Often increases signal strength.
Reduces howling and squealing.
The WAVE TRAP is mounted on a Formica panel in a beautiful mahogany finished cabinet 6x5x6, and is a high grade instrument throughout enhancing the appearance of the most expensive sets.

8.50 CHARGES PREPAID

Ferbend Electric Co.
23 E. SOUTH WATER ST.
CHICAGO
Circular on Request

Micadons are specified by the principal manufacturers, among whom are:—

Adams-Morgan Co.
F. A. D. Andrea, Inc.
Bissell Engineering Co.
Bristol Co.
Central Radio Laboratory
Clapp Eastham Co.
Crosley Mfg. Co.
Cutting and Washington Radio Corp.
[illegible] Radio Tel. & Tel. Co.
Durham & Co.
Eagle Radio Co.
Freed-Eisemann Radio Corp.
Garod Corporation
Independent Wireless Tel. Co.
Michigan Radio Corp.
Midwest Radio Co.
R. Mitchell & Co.
Murad Laboratory, Inc.
National Airphone Co.
O. & T. Electric Corp.
Operadio Corp.
Pfanstiehl Radio Serv. Co.
Q. R. S. Music Roll Co.
Radio Distributing Co.
Sec-Tron Radio Co.
Signal Elec. Co.
Sleeper Radio Corp.
Telephone Maintenance Co.
J. S. Timmons
Ware Radio Corp.
Western Coil & Elec. Co.
Westinghouse Elec. & Mfg. Co.
Whiteland Mfg. Co.
Wireless Improvement Co.
Chicago Radio Laboratories



The BIGGEST LITTLE THING *in radio*

Here is the Dubilier Micadon, Type 601, full size.

It is the standard fixed condenser of radio—adopted by foremost manufacturers of radio sets and accessories and by discriminating amateurs because it is permanent in capacity.

Made in many styles and capacities for any circuit.

Price 35 cents up.

Your dealer will tell you more

DUBILIER CONDENSER AND RADIO CORP.
48-50 West Fourth Street, New York


Radio frequency transformer


Variable Mica Condenser


Plug and Socket

DUBILIER DEVICES

The size you want— the insulation you need

YOU don't need to wait while your panel is cut to order when you get ready to build your radio set. Just go to your dealer and ask for a Celoron Radio Panel. He will give you, without a moment's delay, the exact size you want. And — what is more important — you get the proper insulation for successful results in radio receiving.

Celoron is recognized by radio experts as the best material for insulation purposes. Its high dielectric strength makes it the ideal panel material.

Used by leading manufacturers

Many of the leading manufacturers of radio equipment use Celoron in making their standard parts. It is approved by the U. S. Navy Department Bureau of Engineering and the U. S. Signal Corps.

Celoron Radio Panels come ready-cut in eight standard sizes, selected to meet the needs of the set-builder. Each panel is neatly wrapped in glassine paper to protect the handsome surface.

Celoron panels are readily worked with ordinary tools at home. They are easy to machine, saw, drill, and tap.

Ask a radio dealer for one of the following standard sizes:

3—6 x 7 x 1/8	5— 7 x 18 x 3/16
4—7 x 9 x 1/8	6— 7 x 21 x 3/16
5—7 x 12 x 1/8	7— 7 x 24 x 3/16
1—7 x 14 x 3/16	8— 7 x 26 x 3/16
9—12 x 18 x 3/16	

We also furnish Celoron in full sized sheets and in tubes, and can cut panels in special sizes when desired. If your dealer hasn't yet stocked Celoron panels, ask him to order for you, or write direct to us, indicating by number the size you want.

Send for free booklet

"Tuning in on a New World" is the title of a booklet we have prepared especially for the radio fan. It contains a list of the leading broadcasting stations in the United States and Canada, an explanation of symbols used in radio diagrams, and several popular radio hook-ups. This booklet will be sent without charge, on request.

To radio dealers: Write for special dealer price list showing standard assortments

Diamond State Fibre Company

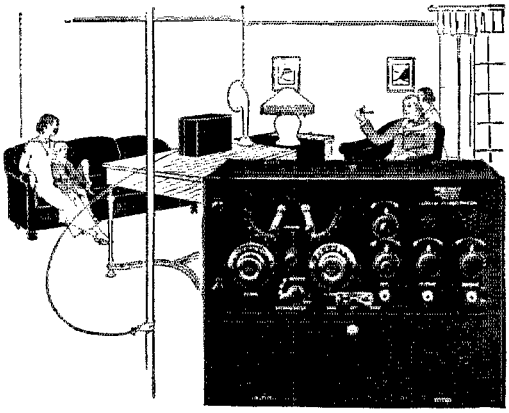
BRIDGEPORT (near Philadelphia) PENNSYLVANIA

BRANCH FACTORIES AND WAREHOUSES
BOSTON CHICAGO SAN FRANCISCO

Offices in Principal Cities

In Canada: Diamond State Fibre Company of Canada, Limited, 245 Carlaw Ave., Toronto

CONDENSITE
CELORON
STANDARD RADIO PANEL



—hook it to the waterpipe

Moon "Satterlee Antennaless" Radio will produce wonderful results simply connected to a waterpipe. No antenna, loop or indoor wire is necessary.

Stations within a conservative 1000 mile radius are regularly received with a non power loud speaker on this set.

It is the ideal set for use in apartments, automobiles, yachts or railroad trains where an antenna is not practical. Extremely sensitive, unusually selective, yet simple to operate.

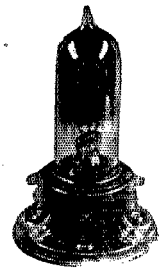
Write today for our folder "California or Newark"

MOON RADIO CORP.

501 Steinway Ave.
Long Island City, New York

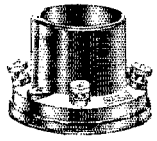
In Canada, Continental Equipment Co., Ltd.
New Birks Bldg., Montreal, Quebec

MOON
Satterlee
antennaless
—RADIO—



Na-ald Special Socket No. 499

DeLuxe Contact



Na-ald DeLuxe No. 400

It's the contact that counts

A careful examination will show that each contact in Na-ald sockets and adapters is of a wiping nature on a broad surface, and of sufficient tension, and so designed that tension is permanent, no matter how often the bulbs may be removed and how much the connecting prongs in the tubes vary.

Na-ald sockets are moulded of Bakelite with uniform cross-section, cure and other engineering features incorporated, avoiding plate to grid losses and insuring each tube to develop its fullest efficiency.

NA-ALD SOCKETS

No. 499 Socket, 199 tubes	$0.50
No. 429 Adapter, 199 tubes	.75
No. 400 De Luxe, 200 tubes	.75
No. 401 Small Space, 200 tubes	.35
No. 411 W.D., W.D. 11 tubes	.75
No. 450 Two-in-One, W.D., 11 or 200 tubes	.50

Na-ald Circuit Booklet packed with each Na-ald product.

Write for "Why a Bakelite Socket," and other descriptive literature.

Alden Manufacturing Co.

Manufacturers of Sockets and dials for every radio requirement

Dept. M 52 Willow St. Springfield, Mass.

RADIO PRODUCTS **NA-ALD**

Attention, Fans

Quality Radio Supplies

We stock all makes of sets and accessories

DeForest	Paragon
Grebe	Radio Corp.
Kennedy	Western Elec.

Experimenters Information Service

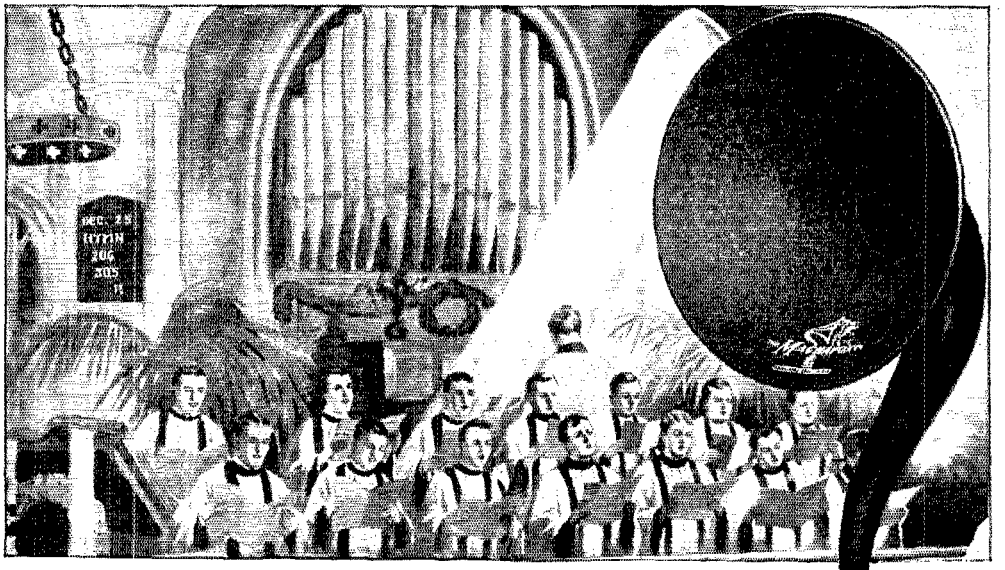
Super Hetrodyne Parts

Mail Order Exclusively

Send for Catalog

Blomeley Radio

68 Columbia Heights,
Brooklyn, New York



Magnavox brings you the Voice of all Christmastide

THE Art of Radio Reproduction is enjoyed by every Magnavox owner. Despite the ever-increasing quality and variety of Broadcast Programs, many a receiving set gathers dust unlamented because of insufficient sensitivity or an unsatisfactory "loudspeaker."

Every Magnavox owner is a master of the art of radio reproduction—the results obtained by the use of Magnavox Reproducers and Power Amplifiers cannot be equalled with apparatus constructed in the ordinary way.

The special attention of dry battery receiving set owners is called to the new Magnavox Reproducer M1, illustrated above.

Magnavox Reproducers

R2 with 18-inch horn . . .	$60.00
R3 with 14-inch horn . . .	35.00
M1 for dry battery sets . .	35.00

Combination Sets

A1-R Reproducer and 1-stage Amplifier	$59.00
A2-R same with 2-stage . .	85.00

Power Amplifiers

A1-One-stage	$27.50
AC-2-C-Two-stage	55.00
AC-3-C-Three-stage	75.00

Magnavox Products can be had of good dealers everywhere

THE MAGNAVOX CO.
Oakland, Cal.
New York Office: 370 Seventh Avenue
Perkins Electric Limited; Toronto, Montreal, Winnipeg, *Canadian Distributors*

MAGNAVOX PRODUCTS

There is a Magnavox for every receiving set

12R

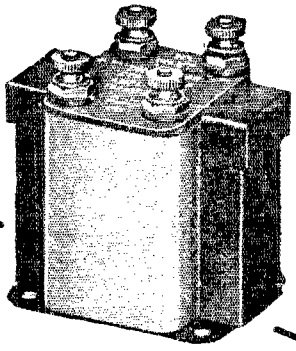
THORDARSON

KENNEDY

The Royalty  *of Radio*

The Colin B. Kennedy Co., internationally renowned for their QUALITY RECEIVING SETS, are equipping all their sets with Thordarson super-transformers.

BE



CONVINCED

ZENITH

TRADE MARK

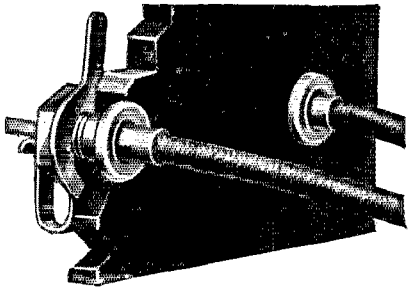
The Zenith Radio Corporation, manufacturers of LONG DISTANCE RADIO RECEIVERS, famous for the Berengaria record and their accomplishments on the S. S. Bowdoin at the North Pole, also have adopted Thordarson super-transformers as standard equipment.

SUPER TRANSFORMER

For All Temporary Hook-ups

UNION RADIO

TIP JACKS



Cost Only 25c a Pair

They give you quick, positive connections for all hook-ups—when you are building your own set or are experimenting with new circuits.

They can be attached to all standard thicknesses of panels. The bushing is ¼" in diameter and fits a $\frac{11}{64}$" hole. Will grip all wires from 24 B&S gauge up to antenna wire, battery leads, loading coils and vacuum tube lugs.

No parts to chip, lose or deteriorate. All parts heavily nickeled.

Other Guaranteed Parts

Dial adjusters for minute variations in capacities of variable condensers. Price 60c.

Variable Condensers. Famous for performance. Without dials, 3 Plate—$1.00; 13 Plate—$2.00; 23 Plate—$2.30.

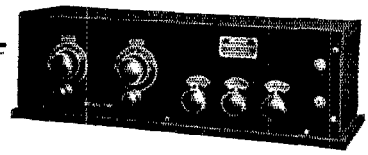
Tube sockets of molded condensite highly polished. Phosphor Bronze contact springs. Reinforced bayonet slot prevents breakage. Accommodates all standard tubes. Price 75c.

Should your favorite Radio Store not carry Union Radio Tip Jacks and Guaranteed Parts send your order direct to us, also write for your copy of "The Union Radio Catalog "D".

Retailers and Wholesalers

Samples of our guaranteed, reasonably priced "Quality Products" sent on request. Our terms and trade discounts are liberal. Write for our proposition.

UNION RADIO CORPORATION
200 MT PLEASANT AVENUE, NEWARK N.J.
NEW YORK OFFICE 116 WEST 32ND STREET



80% of demonstrations result in sales for MU-RAD dealers.

When a complete check on the radio sales of one Chicago store reveals that Mu-Rad Receivers are sold in eight out of ten competitive demonstrations, there must be a reason.
There is! Mu-Rad is easy to operate, uses an inside 2-ft. loop aerial, and is highly selective. Mu-Rad is guaranteed to receive at least 1000 miles.

Dealers: Write for MU-RAD proposition.

Inquiries are solicited from responsible dealers only. In order to help us weed out curiosity seekers, please use your business stationery in requesting this information.
We also carry a complete stock of

WESTERN ELECTRIC CO.
GENERAL RADIO CO.

parts. Write for details and discounts.

Chicago Radio Apparatus Co.

Jobbers of Good Radio Merchandise
General Offices: 401 S. Dearborn Street, Chicago

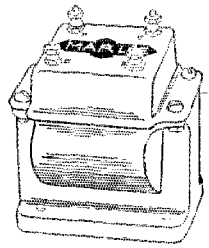
MARLE TRANSFORMERS

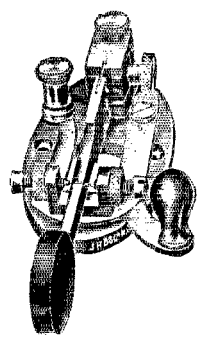
Audio Frequency
Radio Frequency

Superior Quality
Reasonably Priced

Ask Your Dealer

Manufactured by
Marle Engineering Co.
Orange, N. J.





Style W Radio Key

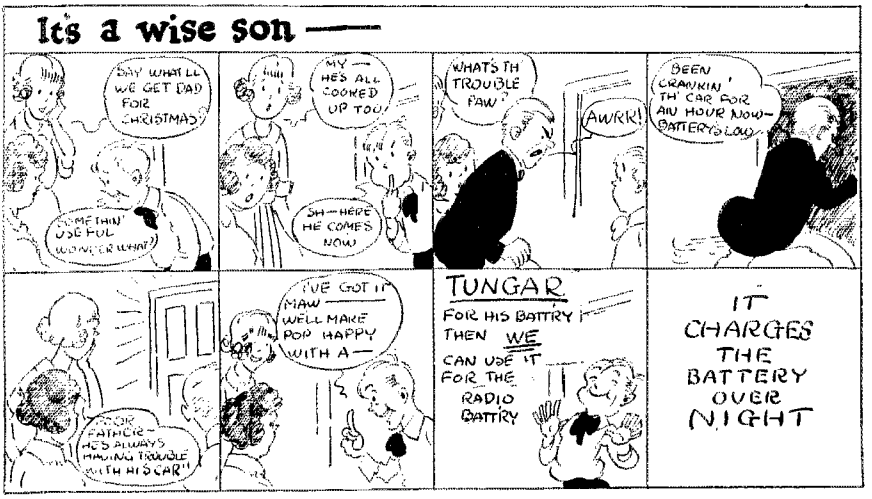
A speed key designed for radio transmission and with which cramp is unknown.

Other types carried in stock.

Sample by mail, $4.00

Send Stamp for catalog No. 45-Q

J. H. Bunnell & Co.
32 Park Pl., N. Y. C.



"Tungar—for your Christmas cheer —makes a perfect radio year" and keeps the auto battery fit

Few Christmas gifts are so universally useful throughout the year as Tungar—the simple little instrument that charges your radio or your auto storage battery from the electric light circuit.

Owners of the finest high power radio sets are depending upon the storage battery for clearest near and far reception, and depending upon Tungar to keep the battery fully charged at "concert pitch".

You attach Tungar wherever there is a lamp or a convenience outlet. Turn it on and leave it, any hour, day or night.

Operation cost low. No moving parts to get out of order.

For years motor car owners have used Tungar for charging their automobile batteries.

See it at any good electrical shop, or write for literature. Address Section Q 12.

Merchandise Department

General Electric Company

Bridgeport, Connecticut

Tungar Battery Charger. Operates on Alternating Current.

(Prices east of the Rockies)

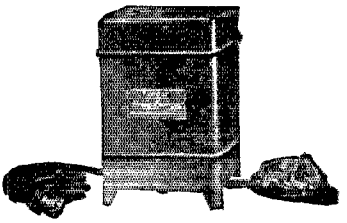
2 Ampere Outfits Complete—$18.00

5 Ampere Complete—$28.00

Special attachment for charging 12 or 24 cell "B" Storage Battery—$3.00

Special attachment for charging 2 or 4 volt "A" Storage Battery—$1.25

Both attachments fit either Tungar



Charge 'em at Home, with

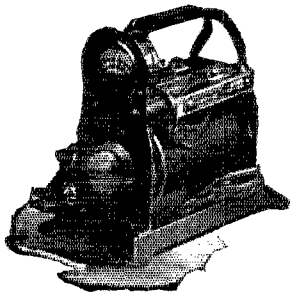
Tungar

BATTERY CHARGER

35A—105C

A GENERAL ELECTRIC PRODUCT

Sterling



Better Than Ever!

PORTABLE RECTIFIER

To keep pace with the advance of the radio industry Sterling has strived to keep a pace or two ahead of the line of march. Therefore, the improvement of its Rectifier.

The adoption of the 5 ampere maximum charging rate has been attended by a reduction in the number of contacts to but one, allowing simplicity and ease of adjustment. Special wear-resisting carbons of large cross section area prevent "freezing" and sticking. Quietness and almost total absence of sparking. Can be connected to battery without regard to polarity. Tapering charge prevents overheating, excessive gassing, etc. Connect to any 110 volt A.C. houselighting circuit.

Price (50 & 60 cycle, 6 or 12 volt).....$16.00
Price (25 cycle, 6 volt)..... 18.50
Add $1.00 west of Rocky Mts.

STERLING "B" BATTERY CHARGING ATTACHMENT

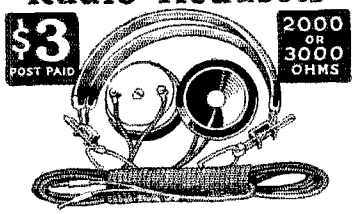
Consists of lamp receptacle and Sterling .5 ampere meter neatly mounted in small hardwood cabinet, including plugs, terminals, clips, etc. Price $5.00.

THE STERLING MANUFACTURING COMPANY

2831 Prospect Ave. Cleveland, Ohio

EDSON

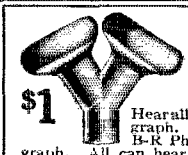
Tone Tested
Radio Headsets



THE lowest-priced first quality headset on the market today. Compare with headsets costing twice our price. Return ours if not satisfied. Our written guarantee protects you. *Send $3 by registered mail or money order.* Buy direct of us and save the difference. We ship, postage prepaid, same day order is received. Ask for our

Free Catalog of Radio Parts

EDSON RADIO SALES CO.
5 Elmwood Providence, R. I.



Loud Speaker $1

$1

Radio Adapter

Hear all broadcasting through phonograph. Make your own horn. Attach B-R Phonadapter to YOUR phonograph. All can hear. Entire family, neighbors, guests can hear operas, lectures, latest news, with this adapter. Stretches over receiver of any standard type head-set and attaches to tone-arm of ANY phonograph. Made of soft, pure gum rubber. Quickly attached and removed. Thousands in use. Will not amplify or distort. For single receiver 50
For pair of receivers (more than twice the volume) $1

Go to your dealer. If he cannot supply you send money order, check or currency at our risk. Prompt delivery—postpaid. Also send us name of favorite radio dealer.

The Beckley Ralston Company
1807 So. Michigan Ave., Chicago, Ill.

CATALOG

E19-112 PAGES FREE

EVERYTHING IN RADIO

One of the largest complete stocks in the world. 40 diagrams of latest Hookups.

DEALERS ALL OVER THE U.S.

Making big profits handling our supplies. 24-hour service. Goods shipped same day order received.

QUALITY AND SERVICE
American RADIO Mfg. Co.

WHOLESALE RADIO DISTRIBUTORS
Dept. "T" 107 E. 13th St. Kansas City, Mo.

Magnavox and BAKELITE

The insulation parts of Magnavox Radio are of Bakelite laminated sheets and rods.

* * * * * * * * *

The use of Bakelite laminated material for making radio parts assures uniformly fine results under any climatic or temperature conditions.

Unaffected by heat or cold, of great mechanical and dielectric strength, and non-absorbent, it is the *ideal* material for radio insulation.

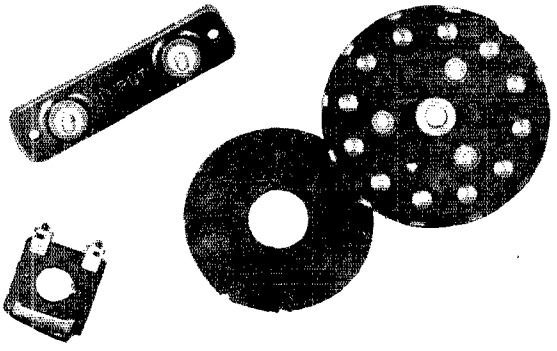
The careful manufacturer and designer of radio apparatus chooses Bakelite because of his confidence that wherever and whenever it is used in the future it will maintain the *same* resistivity which figured in his design calculations.

You will enjoy reading our Booklet C. Send us your name and address and a copy will go forward by return mail.

BAKELITE CORPORATION

Address the Divisions

General Bakelite Company
8 West 40th St., New York
Condensite Company of America
Bloomfield, New Jersey
Redmanol Chemical Products Co.
636 W. 22nd St., Chicago



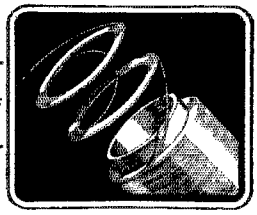
BAKELITE
Condensite
REDMANOL

are the registered Trade Marks for the Phenol Resin Products manufactured under patents owned by BAKELITE CORPORATION

THE MATERIAL OF A THOUSAND USES

Samson
HW-A1
AUDIO FREQUENCY
Transformer

THE SECRET OF



ITS SUCCESS

The Coil Does It— Nothing Like It!

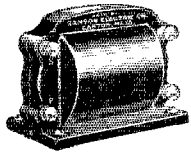
CONSTRUCTED with Helical windings in both primary and secondary Coils (an exclusive feature) the Samson Transformer has proven its superiority under actual operating conditions. In a nutshell-

a—The Effect of Distributed Capacity Reduced to a Minimum.
b—Resistance Reduced to a Minimum
c—The effect of Current Leakage between Adjacent Wires Reduced to a Minimum.
d—Clearer Reception—No Howling.

Note the Coil pictured above; wires are in *layers* at right angles to the core. Write for detail story of the advantages of this *Exclusive Samson Patent.* Free Chart No. 24 of Tests will be included.
The next time at your dealers, examine Radio's newest achievement; ask about Samson Transformers.

SAMSON ELECTRIC COMPANY,
Canton, Mass.

Ratio
6 to 1



At Dealers
$7.00

SALES OFFICES
Boston, New York, Philadelphia, Pittsburgh, Atlanta, Chicago, Cleveland, Detroit, Indianapolis, St. Louis, Minneapolis, San Francisco, Los Angeles, Seattle, Portland, Montreal and Toronto.

PANEL SERVICE

We offer to the amateur and dealer

REAL PANEL SERVICE

Our panels are cut to your order. Only genuine Condensite and Formica used.

1/8" per square inch $0.02
3/16" per square inch .02½
1/4" per square inch .03

We also carry a complete line of radio essentials. Dealers will find it profitable to have our latest price list and discount sheet.

PITTSBURGH RADIO AND APPLIANCE CO., Inc.
Desk B
"Pittsburgh's Radio Shop"
112 Diamond St., Pittsburgh, Pa.

RADIO "B" BATTERY

DIRECT FROM FACTORY TO YOU
SHIPPED PREPAID

Greatest radio B battery on market. Absolutely fresh, full voltage, seamless cells, noiseless—will bring in Concerts **LOUDER** and **STRONGER!** Built correctly—full number of voltage taps—will work **any** tube or loud speaker. Real service **GUARANTEED.** Sold direct from our factories to you at lowest prices. Shipped prepaid to your door. ORDER TODAY. Send money order, check or pay C. O. D. Order By Number

No. 2 22B—22½ volt variable—regularly $2.25—our price **$1.98**
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We Repair All Standard Makes of Tubes Including

W.D.11 or W.D.12	$3.50
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New 1½ Volt Tubes	4.00

All tubes guaranteed to do the work.

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All Mail Orders Given Prompt Attention
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Natural
Re-PRODUCTION

Atlas
AMPLITONE
LOUD SPEAKER

TRADE MARK

FOR Christmas give the radio enthusiast his fondest expectation—a perfect radio re-PRODUCER, the *Atlas Loud Speaker*. Natural re-PRODUCTION, identical with the original in the broadcasting studio. The patented "double diaphragm" responds uniformly to the full range of sound intensities. Adjustable to each individual set and receiving conditions. The *Atlas Loud Speaker* is a gift to an entire home. Hear the *Atlas Loud Speaker* at your dealer's

LIST PRICE $25

Write for Booklet "D"

Contains helpful information

The Marconi Wireless Telegraph Company
Montreal, Canada
of Canada, Ltd.,

Letters from Users Requested

The remarkable re-PRODUCTIONS of *Atlas Loud Speakers* makes every owner enthusiastic. "Musical experts," writes a man in St. Paul, 'have pronounced it the clearest reproduction they have ever heard.' What results have you accomplished with your *Atlas Loud Speaker?* Write us about them —TODAY.

MANUFACTURED BY

Multiple Electric Products Co. Inc.

ORANGE ST. RADIO DIVISION NEWARK, N. J.

Modern Replacement

for Fixed and

Variable Condensers

GREWOL Vari-Grid

Used as a 11 or 23 Plate Vernier Condenser as well as a variable grid control.

The capacity of the grid of your tube *must* be varied to secure maximum efficiency, distance, clearness and sharp tuning. This is the purpose of the Grewol Vari-Grid.

Equipped with grid leak, removable when Vari-Grid is used as vernier condenser in other circuits than the grid. Costs less! One hole to drill 1¾" in diameter, an efficient quality instrument. Write for descriptive booklet. $2.25.

AT YOUR DEALER'S

or sent direct upon receipt of

$2.25

Write for folder

RANDEL WIRELESS CO.

12 Central Ave., Newark, N. J.

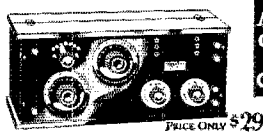
Here are a few of the items we are selling off at greatly reduced prices. Send for complete list of bargains.

Type		Regular Price	Sale Price
	Acmefone Receiver with detector two-step amplifier and loudspeaker. Can be made regenerative at small cost.....$	80.00	$30.00
HZ	Clapp-Eastham Amplifier	35.00	15.00
JM-3	5-tube Radio Frequency Detector-Amplifier.....	95.00	30.00
JM-6	6-tube Radio Frequency Detector-Amplifier	130.00	40.00
RF	DX Tuner for above radio frequency sets...	35.00	10.00
No. 8	Federal Detector-Amplifier	52.00	20.00
No. 9	Federal Two-step Amplifier	58.00	25.00
20-A	Firco Detector.....	27.00	8.00
No. 521	Kennedy Two-step Amplifier	55.00	40.00
No. 220	Kennedy Intermediate Receiver	125.00	75.00
No. 525	Kennedy Two-step Amplifier	85.00	65.00
No. 330	Remler Detector Panel..	8.50	6.50
No. 331	Remler Amplifying Panel (without transformer)	6.00	5.00
No. 502	Remler Variometer Panel	10.50	8.00
No. 505	Remler Variocoupler Panel	12.00	10.00
CR-7	Grebe Long Wave Receiver (Slightly used)	210.00	140.00

THE RADIO STORE

562 East Colorado St.

Pasadena, Calif.



MIRACO GETS 'EM FROM COAST TO COAST

At rock-bottom prices you get the efficiency of sets costing three times as much. Users tell us that Miraco Radio frequency receivers pick up stations from coast to coast. Operate either on dry cells or storage battery. Solid mahogany cabinets — finest workmanship throughout. Order direct or send for bulletin.

One tube outfit.....$18.50
Two tube outfit.....29.50
Four tube outfit.....54.50

DEALERS — AGENTS: — Write for proposition quickly—it's a winner.

THE MIDWEST RADIO COMPANY
822 Main Street, Cincinnati, Ohio.

YOUR SET DESERVES ONE

Fits Standard Mount and Stays Put.

20 S. 15th St.

CHARLES E. BONINE Philadelphia 75¢

YOU CANNOT EQUAL THE SELECTIVITY OBTAINABLE WITH

CURKOIDS

THE SUPREME INDUCTANCE

IF YOU USE ANY OTHER FORM OF TUNING ELEMENT

For real DX work, this precision tuning element is without competitor. CURKOID superiority is founded on simple scientific principles. They give greater selectivity because:

1. THEY HAVE THE LOWEST DISTRIBUTIVE CAPACITY OF ANY KNOWN FORM OF INDUCTANCE

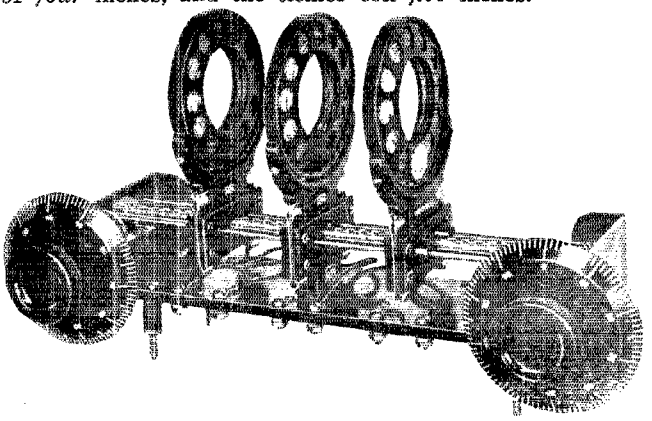
CURKOIDS are wound in the form of the curtate epitrochoid—the circle with the constantly shifting center. Adjacent turns touch each other at only one point, that of inter-section. There is a separation of many turns before one entirely parallels another. Other forms of special inductances usually have alternate turns parallel throughout.

2. THEY HAVE THE MOST CONCENTRATED MAGNETIC FIELD

The low distributive capacity of CURKOIDS is not obtained at the expense of an inefficient magnetic field. It is a highly concentrated field, which permits of extremely loose coupling without loss of signal strength. With them, you can tune out local C.W. without difficulty and pick up stations from record distances.

3. THEY HAVE THE LOWEST HIGH FREQUENCY RESISTANCE

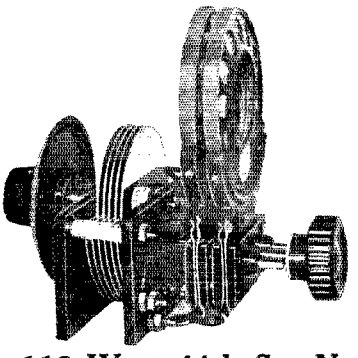
Resistance losses are not only direct waste of energy but they broaden tuning. CURKOIDS give a greater value of inductance for a given length of wire than any other form of coil. The CURKOID DUAL AND TRIPLE COUPLERS are precision instruments. One division of the dial scale represents only *one four hundredth of an inch movement of the coils.* You can obtain precisely the degree of regeneration desired and, by movement of the primary coil, you can log stations as rapidly as you can write. The primary coil moves over a space of *four* inches, and the tickler coil *five* inches.



CURKOID PRICES	
Radio Frequency Coupler	$2.75
Triple Coupler	7.50
Dual Coupler	4.50
20 K inductance	1.40
25 K "	1.50
35 K "	1.50
50 K "	1.60
75 K "	1.65
100 K "	1.70

(Made up to size 1500 K)

THE CURKOID RADIO FREQUENCY UNIT is the first completely adaptable r.f. unit developed. The *coupling* between primary and secondary is adjustable by a micrometer control. The *ratio* between the two is also adjustable to suit your tube and circuits by the use of interchangeable CURKOID inductances. In connection with efficient variable condensers the Curkoid Unit may be used for tuned radio frequency, as well as untuned.



Send ten cents for the booklet which tells you how to make simple single, two and three circuit receiving sets regenerative and non-regenerative, Reinartz, Cockaday, super-regenerative and reflex sets, including full construction data.

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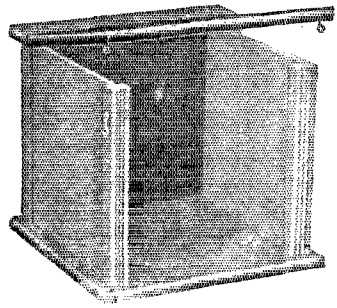
RADIO CABINETS

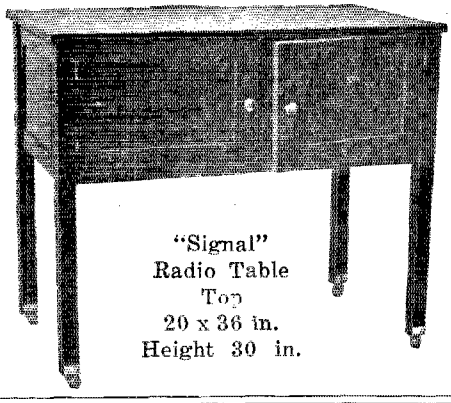
SIGNAL

29 Different stock sizes, and shapes ranging in height from 6″ to 8″ and in width from 6″ to 30″.

Rich Mahogany Finished
Highest grade Cabinet work

Made complete or knocked down. Write for illustrated folder and prices.





"Signal"
Radio Table
Top
20 x 36 in.
Height 30 in.

This table is especially designed for radio. The compartment is 12″ high with two doors opening full length. The table top is 20″ wide x 36″ long, and the height is 30″. The legs are 1½″ square brass capped with casters.

A durable piece of high class furniture $22

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HIGHEST QUALITY SILVERTONE Lowest Price TUBES

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SILVERTONE
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TONE—like a silver bell.
VOLUME—unexcelled.
LIFE—2000 to 3000 hours
OPERATES—on dry cell or storage battery.

THREE MODELS

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Bat. consumption	.06	.15	.25

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One Price **$6.00** Everywhere

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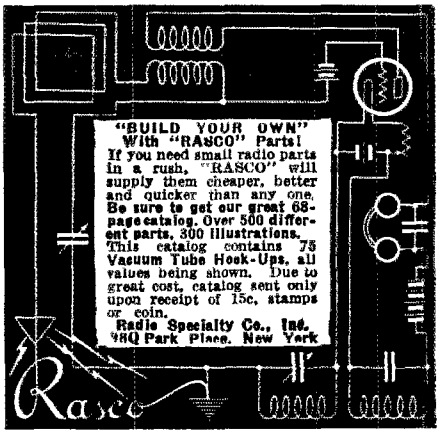
High class representatives wanted.



Write for Special Price List on
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Send 10¢ for copy of new 48 page
RADIO CATALOG
CHICAGO SALVAGE STOCK STORE
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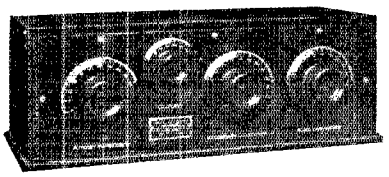
TUSKA 220 TUNER

THE FAVORITE OF AMATEURS



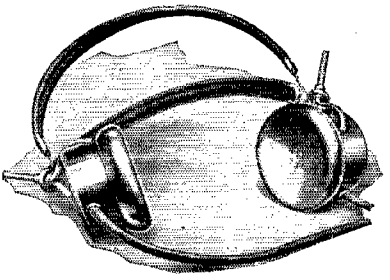
No tuner has ever been placed on the market that has been so popular with novices or experienced amateurs as the TUSKA 220 TUNER. Made by a house that has enjoyed the confidence of the radio world it is an expert and conscientious production.

The Type 220 is a complete regenerative tuning system. It has two distinct circuits; one with a range of from 150 to 385 meters, the other from 375 to 800 meters. The tuning units are: a primary series condenser, a secondary tuning condenser, plate variometer for regeneration, coupling control and wave change switch. Designed to cover its full wave lengths range with maximum efficiency. There are no dead end or capacity losses because of the wave change switch.

The apparatus is mounted in a fine mahogany cabinet 20x6x7 inches; the panel is Formica, machine engraved; high grade knobs and dials.

Due to a big merchandising deal Stern & Co., Inc., are able to offer TUSKA 220 TUNERS at a price that places them within the range of every pocketbook. SHIPPED, (WHILE THEY LAST) BY PARCEL POST OR EXPRESS, INSURED, PREPAID TO ANY POINT IN THE UNITED STATES, ON RECEIPT OF POST-OFFICE OR EXPRESS MONEY ORDER OR CERTIFIED CHECK FOR..... $21.50

Master BALDWIN Phones



We are offering Master BALDWIN Headsets and Single Units, with cords, the product of the H. G. Saal Co., Chicago, made under the Nathaniel Baldwin Patents and fully guaranteed as to material and workmanship at prices never before equalled. Just what every amateur needs.

HEADSETS, List Price $12.00, by Parcel Post, Prepaid Anywhere in the United States..... **$7.90**

SINGLE UNITS, List Price $6.00, with cord, by Prepaid Parcel Post anywhere in the United States..... **$3.95**

BIG MONEY-SAVING COMBINATION OFFER!

We will ship, on receipt of Express or Post-Office Money Order, certified check or Cashier's Draft, by Parcels Post, or Express, Prepaid, to any point in the United States—

ONE TUSKA 220 TUNER.....
ONE MASTER BALDWIN HEADSET..... } Both for. **$28.50**

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Largest Radio Distributors In Southern New England

Keep your Customers satisfied

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Progressive Radio Dealers in all parts of the country realize the importance of handling strictly high grade radio materials and apparatus. This organization wholesales exclusively,—they represent only the leading radio equipment manufacturers,—their products are guaranteed,—they are, therefore, a dependable source of supply, and the type of jobber you should tie up with for your requirements.

Your customers will be better satisfied,—your prestige will be constantly strengthened if you are able to carry ample stocks of the right kind of radio supplies at all times.

Tieing up with Hommel Service will absolutely assure these results.

Catalogue 236 will be sent promptly to dealers.

AMATEURS—Tell us what you are interested in—send us the name of your dealer and we will see that you are supplied promptly.

LUDWIG HOMMEL & CO

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HAM ADS

Six cents per word per insertion in advance. Name and address must be counted. Each initial counts as one word. Copy must be received by the 1st of month for succeeding months' issue. NOTE NEW CLOSING DATE.

WHY USE YOUR SET FOR A MORGUE? GET AN EDISON B. LASTS FOR YEARS. 100 VOLT BATTERY WITH ASSEMBLED, FUMED OAK COVERED CABINET. LARGEST SIZED ELEMENTS WIRED SOLUTION, HARD RUBBER SEPARATORS, TEST TUBES, WHITE SEALING OIL, INSTRUCTIONS, $15.00. WILLARD COLLOID CHARGER $2.00. TUNGAR CHARGERS. CONSTRUCTION SHEET 50¢. ANNEALED GLASS TEST TUBES, ¾"x6" 3¢, 1" 4¢. LARGEST SIZE TYPE A EDISON ELEMENTS 6¢ PAIR, DRILLED AND CUT IN UNITS 7¢, WIRED AND SHAPED 10¢. HICAPACITY UNIT READY TO WIRE 13¢. COMPLETE SINGLE PAIR CELL 15¢, PARTS FOR HICAPACITY CELL 22¢, WIRED AND ASSEMBLED 27¢. TYPE G ELEMENTS 5¢ PAIR, 2 POSITIVES 1 NEGATIVE 6¢, HICAPACITY UNIT READY TO WIRE 11¢, HICAPACITY CELL PARTS 20¢, WIRED AND ASSEMBLED 25¢, INCLUDING SOLUTION. GREAT FOR TRANSMITTER, POWER AMPLIFIER, NEUTRODYNES. SAMPLE A OR G TYPE CELL 25¢. 99% PURE SIZE 20 SOFT DRAWN NICKLE WIRE FOR CONNECTORS 1½¢ FOOT. PERFORATED HARD RUBBER SEPARATORS ½¢. CAN EDISON SOLUTION FOR 100 VOLTS $1.50. DRY SOLUTION 75¢ LB. PREPAID. EVERYTHING FOR THE AMATEUR FROM COUNTERPOISE TO ANTENNA. EASE THE CANS OFF THE EARS AND GET ONE OF THOSE NEW WESTERN ELECTRIC LOUD SPEAKERS AT $21 PREPAID. AMPLITONE $25.00. RADIO 8ML, 4837 ROCKWOOD ROAD, CLEVELAND, OHIO.

PURE ALUMINUM. Square foot: ⅛" eighty cents, ¼" dollar fifty, postpaid immediate shipment. H. Postage extra. Geo. Schulz, Calumet, Mich.

EDGEWISE WOUND Copper Ribbon ⅝ inch wide 6¼ inches diameter 15¢ turn, ⅜ inch wide, 5 inch diameter 12 cents turn, any number turns one piece. Remler Giblin Coils mounted 25-75-100-150-200-250-300-400-500-600-750-1000-1500 turns, half price. Genuine Silicon Transformer steel, cut to order, 25 cents pound, 10 lb. and over, 4 cubic inches to lb. Postage extra. Geo. Schulz, Calumet, Mich.

FOR SALE: 1750 watt sink spark transmitter. Write for particulars, 8TC.

FOR SALE: ⅛ K.W, 500 cycle, Crocker Wheeler, self excited generator, 1 H.P., 110V 60 cycle, single phase Induction motor and complete 100 watt C.W. set, cheap. 2CUI.

FOR SALE: Cheap 3 W.E. 50 watt "G" tubes. H.M.B. 579 Ovington Ave., Brooklyn, N. Y., phone 8178, Shore Road.

RADIO BARGAINS: Any $6.50 tube $5.75; Burgess 2156 batteries $2.50; Erla Reflex transformers any type $4.50; Brandes Superiors $5.25; Signal 23 plate condensers $1.75; Audio transformers $3.00 to $6.50; Neutrodyne and Reflex sets and parts; Complete line of accessories at bargain prices, everything guaranteed perfect. Edward Bromley, Jr., Whitewater, Wis.

WANTED: Radio Sales Engineers to call on highest grade jobbers and dealers for well known manufacturer introducing new Grimes Inverse Duplex Single Control Radio Receiving Set. Write for appointment for interview with District Manager, Box B, c/o QST.

8BHN—Reassigned to Don Canady, 3439 West 119th St., Cleveland, O. Pse QSL.

RUBBER STAMP with large call letters 50¢; Radiogram and Relay Radiogram blanks 25¢ per hundred, Post Card 60¢ hundred. Send us your orders. Carolina Printing & Stamp Co., Wilmington, North Carolina.

OHIO BRASS INSULATORS, 10" LENGTH $1.75 EACH 5" LENGTH .75¢. BETTER THAN THE BEST OF THE REST. INSTALL 'EM AND HAVE THE BEST INSULATED ANTENNA IN TOWN. FORMICA TUBING FOR INDUCTANCES, 5" INSIDE DIAMETER, PER FOOT $2.50 4½ INSIDE $2.25. LESS THAN FOOT ADD 10% BOTH SIZES 1/8TH WALL ELECTROSE LEADIN INSULATORS ½" BRASS ROD MOULDED IN, GOES THRU 6" WALL PRICE $2.50 EACH. JUST OFF THE PRESS, RADIO SERVICE CALL BOOKS 50¢ POSTAGE 10¢. TRANSFORMER CORE CUT TO YOUR SIZE, GIVE US MEASUREMENTS AND LET US QUOTE. CHEMICALLY PURE SHEET ALUMINUM, 90¢ PER SQ. FOOT. SHEET LEAD 30¢ PER LB. SHOOT YOUR ORDERS, WE'EL SHIP SAME DAY ORDER IS RECEIVED. FT. WORTH RADIO SUPPLY CO., 104 EAST 10TH ST., FT. WORTH, TEXAS.

FOR SALE: 100-25,000 Meter Single Circuit Honeycomb, 13 coils. 6"x7" panel. DX is POZ and KHJ. O. M. Carter, 103 Russel, West La Fayette, Ind.

FRESH 45V Burgess B's $4.00; 22½V Burgess large size $2.10; UV-201 $4.50; UV-201-A $5.50; WD-11 $5.00; Northern Electric peanut tube $6.00. Chesaning Electric Co., Chesaning, Mich.

CROCKER-WHEELER Generator Half-Kilowatt 1500 V. D.C. 140 bar commutator. Absolutely pure D.C. Sure makes fifties kick out. Cost over Two-Hundred new—Sacrifice First Seventy-Five takes it. Selling because have 250. 9CP.

EFFICIENT RADIO SETS explains how to make and operate inexpensive sets for receiving wireless broad-casting; New Illustrated Copyrighted Book 25¢. A. R. Collins Co., 197 Fulton, Brooklyn, N. Y.

FOR SALE: Hall relay and recorder complete. Cost $75 will take $25 quick sale. Edward Cooper, Jr., Bramwell, West Va.

WSAW FOR SALE 20 watt fone, C.W., DX 2300 miles, sell for $85. Send for foto and description, its a rare bargain. Act now. Curtice & McElwee, Inc., Canandaigua, N. Y.

250 PRINTED 3½x5½ cards $2.00. J. H. Cooper, Greenfield, Mass.

BROADCASTING STATION complete For Sale: Station known as WIL, located in Washington, D. C. This station needs no introduction. Its performances for the last two years speak for the set. This station will be in operation until it is sold. For particulars write to the Continental Electric Supply, 808 Ninth St. N.W., Washington, D. C.

NEW FIRTH famous five tube "Vocaphone" receiver, comprising tuner, two steps radio, detector, two steps audio, and built-in loud-speaker. Cost $285.00. Sell for $88.00. Brand new Philips 200 watt power tube, unused, $46.00. Palmer Craig, 3401 Glenmore Ave., Cincinnati, Ohio.

FOR SALE: 2AUZ's 100 watt C.W. set complete—2 W.E. tubes, chopper, transformer, etc. Won second prize in Second District Convention. Price $160.00 Photo on request.

EXCHANGE 10-Watt C.W. and phone for Western Electric power amplifier and horn tubes. Box 791, Dennison, Ohio.

FOR SALE: Paragon 10 Watt C.W. and Phone without tubes, etc., cabinet type used very little. Cost $70. Make offer. 5JB, Hot Springs, Ark.

ATTENTION all Hams who DESIRE SPEED. A brother Ham by using our Method increased receiving Speed from 15 to 30 words in One Evening. Ask us for copy of his letter and get the facts as told by himself. Dodge Radio ShortKut, Dept. SC, Mamaroneck, N. Y.

FOR SALE: Remler Panels less tubes, detector No. 330, cost $8.50, sell $5.25; Amplifier No. 333, cost $9.00, sell $5.50, less transformer, all like new. Prepaid on two. Geo. Schulz, Calumet, Mich.

RADIO BOOKS Experimental Wireless Stations, New Edition, regularly $3.00; Special, prepaid to QST readers only $1.60. Experiments, 256 Pages, now $1.00. P. Edelman, 309 Fifth Ave., New York City.

BARGAIN: Twenty Watt Fone CW Set Complete. Panel mounted. Henry Davies, Box 5, Falmouth, Mass.

COPPER BRAID—best conductor known for RF circuits. Surface is what counts. Many mechanical advantages over solid wire ribbon or tubing. Ideal for CW inductances, loops, OT's, pig-tails, lead-ins, etc. Twenty sizes. No. 16 for wiring receivers, fifteen feet for 50¢. 9CZP.

QRA Can. 3OM is W. E. Eldert, 60 Fifth Ave., St. Thomas, Ontario. Will appreciate and answer all cards.

"WARRANTED" C.W. TRANSFORMERS new and ten day's money back guaranteed. 500 watt plate transformers taps 500, 1000, 1500, 3000 volts unmounted $13.00. 200 watt, high voltage 350, 550, 700 volts, filament voltages 2, 4, 6, 8, 10, 12 volts-unmounted, $10.00. 50 watt high voltage 375 filament voltages 8, 10, unmounted $7.00. Filament transformers, 150 watt voltages 8, 10, 12, $7.00. Chokes 500 M.A., 1½ Henry-unmounted, $3.00. Order direct from this ad. Dealers write. C. C. Endly, 22 Sturges Ave., Mansfield, Ohio.

FOR SALE: 9AHQ 1 KW Sink Spark $60, 3400 Induction Motor $10. 15 watt panel mounted C.W. $65. Write 4 dope. 9AHQ, Mendota, Ill.

FOR SALE: 10 point aluminum Benwood gap with extra rotor $12.00, Heavy Copper Ribbon O.T. $5.00. Wanted—1 KW type "R" Thordarson. Send description and price. George B. Faunce, 30 Caloris Ave., Millville, N. J.

FOR SALE: 3 pr. head phones, Books on wireless, one large and one small Westinghouse Rectigon Battery Charger, Magnavox. (Set of Marconi Wireless telegraphy double face records—six in set.) Omnigraph, lot Radio Magazines, Radio wet battery, also lot of parts and supplies. Lock Box 708, Calumet, Iowa.

RADIO. We are temporarily overstocked on following and offer these prices. Baldwin headset $9.25, Unit and cord $4.70, Schwarze 3000 ohm $4.80, Frost 2000 ohm $3.85, Battery charger with 2 ampere tungar tube $11.00. We pay transportation. Fargo Radio Supply Co., 510 Broadway, Fargo, N. Dak.

FOR SALE: Wimco Inductance; Rheostat; Socket; Double Choke; Filter Condensers; Filament Transformer; Motor Generator; 5 Watt Tube; $50.00. All guaranteed A-1 condition. Have miscellaneous receiving parts. Marion Graham, Angola, Indiana.

ANTENNA WIRE, aluminum, No. 14; 100 feet 20 cents. 2BUL.

EDISON STORAGE "B" Battery Elements. Large size, full capacity. 3¢ per pair, in lots of 100. Kindly send postage for 5½ lbs. Per 100 pair. Gilman's Battery Shop, 57 Washington Ave., Chelsea, Mass.

WESTINGHOUSE T-F Transmitter 20 watt phone and C.W. complete with tubes, Microphone, Key and Motor Generator 500 volt, 100 watts, used twice. $150.00. Two Kenotrons 217 for 50 watt tubes @ $15.00 each. Magnetic modulator $10.00, One filter reactor U.P.1654 $10.00, One Oscillator transformer $6.00, One power transformer U.P.1016 $30.00. James C. Gill, 342 West Main St., Galion, Ohio.

FOR SALE: Zenith pre-broadcasting two variometer tuner, like new $35. Detector and two step for same $25. D. E. Gilmore, 46 Thomas St., Newark, New Jersey.

BARGAIN: Complete 10 watt CW transmitter, Regenerative receiver and two step. For particulars apply to Edwin S. Guilford, Box 224, Farmingdale, New Jersey.

FOR SALE OR TRADE, what have you? New ½ KW Thoradrson Transformer, Benwood 8 tooth disc, and large rheostat for motor. Richard Greig, 1100 Wenonah Ave., Oak Park, Ill.

RADIO APPARATUS built to order. Write for estimate. C. Chandlee Pidgeon, 1343 Clifton St., Washington, D. C.

BARGAIN: First class detector and two stage amplifier in cabinet. Works fine, $35. Must sell to raise some money. Alf. Haagenson, Barnesville, Minnesota.

WANTED: All A.R.R.L. members to know that we have a complete stock of radio parts and give mail orders special attention. Write, phone or wire. Hardsocg Mfg. Co., Radio Division, K.F.J.L., Ottumwa, Iowa.

ALUMINUM SHEET 1/16" thick. The real stuff $1.30 square foot. Send money order to E. E. HARRISON, Livingston Hall, Columbia University, New York City.

$100 buys Paragon RA-10, DA-2, Philco A battery, four B batteries, three tubes, rectifier, aerial wire, Stromberg head phones, good as new. Argus, Greenfield, Ill. Ad will appear but once.

GREBE DIALS, 4" type, yes, the real thing, $1.50; Baldwin Phones (C) Double $10.50; Singles $5.25; DeForest Vernier Condensers .0015 $12.00—.001 $11.00; UV199-WD11-WD12-UV201A-$5.95; King Amplitone Horns $7.00; Pathe Moulded Variometer or Variocoupler $3.75; Erla Reflex Transformers $4.75; Samson Transformers $6.50; Pathe Dials, similar to Grebe, 4"—$1.25; 3"—$1.00; Rheostat Dial $0.90; Thordarson Transformers, 3-1 $3.50; 6-1 $4.15; Federal-65 $6.75; Acme Radio or Audio $4.25; Murdock Phones 2000 $3.75; 3000 $4.25; All-Wave Couplers $6.50; Push-Pull Transformers $12.50 set; Fada Triple Sockets $2.75; Brandes Superiors $5.75; Everything Postpaid. Get our prices on anything in the radio line. Hendrick Radio Equipment, 85 West 181 Street, New York City.

FOR SALE: Jewell 0-5 Thermo- ammeter, $9.00; Single circuit tuner, $15.00. Two bakelite sockets for UV-203, $1.50 each, King Amplitone, $5.00; Two McTighe Storage B's, $2.50 each. Three variable condensers, cheap. A. Henglebrok, 624 Monroe, Newport, Ky.

HAMS: Get our samples and prices on printed Call Cards, Letterheads and Envelopes. Hinds & Edgarton, Radio Printers, 19 S. Wells St., Chicago, Ill.

SELL VERY CHEAP: Three Bradleystats, three RCA sockets, New five watters $5.50, both RCA and Navy RCA rheostat, RCA ten fifteen condensers, Atwater-Kent variometers Dictograph loud speaker, also quantity defunct five watters and receivers. B. L. Hinnant, 4NT, Wilson, N. C.

BARGAINS: Benwood 12 Stud Super gap and motor, $15.00. New ¼ H.P. 1750 RPM motor, 60 cycles, 100 volts, $12.00. Thordarson Special Transformer —handles one bottle, $5.00. Elwood Hoepfner, Palmyra, N. J.

OMNIGRAPH FOR SALE: Five dial, in first class condition, twelve dollars. Donald Houghton 120½ Chestnut St., Abilene, Texas.

EDISON ELEMENTS for storage B batteries, six to ten cents per pair postpaid, depending entirely upon quantity ordered. I handle only strictly first grade full capacity elements. A. J. Hanks, 107 Highland Ave., Jersey City, N. J.

SELL: 8 Stud Super-Benwood, Glass Insulated electrodes $6; ½ KW Thordarson $6. Both good as new. 2BWB.

8KG's 10 watt fone heard in London, England, (verified) and 31 states since June. Ask 2OM, 5AMF, 2CKA, 8DAT and many others how they like the circuit. Oh yes, The CW is great; also heard in Frisco during August on a bed spring aerial. Complete copyrighted circuit and dope. Two dollars. J. Wm. Kidd, 404 Lafayette St., Niles, Ohio.

350 volt Westinghouse dynamotors for 10 or 27.5 volt battery. Complete with filter $18.00. 500 cycle generators with motors or field exciters. Inductances —Bakelite construction—beveled copper ribbon 10" diam. 60 or 14 turns. 7" diam. 27 turns. $7.50 each. Henry Kienzle, 501 East 84 St., New York.

TRANSFORMER CORES—Ryerson's Silicon Electrical Sheets, 28 gauge, cut to size for Tungar filament and CW transformers. Write for details and prices to E. F. Korilla, 33 Rockford Ave., Forest Park, Ill.

PROTECT YOUR APPARATUS with small fuse wire in dangerous places. Eighth, quarter, half, three-quarter, one-ampere and larger sizes, three feet for two bits. 9CZP.

MAGNAVOX R3 OR M1. Latest nationally advertised reproducers. List $35. Introductory $25. The factory sealed carton is your guarantee. Radio Central, Dept. Q, Abilene, Kansas.

FIFTY ASSORTED FLAT HEAD solid brass machine screws, nuts, washers, copper lugs, 50¢. Eight initial binding posts, set 60¢. Twelve nickeled binding posts 50¢. All three items $1.50. RADIO LIST for stamp. All prepaid. Stamps accepted. Kladag Radio Laboratories, Kent, Ohio.

WANTED Parts for 100 watter. 9DLT.

OHIO AND WAGNER 60 cycle 110 V. synchronous motors $18.00. Attachments to make synchronous rectifiers for C.W. transmission $12.00. Acme plate transformers, King chargers, "A" and "B" batteries and other supplies on hand. Prices reasonable. Write Kimley Electric Company, Inc., 2665 Main St., Buffalo, New York.

FOR SALE: Eveready 6 V. generator for battery charger $10. Gasoline soldering torch $3, both perfect condition. Pure nickle wire 1 cent per foot or $2.00 per lb. spool. Lowrey, 326 High St., Watertown, N. Y.

RADIO GENERATORS—500 Volt 100 Watt $28.50 each, Battery Chargers $12.50. High Speed Motors, Motor-Generator Sets, all sizes. Motor Specialties Co., Crafton, Penna.

CALLS HEARD POSTAL CARDS (for DX reports). Station Call letters in color and description of station printed on Government or plain postals. 80¢ hundred up. Rubber stamps, station letterheads, envelopes, message cards, blanks, etc. Printed by 9AVO, Member A.R.R.L. Write for samples. "Used Everywhere—Go Everywhere." Radio Print Shop, Box 582, Kokomo, Indiana.

GENERATOR—100 W. 350 V. complete with belt and pulleys. $20. 9DLT.

FOR SALE: Masda Super Vernier Condenser 3 plate geared $1.25. 3 DeVeaux Jacks, open, closed and 2 circuit. $1.25. Geo. Schulz, Calumet, Mich.

SET OF HAWKIN'S GUIDES, Six Dollars. John Moore, Gadsden, Alabama.

BARGAIN: Receiver and two step. Condition OK. Good DX record. $45.00. Write 3BGN, Alfred Matthews, Cape May, N. J.

FOR SALE: Grebe CR-3, $35.00. "J" tube, $5.00. UV200, $3.00. Box 225, South Bend, Ind.

TELEGRAPHY—Morse and Wireless—taught at home in half usual time and at trifling cost. Omnigraph Automatic Tranmitter will send, on Sounder or Buzzer, unlimited messages, any speed, just as expert operator would. Adopted by U. S. Govt. and used by leading Universities, Colleges, Technical and Telegraph Schools throughout U. S. Catalog free. Omnigraph Mfg. Co., 16M Hudson St., New York.

FOR SALE: 10 watt AC CW with antenna, counterpoise and one tube $50. Three circuit receiver $15. Detector 2 stage $20. 1000 ohm phones $3.00. Yale 100 ampere hour battery $15. Two B batteries $3.50. One Radiotron detector tube and two amplifiers $15. One FF Battery Charger $12.00. Chelsea 23 plate condenser and dial $2.75. All for $130.00. Charles M. Nash, Opr. S.S. Munalbro, Portland, Me. Radio 1CRD.

FOR SALE: Honeycomb receiving set thirteen coils 150 to 25000 meters. DeForest geared triple coil mounting and two Murdock 43 plate variable condensers, all for $18.00. Short wave regenerative receiver with detector and two step, range 2000 miles on broadcast reception, $20.00. Radio Craft detector cabinet $4.00. Unusually good buys. J. Nautea, 30 Waite St., Norwich, N. Y.

FOR SALE: Paragon 2-5-U transmitter, 200 watt Acme transformer, rectifier, filter, filament voltmeter, omnigraph, Murdock aerial switch, $85. 8BDX, R. M. Nelson, 58 Pennsylvania, Binghamton, N. Y.

FOR SALE: Variometer Regenerative Receiver $25. Detector and two step $25. All guaranteed. 8IL, 41 Beattie Ave., Lockport, N. Y.

FOR SALE CASH: Power Transformer 600-1200-1800 volts, $12.50. Thermo-couple Jewell Ammeter 0-5, never used, $9.50. 3600 R.P.M. Induction Motor 1/6 H.P., 110 A.C. Like new, $18.00. Generator for charging B Batteries, 110 D.C. at 1.3 amps. Fine condition, $15.00. B. A. Norris, 1287 Parkwood Drive, Cleveland, Ohio.

MICARITE CONDENSER—Can be adjusted from .00025 to .006 M.F.D. Formica base and cover, Copper plates, Mica dielectric. Tested at 2000 volts. For transmitting or receiving. 75¢ postpaid. Radio Frequency Transformers—Type S, Range 150 to 450 meters, Type L, Range 300 to 700 meters. $2.50 postpaid either type. Nelson Radio Laboratories, 1773 Carlyon Road, Cleveland, Ohio.

SELL: 4 tube Neutrodyne $60. H. C. tuner and detector with 4 coils. Radio apparatus built to order. C. Chandlee Pidgeon, 1343 Clifton St., Washington D. C.

MASTER RADIO CODE in 15 Minutes; Qualify for Exam. 3 hours best record our students. To hesitate over Code kills Speed. To master Code our way kills Hesitation. Learning records 100 Licensed Students One Dime. Code Instructions that Instruct only $2.00. Dodge Radio Shortkut, Dept. SC, Mamaroneck, N. Y.

SELL: Crocker-Wheeler ½ KW 500 cycle motor-generator $85; ½ KW 500 cycle alternator $40; Telefunken 500 watt tubes $90; IP 500 receiver Navy $125; 8V 140AH Navy Exides $25; 300 watt 1500 volt transformer $10; Weston switchboard wattmeter $12. J. Edw. Page, Cazenovia, N. Y.

A REAL WAVE TRAP at last for $7.50. Other specials this month, one step amplifiers $14; two step $27.50; Jack control, made of standard parts. Sent Parcel Post C.O.D. Twenty-four hour service. Gillmore's Radio Shop, 46 Thomas St., Newark, N. J.

FOR SALE: 2 Magnetic modulators UT1367, $12.00 ea.; Oscillation transformer UL1008, $9.00; 2 grid leaks UP1718, $1.00 each; 6 porcelain sockets UT541, $2.00 each, 3 50 watt tubes used very little, $20.00 each; Faradon variable C.W. condenser UC1831, $7.00; 2 Faradon fixed variable condenser UC1015, $3.75 each; 3 Faradon fixed condensers UC1014, $1.75 each; Acme special filament lighting transformer 500 watt 110 volt 60 cycle secondary 10 and 12 center tap, $30.00; 8 filter condensers 1 Mfd. 1750 volt, $1.50 each; A.C. Voltmeter 0-15 V, $6.00; Weston Milliammeter 0-500, $6.00; Weston Ammeter 0-3A, $6.00; D.C. Voltmeter 0-500 V, $12.00; Jewell Thermocouple 0-10A, $10.50; Electric Specialty D.C. generator 1000 V, 1000 watt with field rheostat, $100.00; Wheeler 500 V generator 250 watt with field rheostat, $25.00; DeForest 15 panel unit set 2 step, $50.00. 3HB.

SELL: Detector, two step in cabinet, $20.; Transformers, Acme A2, $3.00, A3, $3.00; UV1714 $4.00; Coto rf $3.00; Sacoclad $2.00; Tubes WD12s $4.00; 200s $3.00; 201s $4.00; AP $5.00; Rheos 50¢; Fones, Baldwin $7.00; WE $7.00; Stromberg $3.00; Condensers, Amrad 2747 Electrolite $4.00; UC1015 $3.50; UC488; 23 plate $2.00; 43 $2.50; Potentiometers, Fada, Paragon, etc 50¢; PR 536 $1.00; WD12 sockets 50¢ DeForest 3 coil gear mount $4.50; 0-2½ Jewell RF meter $8.00; 0-300 Jewell Milliammeter $4.50; Acme choke $2.50; Atwater-Kent Coupler $2.50 Several of each all guaranteed as new. Harold Quick, 8COI, Syracuse.

STOP CORROSION: Seven strand ENAMELED copper aerial wire $1.25 hundred ft. postpaid. Eugene Proctor Co., Boston, Mass.

FOR SALE: DeForest Midget Radiophone Transmitter $45. Radisco Variocoupler $2.50. G. Robinson, 1942 Washington Blvd., Chicago, Ill.

TRANSMITTERS AND RECEIVERS overhauled, repaired, rebuilt and made to "percolate." Any circuit. Twelve years experience and up-to-date. 9CZP.

TRADE—Receiving apparatus for five or fifty watt transmitting apparatus. Can use meters, inductance, transformers, and tubes. What do you want? We have it. Radio Shop, Belmond, Iowa.

DO YOU KNOW that Mix has ZENITH at WNP? Are you going to THE same advantage in your DX this winter. Write us about special offer to Hams, clubs, schools, colleges. If you want a live wire you can get a Zenith, free. We also have a compete line of standard transmitting and receiving apparatus. Have a few small 900 cycle generators at $15. Great for 2 or 3 five watters. If you have any special needs we are the ones to consult. Radio Central Supply, 3143 W. 63rd St., Chicago, Ill.

WANTED—Names and addresses of sectional organs and other A.R.R.L. publications. Radio Print Shop, Box 582, Kokomo, Ind.

SELL: 3 circuit detector, one Audio receiver. 9AHO, 509 E. Maple St., Fairbury, Ill.

MAKING YOUR OWN, Grebe CR5 inductances for sale, wound with 20/38 litz, very neat, taps soldered, complete ready to attach to your variometer, $3.90. Grebe CR5—new $45. Coils wound to order by expert. Money promptly returned if you're not satisfied. E. Rosewater (formerly Chief, Winding Dept., A. H. Grebe & Co.,) 8514 106 St., Richmond Hill, L. I.

A BARGAIN—Complete ten watt C.W. transmitter with S tubes and Mershon condenser; includes tubes, two meters, separate filament, and plate transformers. Fifty dollars. 9EEJ.

1000 VOLT ½ K.W Esco gen. for $55. Shoved 8UE to New Zealand. Guaranteed. Like new. N. Schaefer, 32 Broadway, Lancaster, N. Y.

FOR SALE: Omnigraph No. 2, $16.00. F.F. Charger, $7.50. Write Pred Smith, Mendo, Iowa.

FOR SALE: DeForest 3 Stage Outfit, Transformer coupled, 3 Jacks and Honeycomb coil in 2 Cabinets with covers. Like new, $25.00, less tubes. Geo. Schulz, Calumet, Mich.

WESTERN ELECTRIC No. 216A bulb—new $8.50; Moorhead Amplifier bulb $4.00; Murad No. T11A R.F. transformer—new $4.00; Holt Crystal Receiver—new $5.00; Brand new lineman's climbers with straps $5.00. D. O. Shepard, Plantsville, Conn.

GENERATOR—3 H P500 V shunt wound, speed only 1100 RPM. Get 1000 V from it and handles heavy load. Perfect condition. $50.00. 9DLT.

FOR SALE: Paragon RA10 DA2 $90, 10R $25; Honeycomb 2 step with coils $60; Grimes Inverse Duplex $60; Sets built to order and repaired. Smith, 191 Alexander, Upper Montclair, N. J.

SACRIFICE sale of Radio Parts, 23 plate condenser $1.59, Vernier $2.59; 43 plate $1.79, Vernier $2.98. Genuine Baldwin Phones $9.90, Guaranteed Phones $2.90. Crosley "Ace" Type V with tube, batteries, phones, complete aerial $29.75. List price $36.00. Satisfaction or money refunded. Dept. C, Spies Radio, Bank and Ann, Baltimore, Md.

EXCESS APPARATUS for sale, including a REAL Amateur Single Circuit with Detector, One Step, and Cabinet. A1 Condition. Write for list OM. Ralph Sprungman, 1720 Third Ave. North, Minneapolis, Minnesota.

FOR SALE: Paragon RA-10, DA-2 Detector Amplifier. Western Electric Amplifier and Horn. 40% off list. 100 watt Western Electric transmitting set with high voltage and filament transformer and tubes $125. All cash. Western Electric VT-1 $6.00. New Fifty Watt Genera lElectric tubes $25. Each. New 250 watters $80. 9DXM.

LOWEST PRICES on all Radio Sets and Parts. Write us first. Radio Electric, 729 Linderman Ct., Kenosha, Wis.

SWAP—W.E. Power Amplifier and loud speaker No. 10A. Like new. Complete with tubes, $85. Cockaday four circuit set, detector two step all best parts in splendid oak cabinet, $30. C.O.D., Box 32, Boonville, Ind.

BULB RECTIFIERS, for any voltage; half and full wave types, made to order. Standard type, for "A" and "B" Batteries, up to 100 volts and variable current up to 4 amperes, $16.00. Literature on request. New Edison Cells, 37.5, 75, and 112.5 Ampere Hours, $2.50, $3.25, $4.00 per cell. Your opportunity to get the only trouble proof and everlasting battery at ¼ price. Only a few on hand. A. R. Spartana, 615 N. Washington St., Baltimore, Md.

SELL OR TRADE for ½ kilowatt spark set parts, the following guaranteed used less than 3 hours and in good condition. Acme 75 watt, center tap, filament and plate, unmounted transformer, $9.00. Radio Corp. 0-5 H.W.A., $3.50. UV202, $5.50. Two used UV200s, $1.75 each. To trade. Write me. John Stiles, Rensselaer Falls, N. Y.

REINARTZ coils $1. 3 spider webs, 150 to 500 meters $2. Used apparatus bought and sold. Wanted DeForest transmitter, Znith tuner, RCA parts. Radio 8CMU, Lakeview, Ohio.

15 WATTER for sale complete, tubes, sockets, voltmeter, Thermocoupled ammeter, inductances, Century buzzer, rheostats, grid condenser and leak, switches, etc. Mounted on Formica panel, and wired, $40.00 8WY.

FOR SALE: 10 watt CW and SWR receiver used last season at 5RN. Everything complete with tubes and accessories. 2404 Univ. Ave., Austin, Texas.

FOR SALE: 3 Cotocoil Radio Transformers, cost $5.50, sell $3.50; 2 Erla Radio Transformers, cost $4.00, sell $3.00. Like new. Prepaid on 3 or all. Geo. Cchulz, Calumet, Mich.

BARGAINS: Ferbend Wave Traps $5.00; Conecticut J807 Condensers $5.00; Wireless keys $1.25. All new. Postpaid. Van Blaricom, Helena, Montana.

FOR SALE: Brand new 750 watt CW transformer RCA UP1016 $31. Regenerative receiver consisting of 2 Atwater-Kent variometers, coupler, 2 variable condensers, detectors and two step, all in cabinet for $60. W. Vollkommer, 48 Windsor Pl., Brooklyn, N. Y.

TRADE: Practically new Remington No. 10 and typewriter desk for C.W. and phone set. Describe sessfully. L. M. Whitehurst, 823 N. 24th St., Richmond, Va.

1ZE's Reinartz Tuner with tubes $50.00

A.R.R.L. MEMBERS AND AMATEUR CLUBS ATTENTION! HERE IS AN UNUSUAL OPPORTUNITY. Am compelled to dispose immediatel of my brand-new Colin B. Kennedy (latest type) Universal Receiver No. 110 (180-26900 meters), and their No. 525 Amplifier. In original packing cases and A1 condition. Price $300. for quick sale. H. H. Wilkins, 511 West 34th St., New York City.

COMPLETE 20 watt Radiophone less generator $100.00 General Electric Motor Generator, 400 watt, 500 volt, $100. 120 watt spark set $15.00. Or make offers. The Wireless Shop, Punxsutawney, Penna.

FOR SALE: Latest Model Grebe CR-6 Receiver, $125. In perfect condition. E. W. Walker, Houghton, Mich.

FOR SALE: Eight genuine VT-11 Signal Corps Vacuum tubes. Here's your only chance to get these tubes $5.00 a piece. All money orders returned if tubes are gone. Send at once. Stewart Walker, East Sparta, Ohio.

FOR SALE: General Electric motor-generator, 500 volts, brand new, $47.50; Jewell 0-500 voltmeter, $10.00; Jewell 0-3 themo-couple radiationmeter, $8.00; RCA small grid leak, 75¢; RCA UC1014 Condensers, each $2.00. Write for list. Lee Wong, Jamestown, N. Dak.

FOR SALE: Grebe CR3 Special $35. Westinghouse Type RA Regenerative tuner, $25. Two step Amplifier, $12.00. Perfect condition. Raymond Schlegel, 1118 N. Negley Ave., Pittsburgh, Penna.

EDISON ELEMENTS for storage "B" batteries. The real kind that are dependable. Type A elements 6¢ per pair. Type G 3¢ per pair. ¾x6" heavy glass flat bottom containers 3½¢. 1x6" 4¼¢. These containers are not ordinary test tubes. Perforated hard rubber separators 1¢ each. Pure nickel wire 1¢ per foot. 5 lb. can electrolyte $1.50. Complete cell using 3 positive and 2 negative Type G plates 16¢. 500 volt battery using 3 positive and 2 negative Type G plates complete with rack and electrolyte $75.00. Other high capacity combinations. All material guaranteed first grade. J. Zied, 530 Callowhill St., Phila., Pa.

A NINE CIRCUIT Combination Primary Condenser Switch added to your receiver will give it extreme flexibility, greater wave length range and better control. Inexpensively and easily built by Blue Prints. 50¢ per set or 3 for $1.00. Sell two and get your own free. A. Franklin Starbuck, (6CIY), 569 Franklin St., Whittier, Calif.

FOR SALE: 6 Meyers Audion High Mu and Receptacles, cost $6.00, sell $3.50; Meyers Choke Coils, cost $3.50, sell $2.25. Postage 10¢ each. Prepaid on 3 or more. Geo. Schulz, Calumet, Mich.

FOR SALE: Complete parts for 20 watter. Also Kennedy 281 receiver. 9DLT.

BARGAINS: 1 UP1016 RCA CW power transformer for 50 watts, nearly new, $23.00. 2 UV217 Kenotrons, used about 10 hours, $18.00 each. R-2 Magnavox $45.00. Arthur Walser, Chesaning, Mich.

30 Henry chokes, capacity .75 amperes, $15. 3PZ

RADIO CALL CARDS printed TO ORDER. Red call, black printing. 100, $1.75; 200, $2.75, prepaid. Color changes 35¢ extra. Goverment postals 1¢ extra each card. LETTEHEADS 8½x5½ AND ENVELOPES, 100 EACH, $2.25; 200 EACH $3.50. A.R.R.L. emblem used on cards or stationery if requested by members. Send TODAY. Department 19-C. |Radio Printers, Mendota, Illinois.

9DBL's TEN WATTER FOR SALE: Heard in 38 States and Hawaii. All districts worked. Am at college and must sell. Complete with plate power supply and tubes. Cost over $150, sell $75. Write Geo. and tubes. Cost over $150, sell $75. Write Geo. Birdsall, 601 Hayward, Ames, Iowa.

FOR SALE OR TRADE: Several John Firth Receiving Sets, with and without loud speaker. Packed in original cartons. Want Western Electric Loud Speaker or transmitting apparatus. Write. W. L. Otto, Cambridge, Ill.

SACRIFICE: Three UV203, $25.00 each; 10 UV201A, 8UV199, $5.30 each; 3 pair Baldwin "C" phones, $8.00 pair. All brand new. J. A. McDonald, 151 W. 102 St., New York City.

FOR SALE: 900 cycle, 250 watt, ball-bearing belt drive alternators with transformer wound for any voltage. Fine business for plate supply. While they last at $18.50, cash with order. Miscellaneous transmitting apparatus. State your wants. N. A. Patchin, 226 Slocum Pl., San Antonio, Texas.

ELEVEN used GR HC and DL, highest 750; new WD-12; new WR-21 with socket; Remler dials and coil plugs; .00025 Micadons. Need two All-American 3-1 shielded, GR coils 1000 up, garage type Homcharger or offer. A. Woody, Homewood, Ill.

2 UV204s FOR SALE: All parts of 9AUL. Heard in 13 countries. Complete spark coil CW set. 9AUL, Mpls.

FOR SALE or trade: Radio Receiving Apparatus. Write Albert Krug, Gardner, Ill.

STATION ACKNOWLEDGEMENT CARDS, Our Special Design; Send Stamps For Sample and Prices. Efficiently Arranged Blue Radiogram Blanks At 25¢ Per Hundred. Van Wert Printing Co., Van Wert, Ohio.

FOR SALE 5KC 1KW SPARK. DX 1600 miles. Only used during the month of December. Consists of Acme Transformer with ¼,⅓, and 1KW Taps, Synchronous Spark Gap, ½ inch Plate Glass Condenser, Extra heavy O.T. and 2KW Marble base key. Worth $115., Sell $65. or exchange for 3 used UV-203s Radiotrons. Vincent Rosso, Plaquemine, La.

FOR SALE: 100 watt, 500 volt General Electric motor gen. set. New. $40.00 F.O.B., Fort Dodge, Iowa. Harold Pirie, 1416 Central.

MAKE $120 WEEKLY IN SPARE TIME
Sell what the public wants—long distance radio receiving sets. Two sales weekly pays $120 profit. No big investment, no canvassing. Sharpe of Colorado made $955 in one month. Representatives wanted at once. This plan is sweeping the country. Write today giving name of your county. Ozarka, 853 Washington Blvd., Chicago.

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1OA—S. Kruse, "LQ," 20 Rodney St., Hartford, Conn.
9KW—S. Kruse, "LQ," 1538 Kentucky St., Lawrence, Kansas.

1AKR—Hugh Pollock, 15 Whitford Ave., Pawtucket, R. I.

2AG—C. R. Runyon, Jr., 544 North Broadway, Yonkers, N. Y.

2AH—Morton Lipper, 125 West 76th St., New York City.

2CLG—Oak Drive, Great Neck, L. I., N. Y.

2BBX—Burton Synnott, 1287 Castle Hill Ave., Bronx, New York City.

Can. 2FB—Albert J. Lorimer, Farnham, Que.

3HA—W. Scobell Phippen, Napanee, Ontario, Can.

4EU—Edw. Fox, 600 Crescent Ave., Charlotte, N. C.

4JR—Robert S. Morris, 413 S. Broad St., Gastonia, N. C.

5WO—S. E. Adcock, 2000 Washington Ave., Knoxville, Tenn.

6XAD-6ZW—Major Lawrence Mott, Avalon, Catalina Island, Calif.

6ZAR—C. C. Whysall, Los Gatos, Cal.

7ACI—A. B. Williams, 510 West Park St., Butte, Montana.

8ANB—Carl P. Goetz, 1128 Atwood Ave., Cincinnati, Ohio.
8ZAB—Carl P. Goetz, 1128 Atwood Ave., Cincinnati, Ohio.

8BBI—W. Guy Watson, 457 Florence Ave., Royal Oak, Mich.

8BNH—W. E. Slabaugh, Jr., 142 S. Union St., Akron, Ohio.

8BVD—M. E. Johnson, 93 Sawyer St., Rochester, N. Y.

8CXM—Clarence Doty, 519 Nancy Street, CharlesTON, West Virginia.

8DIG—C. H. Baird, 329 South Richardson Ave, Columbus, Ohio.

8DGO—A. H. Cassin, 731 16th St., Port Huron, Mich.

8ZC—R. E. Humes, 834 Jefferson St., Springfield, Ohio.

8KH—Barton T. Dreyer, 1516 Montclair Ave., Detroit, Mich.

9ADH—E. Peacox, 52 Radford St., Yonkers, N. Y.

9AWV—Geo. Edw. Zembal, 406 Buchanan St. N.E., Minneapolis, Minn.

9AWY—J. C. Harrower, 1138 N. Walker Ave., Chicago, Ill.

9CEA—Floyd Saint, 200 N. Pioneer Ave., Lyons, Kansas.

9DTT—Paul Lutz, 1365 Bardstown Road, Louisville, Ky.

9EM—James H. Slusser, 1214 Erie Ave., Logansport, Ind.

9CHV—Clark Spalsburg, 721 Miss. St., Lawrence, Kansas.

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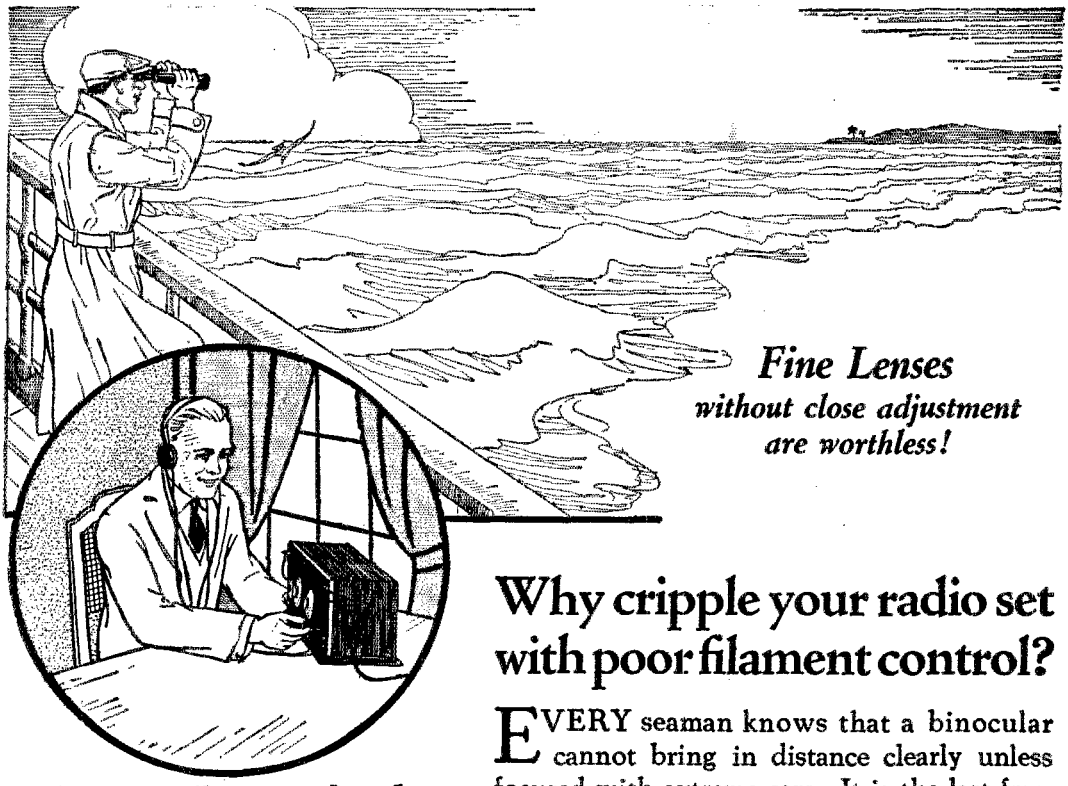

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EVERY seaman knows that a binocular cannot bring in distance clearly unless focused with extreme care. It is the last fractional turn of the adjusting screw, perhaps the width of a hair, that brings the distant object within the range of clear vision. The slightest turn, either way, makes a blurred, distorted image.

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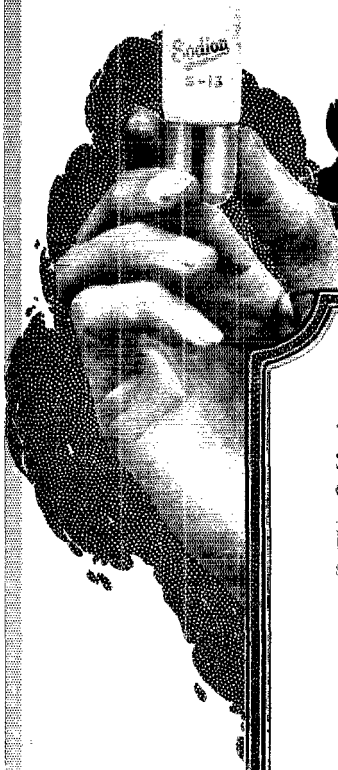

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A New Era in Radio

That, in the fullest sense of the word, is what the SODION TUBE means to everybody who owns or expects to own a receiving set.

Based on an entirely new principle—utilizing the highly valuable and peculiar properties of the sodium ion

The Sodion Tube

(Sodium–Ion)

is many times more sensitive and produces far stronger signals than any detector yet developed. Due to the fact that it cannot be made to oscillate, it not only eliminates any semblance of whistles or beat-note howls in your own reception, *but does not interfere with the reception of others.*

At a meeting of the Institute of Radio Engineers where this tube was being demonstrated, a prominent Scientist and Radio Engineer in contrasting this with the action of the ordinary detector, dubbed it

"THE GOLDEN RULE TUBE"

Stable and uniform in operation. Runs for hours without adjustment. Has no grid. No grid leak or grid condenser are required. Crystal tone reception. Unusually sensitive to weak signals. Operates on dry cells or storage batteries.

Bulletin A-100 describing this tube upon request.

CONNECTICUT TELEPHONE & ELECTRIC COMPANY
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RADIO DIVISION

AMRAD

Mershon Electrolytic Condenser, No. 2747 25-30 Mfds. only $8.00.

The IDEAL FILTER

Operation of radio transmitters on AC current supply has been retarded by lack of an effective filter which would render inaudible the disagreeable AC hum.

As every amateur knows, a successful filter requires choke coils and a high value of capacity. Paper Condensers have heretofore been the only suitable capacities available, but these have been costly, not only because of their high first cost, but also because of their susceptibility to puncture, which renders them permanently useless.

The MERSHON ELECTROLYTIC CONDENSER meets the filter problem admirably. High capacity—compact—economical. The first cost is the last cost. Although abnormal voltage will break it down, this Condenser can be rehabilitated by re-forming the anode.

Order from your Dealer or send your remittance direct to us, and we will ship promptly.

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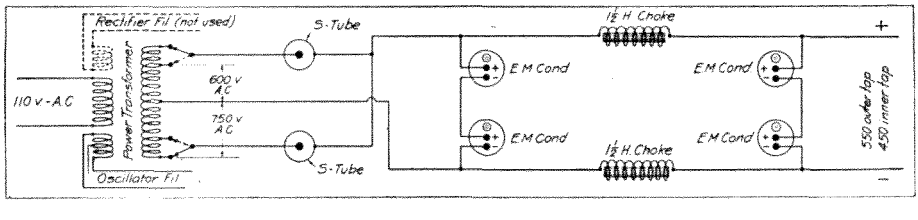
Illustrated below is an ideal filter (with "S" Tubes) consisting of two M.E. CONDENSERS across the DC source, a double 1½ henry choke, and 2 M.E. CONDENSERS as a bypass. This arrangement renders the AC hum inaudible at stations only one mile away and projects the voice as free from distortion as can be obtained from the best and most expensive motor generator set.

Write for Bulletin J-2



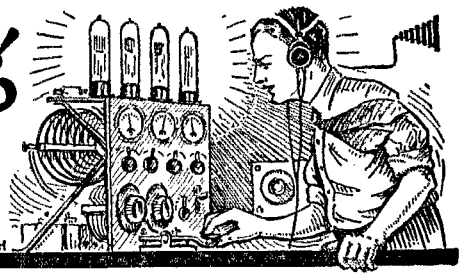
AMERICAN RADIO AND RESEARCH CORPORATION

205 College Ave., Medford Hillside, Mass.

AMRAD Dealers in Principal Cities

The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.



HONESTLY, fellows, it is a tiresome job to be continually warning you about this business of using wave-lengths above 200 meters on a general amateur license and transmitting during "quiet hours." In every circular letter and every broadcast, we have cautioned you about these very things. You know that you are not licensed to transmit during "quiet hours" and you know a general amateur license doesn't specify wave-lengths above 200 meters. Why do you continue to violate these regulations? Don't you care whether you lose your license or not?

Even tho it is tiresome, it is our duty to warn you and we like to do our duty by you, but we also like to see some results of our efforts. Your station is NOT licensed to transmit between the hours of 8:00 and 10:30 P.M., nor on Sunday mornings during local church services. The band of wave-lengths which you may use is specified on your license.

We have noticed that the most flagrant violators are those fellows who start blasting away about 10:25 P.M. with a 5 minute "CQ," and we venture a guess that it will be this same "CQ Hound" who gets caught first. We feel that the Department of Commerce has been very reasonable toward us and that we all have had sufficient time to adjust ourselves to the new regulations. If your license is suspended for any violation, we know we have warned you many times and you needn't come to the A.R.R.L. with a long tale of woe about how Willie Jones changed your wave-length or how little sister changed your clock. The A.R.R.L. stands for the radio laws of the United States and Canada. So that's that! It is now up to YOU, fellow amateur.

Probably by the time this issue reaches you the new O.R.S. certificates will be in the mail to those stations which comply with the requirements. In the future, to obtain an O.R.S. certificate the station must show that the wave length complies with the law and that strict observance of the quiet hours is enforced. No station which uses an illegal wave-length or which transmits during the quiet hours can become an O.R.S. The new O.R.S. certificate will be an honor medal among radio amateurs that will be evidence of observance of law. It will mean that such station takes pride in the delivery of messages within the prescribed time or that the messages will be mailed to their destinations without further delay. We're going to correct this business of non-delivery. It may take some time, and we'll correct it just as the "rubber stamp message" business was corrected.

Late news comes to us that Alaska has been opened up for traffic. We have a letter from 7ABB who has worked 7AHB in Anchorage, Alaska. Also 7MN, in Ketchikan, Alaska, is QSO 7ABB. This paves the way for a dandy relay—Porto Rico to Alaska. If further information proves the possibility of such a thing, get ready for the "Alaskan-Porto Rican Relay" probably some time in February. We'll have some real fun with a relay of that kind and we might even push it up to WNP and back. Keep it in mind, gang!

At the request of the Australian Radio Relay League, twelve of the most powerful stations on the Pacicfic Coast have been appointed terminal stations for Australian traffic. Until such time as two-way communication is established it has been proposed that these stations broadcast messages for Australia. The stations were selected by the San Francisco Radio Club convention and are as follows: 6AUU, 6ZH, 6CHL, 6NX, 6CMR, 6ALK, 6PL, 6KA, 6CGW, 6BVG, 6AWT, and 6ARB. Australian traffic may be sent to any one of the above stations and an earnest effort will be made to transmit it to Australia.

ADDITIONS AND CORRECTIONS IN OCTOBER DIRECTORY

WINNIPEG DIVISION

Manitoba and Saskatchewan.

D.M.—J. E. Brickett, 260 Athabaska St. E., Moose Jaw, Sask. Canada.

Saskatchewan

A.D.M.—E. L. Maynard, Morse
C.M.—W. R. Pottle, 1164 Willow Ave., MOOSE JAW, 4AO
C.M.—W. R. Pottle, 1164 Willow Ave., Moose Jaw, 4AO
C.M.—G. Stevenson, 600 Queen St., SASKATOON, 4FN
C.M.—Geo. Shadick, 2079 Rae St., REGINA, 4BR
O.R.S.—4AO, 4FN, 4AJ, 4ER, 9BX, 4BB.

Manitoba

A.D.M.—S. G. Patterson, 612 Beresford Ave., Winipeg, 4DY
D.S.—A. J. R. Simpson, 408 McGee St., Winnipeg, 4DK
O.R.S.—4CN, 4DK.

MICHIGAN: Transfer Kalamazoo county from Dist. No. 2 to Dist. No. 3. Dist. No. 1: O.R.S. 8CE should read 8CF. New O.R.S. 8VT, 8BBI, 8DLM, 8AIH, 8BLX. Dist. No. 2: New O.R.S. 8BWR, 8DFB. Dist. No. 3: D.S. J. Wilson, 318 N. Church St., Kalamazoo.

ILLINOIS: Dist. No. 1: Delete 9VM. New O.R.S. 9COL, 9ARB. Dist. No. 3: New O.R.S. 9TW, 9CTC, 9CTK, 9DBW, 9DJG, 9BHH. Dist. No. 4: C.M. DANVILLE—J. Fairhall, Main & Gilbert Sts., 9VV. Change C.M. of Champaign to read C. Tanner, 36 E. Green St., Champaign,

9DCR. New O.R.S. 9DKH, 9CLJ. Dist. No. 5; New O.R.S. 9CIZ, 9AYX. Dist. No. 6; Transfer Cook county to Dist. No. 7, which will be a new district under D.S. J. E. Brennan, 5714 W. Race St., Chicago. O.R.S. are 9AAW, 9AC, 9AOY, 9LZ, 9UZ.

NORTHERN INDIANA: Dist. No. 1; Delete O.R.S. 9CBB. Dist. No. 2. New O.R.S. 9DYT.

OHIO: A.D.M. C. E. Nichols, 739 Weadock Ave., Ohio, 8AA. Dist. No. 1; Change D.S. to read: Kenneth Uncapher, 730 Woodlawn Ave., Van Wert Ohio. C.M. LIMA, James Lisk, 902 S. Elizabeth St.,, Lima, Ohio. Add O.R.S. 8BSI. Dist. No. 3; Cancel C.M. AKRON, 8KWA. New O.R.S. 8KG, 8AJD. Dist. No. 4; Cancel C.M. NORWOOD, 8EB, Cancel O.R.S. 8EB, 8DAG. Dist. No. 5; Cancel O.R.S. 8AER. Dist. No. 6; New O.R.S. 8BKN. O.R.S. 8RY has changed from Dist. No. 3 to Dist. No. 2.

WISCONSIN: Dist. No. 1; Call of M. H. Doll, West Allis, is 9ALR. New O.R.S. 9CFZ, 9ALR, 9CCD, 9AHO, 9FI, 9DHM, 9CFZ. Dist. No. 2; New O.R.S. 9EEY, 9CWZ, 9CHE, 9DDH, 9ATX, 9DZN, 9DUU, 9ALG. Dist. No. 3; New O.R.S. 9BGB, 9BYE, 9DLY, 9AMQ, 9BHQ. Dist. No. 4; New O.R.S. 9DST, 9ALI.

NORTH DAKOTA: Dist. No. 1; New O.R.S. 9GK, 9BAN, 9AUU, 9DLI. Dist. No. 2; 9DKB.

SOUTH DAKOTA: Dist. No. 2; O.R.S. 9CTS should read 9CJS.

MINNESOTA: Dist. No. 1; New O.R.S. 9EGU, 9DOE. Dist. No. 2; County Watona should read Watonwan. County Winona should appear in this district. New O.R.S. 9BCP, 9DSW, 9BKX, 9DCH, 9EGG, 9DDP. Dist. No. 3; New O.R.S. 9CVV.

LOUISIANA: Dist. No. 1; D.S. W. E. Owen, Alexandria, La. 5WG. New O.R.S. 5WG. Dist. No. 2; D.S. P. E. Greenlaw, Franklinton, La.

MISSISSIPPI: Delete 5NJ. Dist. No. 2; New O.R.S. 5NJ.

NEW HAMPSHIRE: Change A.D.M. to B. H. Stevens, 118 Brook St., Manchester, N. H. Dist. No. 3; Change C.M. to C. R. Sawyer, 11 Stark St., Manchester, 1GL

EASTERN MASS: Dist. No. 1; Delete 1AGS, cancel 1IZ. New O.R.S. 1BCN, 1LT.

WESTERN MASS: Dist. No. 4; Cancel C.M. WESTFIELD, 1BLN. Dist. No. 5; Change D.S. to read R. A. Nystrom, 336 Elm St., W. Springfield, Mass. Dist. No. 7; Change address D.S. to 268 Main St.

CONNECTICUT: Dist. No. 1; New O.R.S. 1IV. Dist. No. 4; Delete 1OV.

MAINE: Dist. No. 1; County Osford should read Oxford. Dist. No. 4; Delete 1BSJ.

VERMONT: Districts No. 1 and No. 2. A.D.M. R. P. Slayton, Converse Hall, Univ. of Vt., Burlington, Vt., 1ARY. Dist. No. 1; Counties: Grand Isle, Franklin, Orleans, Essex, Chittenden, Lamville, Caledonia, and Washington.
D.S.—C. E. Jennings, Hardwick, Vt. 1AIQ
O.R.S.—1AIQ, 1ARY
Dist. No. 2; Counties: Addison, Orange, Rutland, Windsor, Bennington and Windham.
D.S.—J. J. Eaton, Rutland, Vt. 1CJH.
O.R.S.—1CJH.

RHODE ISLAND: Dist. No. 1; New O.R.S. 1AWV.

UTAH: Dist. No. 1; Delete G. J. Quillman, 2421 Jefferson Ave., C.M. OGDEN. Add C.M. SALT LAKE CITY Don B. McRae, Salt Lake City, 6RM. New O.R.S. 6CBU. Dist. No. 2; County Duchense should read Duchesne.

COLORAD: Dist. No. 1; New O.R.S. 9BJK, 9AVU. Delete O.R.S. 9FV, 9OCJ.

CALIFORNIA: Dist. No. 2; C.M. M. P. Potts, FRESNO street address should be 3265 Belmont St. New O.R.S. 6VD, 6CMR, 6CBB. Dist. No. 3; 6CDG. Dist. No. 7; 6CBW.

IOWA: R.M. J. P. Gillett, R.R. No. 2, Rippey, 9BGH. Dist. 1 add C.M. Paul Lovet R.I. Jersey Ridge Rd. DAVENPORT. Dist. No. 2; County Wapallo should read Wapello. O.R.S. 9ZA should read 9ZAA.

KANSAS: Dist. No. 1; Change D.S. to read Ed. Barricklow, R.F.D. No. 2, Courtland, 9CCV. Change C.M. KANSAS CITY to read William Hinton, 9DLM. Dist. No. 2; Change D.S. to read Merwin Lewis, 312 E. Rutledge St., Yates Center, 9CCS. Add O.R.S. 9BEZ, 9CFI, 9DSD, 9CCS, 9AQE, 9CLW, 9CAC, 9DHB.

MISSOURI: Dist. No. 1; County Schyler should read Schuyler. New O.R.S. 9EKY, 9PW, 9DCW, 9NU, 9BHI. Dist. No. 2; County KeKolb should read DeKolb. C.M. H. S. Cchnur should read H. S. Schnur, Jr. Cancel C.M. KANSAS CITY, 9RR and O.R.S. 9BMN. New O.R.S. 9DLT, 9DJB, 9DAE. Cancel O.R.S. 9CLW.

NEBRASKA: Dist. No. 1; County Sarpy should read Sarpy. Dist. No. 2; County Deith should read Keith, and county Sward should read Seward. New O.R.S. 9YU.

DISTRICT OF COLUMBIA: New O.R.S. 3EM.

NEW JERSEY: Dist. No. 1; New O.R.S. 2CSA. Dist. No. 2; Change address for C.M. to Columbus Ave., WEST NEW YORK name is L. R. Shropshire. New O.R.S. 2CJP, 2BIR. Delete O.R.S. 2BLR. Dist. No. 3; Add C.M. O. W. Lummis, 2823 Kansas Rd., CAMDEN, 3OE. Dist. No. 8; Delete 3ACQ. New O.R.S. 3BWJ.

EASTERN NEW YORK: Dist. No. 2; Change C.M. NEW YORK (Northern Manhattan Dist.) to read Harold Sacks, 170 West 73rd St., New York City, 2CHK. Change C.M. NEW YORK (East Bronx Dist.) to read F. H. Mardon, 1390 West Farms Rd., Bronx, 2CWR. Add C.M. NEW YORK (West Bronx Dist.) Howard Cervantes, 2040 Webster Ave., Bronx, 2ACT. New O.R.S. 2ACT, 2CWR, 2CHY, 2BO. Cancel O.R.S. 2CIM. Delete O.R.S. 8CKN. Dist. No. 9; Add D.S. N. S. Sherman, 418 Sherman St., Watertown, N. Y. 8BEO. Cancel C.M. 8BEO, WATERTOWN. New O.R.S. 8CQL-8BUZ. Dist. No. 16; Change D.S. to read A. R. Dean, Olean, 8AXN. New O.R.S. 8DHI.

PENNSYLVANIA: Dist. No. 1; Delete O.R.S. 3UD, and 3OE. 3HB should read 8HD. New O.R.S. 3GC, 3HH, 3AEN. Dist. No. 3; O.R.S. 8CMZ should read 8CMA. New O.R.S. 3CDG. Dist. No. 4; O.R.S. 3AUY should be 3AUV. New O.R.S. 3QT, 3BDI. Dist. No. 5; Call for C.R. Grim (C.M.) Harrisborg should read 3BBV. Dist. No. 6; County Branford should be Bradford. Dist No. 9 C.M. J. Lehman should read J. Lohman.

VIRGINIA: Dist. No. 1; Cancel C.M. for NORFOLK. New O.R.S. 3TI, 3UU, 3BBT, 3OL, 3UV. County Curry should read Surry. Dist. No. 3; Delete 3BIJ. Dist. No. 6; Delete county Alleghany. Dist. No. 8; add county Alleghany. Dist. No. 7; Delete county Craig. Dist. No. 9; Add County Craig. Dist. No. 7; Delete county Amherst. Dist. No. 8; add county Amherst. Dist. No. 9; Delete county Smyth. Dist. No. 10; add county Smyth. Dist. No. 9; add county Washington. Dist. No. 10; Delete county Washington. Dist. No. 10; County Dickerson should read Dickenson.

Address for (EA) should be 545 Main St., name A. S. Clark.

WEST VIRGINIA: Dist. No. 1; New O.R.S. 8BSU.

OKLAHOMA DIST: No. 2; County Muckogee should read Muskogee. Add O.R.S. 5GA.

NORTHERN TEXAS: Dist. No. 1; O.R.E. 5EC should read 5TC. Dist. No. 2; Cancel O.R.S. 5GA.

NORTHERN TEXAS: Dist. No. 1; O.R.S. should read 5TC. Dist. No. 2; Cancel O.R.S. 5GA.

SOUTHERN TEXAS: A.D.M. should read E. A. Sahm, Box 569, New Braunfelds. Dist. No. 6; O.R.S. 5XAB should read 5XB. Dist. No. 8; County Bexas should read Bexar. County Hidolgo should read Hidalgo.

EASTERN ONTARIO: C.M. OTTAWA street address should be Rosemount Ave. Add O.R.S. 3AF.

NORTHERN ONTARIO: D.S W. M. Sutton address should be 227 S. Archibald St., Ft. William, Ont.

CENTRAL ONTARIO: A.D.M. Mm. Choat, 241 Robert St., Toronto, Ont., Canada, 3CO.

ATLANTIC DIVISION

Chas. H. Stewart, Mgr.

For the first time in many months, the report from the Northern Section of the Atlantic Division is missing. 2OM hasn't failed us before, and while there is no explanation, we feel there must be some extraordinary excuse. It may be said that this will not happen again.

DIST. OF COLUMBIA—Washington will have its first OW station soon. Miss Zandonini is an excellent op and her station 3CDQ promises to be one of the leaders this winter. It will be an exaggerated 50-watter. Stations are quite active here. 3BWT is the star traffic station this month and reports that a crew of six ops will keep things humming this winter. 3AB has come down a notch in traffic but is putting the time in experimenting. 3SU is heard on the job but failed to report. 3JJ is ever present on the air.

MARYLAND—Very little A.R.R.L. traffic is going out of Maryland. 3APT handled 53 in two weeks, the noticeable drop being due to his absence. He is moving to 1507 Edmondson Ave. 3APT maintains his schedule with 3JJ, 4FT, and 8IJ, as he will work either 3BU or 3PH while moving his station to the new location. 3WF, 3LG, 3PH, 3DQ, 3BTP, and 3EM have been heard at the A.D.M.'s station working DX. It is earnestly desired that the DX men about town will pay more attention to reporting traffic in the future. 3GZ is in town again, and promises to be on the air. 3BCK is in shape for good DX work now. Some of the old standbys as 3BUC, 3MF and 3TE are greatly missed.

EASTERN PENNSYLVANIA—Dist. No. 1: Many individual reports are missing. Chester reports missing. If your C.M. fails to report your traffic, then report him, we need live wire men in office.

Dist. No. 2: 3BNU, 8AVL, and 8CTZ handled all traffic for this section. 3BNU has been heard in Salem, Oregon by 7HA.

Dist. No. 3: Scranton stations are showing wonderful cooperation and turned in a good report.

Dist. No. 4: 3ZO heard in Liverpool, Eng. by English 2ZS who used det only. Some DX for one tube. 3CHG is tuning up a 50-watter. We would like to hear from all stations in Reading without having to coax them for reports.

Dist. No. 5: R. S. Williamson, 3BRF, Lancaster, Pa., has been appointed superintendent for Dist. No. 5. 3ACY, 3AQR, 3CCU, and 8GM please note. 3CCX and 3BBV are reporting strong.

Dist. No. 6: The D.S. reports most all stations dead.

PHILADELPHIA—A few changes have been made in City managers and will be some time before a complete line up is made. Mr. O. G. Albert, 667 N. Preston St., Phila., has been appointed C.M. for Dist. No. 3.

WESTERN PENNSYLVANIA—Dist No. 8: Relay activities are gradually getting in shape for winter work. Waynesboro is leading in activities. 3DY, 3AOX, and 3AWL are doing all the work at present. 3AOX is reporting a great many of the stations in the 6th district. Altoona; The only active station is 8AKI who has only been on a little during the past period.

Dist. No. 9: The only active part of this district reporting this time is the city of Pittsburgh. 8BT is going to build a new receiver. He gets lots of cards but cannot hear them call him. 8PX put up a new pole and also added another 5-watter to his set making 3 in all. 8AIG was not on during the past month, but has just built a new shack and erected a pole. 8AGO has also built a shack and will get moved in a couple of weeks. He is doing his customary DX but will get out still better when he gets in his new location. 8CEJ has increased and works the coast regularly now. 8DGE has decided to put up a real antenna after using a single wire for a while. 8CFB is getting fixed up for the winter. The C.M., assisted by 8BJV, finally got up an antenna at 8VE-8ZD. A six-wire cage on metal hoops 1 ft. in dia. and 50 feet long. This antenna is fifty feet high and has a six-wire, 3 inch cage lead-in 50 feet long. Out of fairness to 8BJV be it said that he did most of the work.

Dist. No. 10: All activities of this district have been confined to Johnstown on account of the inactivity of the D.S. 8ADS with 10 watts D.C. C.W. is getting out to the midwest regularly. 8BCH blew his tube and got it repaired but there was nothing doing so he is going to get 2 new 5-watters, expecting to be on the air again in a few weeks. 8BHA has not been operating lately on account of lack of power supply. 8BYI expects to be going shortly as soon as he receives the transformer for his new 100-watt I.C.W. set.

Dist. No. 11: 8DKI is the only station reporting this month and is the only one handling traffic. 8BIL is operating at 8XE. 8CON is erecting a 60-foot mast which he hopes will cure the troubles that he has had in getting a good antenna. At present he is operating at 8DKI until his own set is completed.

Dist. No. 14: Every O.R.S. in this district is now down below 200 meters and are all getting better results as is shown by the traffic report. The D.S. has paid personal visits to all of the official stations so that there is a good feeling of understanding between all of the operators of the district. It is interesting to note that out of 485 mesages handled in this district 76 of them were relayed to the point of destination. In other words, 15% of the message traffic is known to have been delivered. The station operators of the district are to be commended on their efficiency in handling relay traffic. 8BJV improved traffic conditions east and west during the last period with efforts for "BVD" of traffic with some success. 8ABS is back on the air with 20 watts using rectified A.C. and A.C.C.W. A new fan antenna has been installed. 8DKY is handling traffic nicely on five watts and ten watts. 8BSJ is about to close down and the second operator, Tormay Brown, having applied for license will assume the new assignment. 8AAF is beginning to handle traffic in good shape. 8DKS has been in trouble during this period due to his receiving set, but is back on the air OK. 8BDU installed a new chemical rectifier to operate his ½ jug and is beginning to bust up the ether. 8BRM is installing 100 watts rectified A.C.C.W. 8DBL is down on 195 met rs with usual good results. 8AWZ is putting in some time to assist in handling traffic. The following stations have temporarily been dropped as O.R.S. because of no activities and stations not in operation: 8WR, 8BRW, 8BUT.

CENTRAL DIVISION

R. H. G. Mathews, Mgr.

The following is the report for the Central Division for the month of October.

WISCONSIN—Dist. No. 3: Sixes and sevens are more frequently called now, which means the DX season is growing and traffic shows some increase. 9ARC reported in New Zealand on 10 watts, now has received a card reporting his signals at 2ZS, England. 9DCT has been heard by WNP. 9BYE has changed fro A.C. to D.C. 9BCH is building a shack, and talks of a better aerial system. 9ZL has apanel sonstructed for 50-watters. 9BQG is stronger on C.W. than his spark, he was the last real active spark in the district. 9DAQ is on with 5 watts A.C. 9ALA is working on C.W. now. 9AGT added another 5 making 15 watts. He will be the connecting link between eastern and western Wisconsin, daylight. 9CSX is installing a sink rectifier and a 250-watt tube.

SOUTHERN INDIANA—Except for the Indianapolis stations and 9BBK, southern Indiana is dead.

ILLINOIS—Dist. No. 1: 9BUH has a sink rectifier and is going good. 9CFK is working 7s with a 10-watt set. 9DBP is out after prospects and has unearthed a new station 9BTM for A.R.R.L. relaying. 9AWU is proud of working 1AWE on 10 watts. 9CGU QRV for traffic. 9CTV in radio business but hopes for time on QSRs. 9DYY built lattice mast, a new aerial and ctps and now crowds 2.4 amps in the aerial. 9BIJ has 100 watts and is QRV for winter.

Dist. No. 2: OM Bergman is so full of news that he writes on the envelope. 9BJT has 10-wire vertical cone like 9CA, also a 250-watt jug. 9DXL sez msgs. scarce but turns in 75. 9AIC is now QSR all districts (4 bottle and a jug) (9CA sez vy old, Hic!) 9DLO shows some activity again. 9ARM works noon and eves. 9DYN finds QRM heavy turning under corn stalks. 9EBN is hunting a bug but manages to QSR. 9CTF, working half time, cops the district msg. total this month. 9AHQ is still repairing. 9BTA is playing football. 9CA is a decorator 10 hours and a movie op. till midnite. Operates 9CA in spare time with 9DDY on as relief signing ddy. "C.W. soon, but the spark stays"—Bergman. Hw 9ZN and 9AAW? 9CXH is in Washington. 9GT has moved. 9BDF is in Chicago.

Dist. No. 3: Hen is up in the air. For the good of the A.R.R.L. he tells OM "ND QSK. ND on tt tnx fr crd stuff" de 9MC OM XXX comes back "gess u only handle BCL msg.." 9MC comes back nil. He is unconscious under the operating table. 9CLZ has a new 20-watt and reports DX much improved. 9MC has 500 watts and sleeps in a new shack. He is QSR the whol UeS now. 9CMN has changed ckts and radiates a little more juice. 9BHH is a new man doing, FB. 9BYX came back on the air September 15th. (Glad to hv. u bk OM. OM) 9AWQ reports a new stn 9AKA on and doing FB. 9CMC, a fifiver is cutting loose.

Dist. No. 4: 9VV holds so many jobs he is afraid of doing a Harding testing with Australia. (Been hrd too) A.R.R.L. correspondent for Danville and C.M. All of his jobs are well done. 9DCR reports much doing at Chambana. 9DHZ

has a new lot of ops. for relief. Put up an 80-ft. stick and installed a 50-watt. 9DBV, 9BGC and 9ASD all brushing the cob webs off their *inductances*. 9AQR and 9ASD are going into partnership on a new layout. 9BHX has a 50-watt and a new Reinartz receiver. 9BIT is opening up with 10W. 9CZL is high man on messages, working 3 sevens and one six during the last month. 9DQU is back with 100 watts.

Dist. No. 5: OM Hicks is working against difficultise as before but has lined up two new O.R.S. in 9AYX and 9CIZ for winter traffic

Dist. No. 6: 9AKU bought a new car and got a new girl and it's getting too cold to snuggle so he is teaching her radio. (He told me not to tell but it's too good. Ask about his first razor, gang—A.D.M.) 9ACW is on the job with 15 watts which is to become 20 soon. 9OF is quitting the game.

Dist. No. 7: 9DWX will be on with two 50-watters this montmh. 9BR will be on again this month with the Zenith set won at the Nat'l convention. 9BP is on with four 50-watters. 9DBF is on the air this month at his new location in Evanston.

MICHIGAN—Dist. No. 1: Believe fine Flint-Detroit and north-south route will be open soon

Dist. No. 2: OM Bergman is so full of news via 8BBI and 8VT at Royal Oak, one or the other promises to be on most every day. 8BXA at Ann Arbor is now QRV and ready to shoot. 8BDR is nearby, QRV. 8DBO says QRM at night is bad but G.A. 8BBJ is on the job with a new receiver. 8ZH QRV all set in special new room. 8DIL says soon 8RV and about six at Ypsilanti ready for winter Report in *QST* 8AND hrd in Cuba verified thru 5BX. Many thanks are extended to stations whose operators made regular report as they are the ones who kept traffic moving during the worst month of the year. Only a few missed more than two reports.

Dist. No. 3: 8DCY has started up again with six operators who will be divided in shifts to cover most of the hours from 6 P.M. to 8 P.M. each day so that they will afford daylite connections fr west bound traffic. 8CPD will be QRV fr traffic this month. Two good ops there. 100 watts, greatly overloaded is to be their this years outfit. 8CZZ is all set with a 50-watt bottle (overloaded) and is hitting out pretty gud. 8VY with 100 watts seems to be hitting out in fine shape. 8DKC has been done during daylight and early hours in the evening. 8CED has been appointed traffic mgr. for dist No. 2. All station schedules and routes will come under his direction but traffic reports will continue to be sent to the D.S.

Dis. No. 4: 9CE is booming as usual. 9DRR is steady at the key. He is using the 1DH circuit in coupled form with very good results.

KENTUCKY—According to the pep shown by the Kentucky gang this month in getting away to a flying start, our state should be among the top nocthers by next spring. 9OX leads the state this month with 9APS second.

OHIO—Dist. No. 2: 8IJ takes the lead this month. 8LT has gone away to school for the winter. 8AAJ is doing good DX with 10 watts. 8YAE is still off the air getting his 100 watts ready for the winter. 8AAJ (C.W.) is on the job and complains of no traffic coming his way. 8BCE is on the air again. 8BXX is still short of tubes but borrowed a 5-watter in order to turn in a report. 8DBM reports he is still busy restoring his finances damaged by the Nationel convention, but wil lbe on the job in the near future.

Dist. No. 4: 8ANB sends in a fine report. H. S. Pyle, now assistant radio inspector, is putting in a 10-watt set with call 8UC at Detroit. Dayton; 8CWR has been handling the traffic with his 10 watts in fine shape. 8AIB has just installed 100 watts and is going great. 8CVG is on the air regularly again.

NORTHERN INDIANA—Dist. No. 2: 9DYT seems to be the star station. Using 5 watts he handled 164 messages. 9MM works most of Indiana in daylight with fone and C.W. 9BON, with 10 watts and 1.2 amperes radiation worked 6TV in California. 9DVK has had a 500-watt tube in use for about two years and is using 12 volts filament current and twelve hundred volts on the plate. Says he has to jar the tube many times to get it lighted as the filaments have parted. 9CP is at home only on week-ends. 9YB has been in operation for the past month but no other stations have started up. 9DWA has a new 10-watt outfit and is getting good DX with rectified A.C. Operating hours at 9YB are 12 to 2 A.M. and 4:30 to 6:00 P.M., call C.S.T. The operating force at 9YB is:

Fri. night	L. W. Franklin, Senior operator
Mon. "	J. E. Raffensberger
Thur. "	F. W. Willis
Wed. "	E. E. Pippenger
Tue. "	P. E. Harmegnies
Extra	H. H. Webb

DAKOTA DIVISION

N. H. Jensen, Mgr.

The campaign for more care in the delivery of messages is winning out. Most of the fellows fully realize the necessity of delivering and relaying messages promptly. A few stations continue to violate the quiet hour regulations. (What's the idea, fellows? Do you want your licenses revoked?)

MINNESOTA—Traffic reports are not so big this month, but amateur radio seems to be on a more stable basis. There are no active sparks, and C.W. stations are devoting much of their energy toward putting in filter systems and better receiving equipment.

Dist. No. 1: 9BAV has installed a 50-watter. The stations on the Range are doing fine with new ones coming into commission all the time. These will be lined up as official relay stations as soon as they can pass the requirements for a certificate. 9BMR is moving to a new location. Dist. Supt. Hayes adds that they are somewhat handicapped in their northern route to Canada because they have to communicate direct.

Dist. No. 2: Things are opening up in great shape. Many of the gang have been putting in their time rebuilding and improving their transmitters, and quite a bunch of new stations are coming on the air. 9YAJ started on the air with its new station and stayed on for a little over a week when the high voltage generator blew up. Four 50-watt tubes were used during that time and all U.S. and Canadian districts were worked with ease. 9BVY and 9CDR are combining their stations and will be going with 100 watts. Kenneth, Minnesota, has two good relay stations in 9EGG and 9DDP.

Dist. No. 3: 9BPN is on for good with C.W. and has canned the rock-crusher. 9AXX might handle a good share of the traffic if he went after it right because he is on the air practically every night. 9AUA, 9DGW, 9AUL, 9IG, 9BTT, and 9DGE are all attending the U. of M. and haven't much time for traffic. 9ZG is now on with master oscillator and super-heterodyne, both of which are working OK. 9BMX and 9APE have aerials on same mast. Hi. 9AWS lost his license and now has 9AWV. 9APE is using the master oscillator circuit with success. 9EBG is heart-broken over the loss of his 50-watter. 9BFI was high this month with 208 msgs. 9ACD lost his call and has been assigned 9EJZ. (That's turrible.) 9DAL has a tower over 100 feet high. 9DAW reports hearing 6CEU in Hawaii. 9ZT reports an interesting experience while working 2CXL and 6BUO at same time. Both of these stations were on same wave and worked 9ZT at same time. 9ZT finally managed to get them together and some fast relay work was pulled from coast to coast.

NORTH DAKOTA—Dist. No. 1: 9DLI now has a 90-foot wooden mast which will give his 50-watter a better chance. A new station appears in Aneta, 9AMP. 9EBT is high this month with 82 messages. Business keeps 9UH and 9GK off the air most of the time and neither will be able to hold up to last year's record.

Dist. No. 2: With the addition of 9DKB, the traffic increased somewhat. His total being 75. 9ACK is doing good work although handicapped by a lack of time. Several new stations are reported to be about to open, among them being 9DM, 9AFM and 9DUM.

SOUTH DAKOTA—Third Annual South Dakota Radio Convention at Sioux Falls on December 27 and 28. Big attendance and a good time. Come and meet the gang.

Dist. No. 1: 9DKQ is moving to a new location. 9BG is doing very good work. 9BDH is high for the entire division this month. 9CKT continues to do good work, as also does 9BOF with his spark.

Dist. No. 2: 9CGA is getting better results since he raised his poles. 9AGL is a new station. 9BRI spends most of his time with football.

9AVZ works both coasts easily. 9CJS is doing very good work and is on regularly.

DELTA DIVISION
W. W. Rodgers, Mgr.

With winter almost at hand, there has come a general awakening of hams in the Delta and the outlook is most encouraging. Here and there, we see sparks of real fire and hope to see more as the season passes. Now for the reports

ARKANSA—Dist. No. 1: D.S. Daly reports very little hope in his section of the state. Only five members can be reached and none of these promise any help this year. (Come on, you fellows! How can your A.D.M. and D.S. do anything unless you help?—D.M.)

Dist. No. 2: D.S. Woodruff has returned from commercial work and has his report in on time. 5ALN, C.M. of Ft. Smith, failed to get his report in on time. (Watch your steps, Officers.—D.M.) 5AFQ at Fayetteville is doing good work, but reports nothing. 5JB has a temporary set—we hope he makes it permanent. 5WE is on as much as business permits. 5XAC, the D.S., is rebuilding.

TENNESSEE—Dist. No. 1: MISSING!!! (What's the matter, Cowless?? Watch these report dates!!!—D.M.) Some good traffic stuff gone to waste here, I know.

Dist. No. 2: All present. 5WO, C.M. of Knoxville, reports directly to the D.M. 5XK is out of working commission—no tubes. 5AKW has gone to school. 5UV is operating but no traffic handled. 5JV is a new one at Knoxville. Sutton is an ex-op. at 5RZ in Memphis, the D.M.'s outfit. We are very glad to have news from 5AOK and 5AIE at Maryville. These stations promise to be of great help this winter. 5WO is knocking 'em off. WO has two ops at the shack and they keep the tubes warm. 5HL is the star Delta station this month—he handled 554 messages. (FB. OM—D.M.) 5MB expects to be on shortly. 5AAG is being married, and swears he will never pound brass again. (Watch for the announcement of his new station next month, gang.—D.M.) 5WL is getting out well on his phone. 5DA, our old time standby, has been off the air lately on account of business pressure on Hutcheson.

LOUISIANA—Dist. No. 1: 5WG is the only active one in this district. 5EB, 5AAP, and 5ABX have joined the League. (We certainly welcome you, fellows.) 5ABX promises to be on shortly with a 5-watter.

Dist. No. 2: No report from C.M. Webre of Baton Rouge. (How cum?—A.D.M.) 5GI is very active with 15 watts—gets into 17 states with the bottles and in QRN season, too. 5GI, 5UK, and 5UA are the steady ones in New Orleans. 5KC says he is still getting into Hawaii on 20 watts. He handled quite a gang of messages during the month. 5UK is using 10 watts—will have 20 soon, and hopes to make it fifty. With a new antenna, he hopes to get out a little better. 5ABH has just opened up for the season with sink rectifier on 100 watts. 5RH has just returned to the states from a tour thru Europe. (Bet he saw some phoney sets over there—D.M.) 5RH will have 100 watts with motor generator. 5KC reports the static still very bad in the state, but abating somewhat.

All Official Relay Station appointments will be cancelled shortly. We are reorganizing ths system, so if you are an O.R.S. and are told to surrender your certificate, don't get sore—all others will be cancelled at the same time.

EAST GULF DIVISION
H. L. Reid, Mgr.

ALABAMA—Dist. No. 1: 5AGJ and 5AMH were leading stations. Things have not opened up in the northern part of the state, although a good many fellows are working away at their sets, trying to get them in shape. Mr. Brooks sends in the best report from his district, two new stations alone in Montgomery handling 260 messages; 5AJP, 150 and 5ABT, 110.

Dist. No. 3: Mr. Barnett seems to be getting good results with the Mobile bunch. He is offering a prize for the best report from any station in his district for the month of November. Guess the mesasge total from this district will take a jump next month. 212 mesages were handled this month with five stations reporting. 5AC leads the list with 78.

SOUTH CAROLINA—This state has been recently put under the supervision of Mr. Claude E. Wells, who is now acting in the capacity of A.D.M. The affairs have not been thoroughly straightened out as yet. 4JK is the only active station in Greenville. 4KE had a little hard luck in building his transmitter but hopes to be on in a few weeks. 4KI will be on the air as soon as the football season is over as he is the star player for the Greenville High School. Hi! 4RR is the only station in Spartanburg. Mr. James Rutledge has been appointed D.S. of Dist. No. 1, and 4HW at Spartanburg has been appointed Supt. of Dist. No. 2.

FLORIDA—Dist. No. 1: Jacksonville boasts five active DX stations, three of which are traffic handlers. 4FS, C.M., has his men lined up for the best season in history and his efforts are showing results. He is to be commended on his splendid work through the Times-Union which he has kindly agreed to turn over a section of to the A.R.R.L. with a regular A.R.R.L. heading. 4FS, 4PL, and 4ER are the consistent traffic handlers while 4FY and 4IU, new stations, have started out with splendid DX. St. Augustine has again established itself as an important relay point reaching out well.

Dist. No. 2: Tampa is the center of activity in this district. 4IZ, 4OB, and 4PB all have good message reports. 4PF has just started up with 20 watts. 4JZ is on the job as usual and his consistency makes St. Petersburg an important relay point.

Dist. No. 3: 4DL is on the job and has handled traffic with several Florida stations.

Dist. No. 4: 4DP has a new antenna and counterpoise and is putting 4.0 amps into the system. He rates DX but no traffic.

GEORGIA—G. L. Hight, A.D.M., reports that he is getting his state into shape and will be in a better position to make a report next month. In Atlanta 4QF leads the city for this month for the most messages handled, but 4KU is pushing him. 4EQ and 4RH are the most consistent workers, excepting the above two. 4AO, 4ZA, 4CS, 4DO, and 4NA are all sticking to the key and handling some messages. WX5, the old 4YA station is now on and is doing some nice work, having a quintet of operators including 5HL from Chattanooga, along with the two Rumbles. At 4KU a system has been started whereby messages like "tnx fr crd" are taken and handled but not counted in the message total. Working four operators this month, this station only handled 55 REAL messages. 4EB is always on and is still as reliable as ever. 4DB, 4AI, and 4BQ are doing their bit. 4FG has had M.G. trouble but will be on soon again. 4AG is heard often. We are expecting some good work from 4FZ and 4AYY this season.

Dist. No. 2: 4GN is still D.S. but evidently doesn't know it as he didn't send in a report. However, on the air, 4GL, 4BYY, and 4EL have been doing good work and we hear them regularly.

PORTO RICO—This territory has recently been returned to the East Gulf, but so far no word has been received from this source.

MIDWEST DIVISION
G. S. Turner, Mgr.

ATTENTION ALL MEN OF THE TRAFFIC DEPARTMENT ! ! ! Read this report. It gives facts. Each state included. Learn what a live gang we have down here in the Midwest Division. For instance:

MISSOURI—The Radio Sewing Circle and Radio Tea at Joplin.

IOWA—How far can we Transmit on an Amplifying Tube?

KANSAS—A True Story of the A.D.M. and a B.C.L.

NEBRASKA—Unless you Live in Nebraska—DO NOT READ.

Does the above sound interesting? Have I aroused your curiosity? Very well then, read on.

MISSOURI—It may be OK for the gang to use 100 watts and more but the fellow who gets out and works both coasts regulary, handing 20 to 30 messages each night deserves the credit, especially when this is done on 20 watts. One of the recently more active stations, 9CEE is doing this and deserves credit. Working a half dozen sixes nightly is getting to be a habit with 9EKY. 9EKY employs three regular operators and he has his 100 watts on the air regularly. In general,

conditions in St. Louis are much improved and all the fellows seem to be cooperating. At Joplin conditions are not so good. Traffic seems to be entirely in the hands of the local C.M., 9CHJ. The C.M. adds that their radio club is quite active but due to the fact that they have admitted OWs to membership, he fears that the OWs will eventually run things and shelf the real purposes of the club. (How is that, gang? That's a new one on us old timers—D.M.) Who knows but what it might be the forerunner of the radio sewing circle or even a radio tea. 9ANO, of St. Joseph is to congratulated for his prompt and efficient reports. They are sure great. 9DLT has changed to R.A.C. and complains he is not getting out so well. (We did not expect you to OM. Hi.—D.M.) A new station 9LJ promises to add to efforts of the old reliables. 9CKS reported 18 messages. Kansas City has a new C.M., and according to his report, a short sweet one, K.C. is doing well and he expects to have the gang working great. The new C.M. is 9SS. McDonald is a live wire and one of the more recent amateurs. Those in K.C. heard recently, 9ST, 9ACX, and 9AVN, should add materially to the list of regulars of last season. Both D.S. in their respective sections report conditions very good. 9EKY, 9BKO, 9DJB, and 9SS are the new O.R.S. appointments this month. Come on gang, all together for the A.R. R.L. and the ole Missouri in particular. Missouri message total—2322.

IOWA—Traffic has increased somewhat. 9AOU has a WE 50-watter going. He works all districts consistently, also 1000 miles on phone. 9DXC is now using 10 watts. 9AMI is having considerable trouble with his 100-watter. 9DKY is doing wonderful DX on a wee small bottle, working every district easily. Here comes another guy with a UV-201 A tube for receivnig and transmitting. Does it work? Well he has been reported 600 miles already. 9BRS works all districts with 50 watts. 9CLQ is having trouble with his 100, but his receiver works to perfection. So far as has been reported he is the first Iowan to copy WNP. Others will follow in rapid order, but he's the first. 9ATN, operating 20 watts on a sync rectifier gets out FB. 9BIK has a 100-watt pure D.C. 9BZI has a schedule with 7TO so give him your west bound traffic. 9AMU and 9AAQ are both active. 9AIG's second op. is 9AMU's roommate at college and station No. 2 is expected to be opened in Ames. 9CHN promises a bigger report next month. 9YA is going into the broadcasting game with a 500-watter, however, she will be on 200 with a 200-watt set. 9HK is still going great. 9JF is a new comer and is FB. All men please note the A.D.M.'s new address—D. E. Watts, 116 Hyland Ave., Ames, Iowa. Iowa handled 1257 messages.

KANSAS—The report for this month is rather slim as only about half of you reported. (What's the matter gang?) The following new appointments have been made during the past month. 9CCS is now D.S. for Dist. No. 1. 9CCV is now D.S. for Dist. No. 2. 9DLM is the new C.M. for Kansas City, Kans. 9AYP is a newly appointed O.R.S. Now, gang, get busy and send the D.S. your report each month by not later than the 20th, and if you haven't anything to report, write him anyway. 9BVN blew six 5-watters and 9CKM blew four; they want to know why they will not hold 1100 volts. 9BHN is the star this month with a total of 279 on 10 watts. (FB, OM!) 9CCS handled 135 on his new 50-watter. There seems to be some mystery as to where he got it. Anybody know? Hi. 9AIM is back again using 150 watts or less. He rewound his M.G., exciting the field with a storage battery. Says he gets 50 more watts out of Betsy now. 9CCZ had some trouble, dismantled his set to locate it, and finally found he had blown his ammeter. Hi. 9BEZ QSR'd 50 with a 5-watter using 1500 volts on the plate. Besides this, he worked 6CEU. (FB) 9CCV handled 130 since he rewound his M.G. Listen gang, he says there may be an OW at his shack soon. Don't crowd, she is already married to 9CCV. Another go getter is 9CZW who handled 260 msgs. on his 50-watter in six weeks. 9CWC is spending all his time whipping his state into shape, answering letters and giving the publicity department a boost now and then. Almost forgot to mention that 9BCA is up for C.M. and an O.R.S. appointment. 9CAC will be on soon. 9DTA, our R.M., is hard at work laying out and lining up new routes. He is also after the O.R.S. for more action and cooperation. He is going to help put Kansas over the top this winter. 9AVG, on 5 watts, handled 65 in two weeks. 9AYP is another reckless guy, putting 1100 volts on his 5-watters. How do you do it? 9AOG, 9CKM, and 9CFI got in by the skin of their teeth. Little earlier next time, please. Kansas handled a total of 1366 msgs. during the past month.

NEBRASKA—Nebraska report sent in by wire, so it is of necessity rather brief.

Southern Nebraska reports many new stations starting up. Also that a large number of the fellows sold out and are now in College. This hurts our standing considerable, but it should not take long for the new men to bring the old state back in the running. The cooperative spirit is running high. The message total for Dist. No. 2 is 387 with 9YU heading the lits, handling more than the others as a whole. His hook cleared 287. (FB) A real comer is 9DEW using 10 watts. He handled considerable traffic, and worked everything up to 1300 miles in four nights. OM, 9DXY is back from a hunting trip and is just getting lined up with his new 50-watter. He works both coasts easily.

Men of Nebraska, I, your D.M., am going to take a small amount of your time to ask if you are satisfied with conditions in your state. It appears to me that Nebraska does not show up like the other states in this division and I am anxious that she should. If you do not think that I or my officers are doing the right thing by you, I'd appreciate it very much if you would put me wise. I am sincere in my wish to see Nebraska near the top of the list. Help me put it there by giving me facts as to why she is now at the bottom of the list. Thanks.

NEW ENGLAND DIVISION
I. Vermilya, Mgr.

MAINE—L. B. Hilton submits a very good report for the state of Maine. 1KX apparently is the leader here with 192 messages, which is a very good total just as the season starts. Fourteen stations are handling traffic and there are promises of fine work for the coming winter.

NEW HAMPSHIRE—Bernard H. Stevens, 1MC, has been appointed A.D.M. for the state of New Hampshire. 1CQJ will be on the air every day around 1:30 P.M., and Sunday afternoons. 1AEQ is getting started again. 1GL handled 121 messages, 1MC 217. 1CM is going to be on the job and will greatly help out the northern part of the state. 1BNK is building a new 50-watt transmitter. 1ATJ will be on every night. 1YB will probably be New Hampshire's star station.

VERMONT—1ARY seems to be the only station on the job. He is working a 50-watter with D.C. on the plate. He complains that it is impossible to get messages now that the rubber stamp type has been eliminated.

RHODE ISLAND—Dist. No. 1: D.S. F. S. Huddy reports that there is nothing of great importance taking place except that the boys have turned in very good message reports. 1AWE, 1OJ are ready to take traffic for Pawtucket. 1CMP is the leader in the traffic reports in this district. The quesion is, when do the operators at this station sleep.

Dist. No. 2: 1BVB is the only station in operation at present. 1ANX has a 100-watt outfit all built, but will not be in operation until he has a new aerial and counterpoise system installed at his home. 1CDM was logged in Hawaii by 6CEU.

Dist. No. 3: Geo. Mathewson, D.S. 1ALZ is back on the job with a 20-watter instead of a 50, and judging from the sound of the 20, it is twice as good as the 50. 1AML seems to be having some trouble with his transmitter. 1BNK is still on the job with 20 watts and 1BQD has made several changes, which have resulted in increased efficiency. A total of 1228 messages were handled in Rhode Island. Fancher takes great pride in reporting that there are no spark stations in his state. (Amen, Bro.!—T.M.)

CONNECTICUT—John L. Reinartz has asked to be relieved of the job as A.D.M. The experimental work at his station takes up nearly all of his time. This will be accepted and we regret to lose his service. 1MY, who incidentally was a former B.C.L., tops the list for messages handled this month, with 166. 1AJP has been reported in England four different times. 1BM received signals from 7WM on October 7th at 9:45 P.M. He reports 7WM signals as steady and readable. He also heard 6BCC calling 6PL and 6PRF. 1FD is back on the job and handled 23 messages during the last month.

Hey, uxtry! A.R.R.L. Headquarters gang on the air! Some one of the following stations is on the job every night for traffic to A.R.R.L. Headquarters. "Don't write, use amateur radio." 1CKP—195 meters; Operators C. A. Service, (CS), A. A. Hebert (AH), G. H. Pinney (GP). 1HX—200 meters; Operators, Boyd Phelps (BP), and S. Kruse (LQ). 1OA—176 meters; same ops as 1HX. 1BHW—200 meters; Operators K. B. Warner (KB) and F. H. Schnell (FS). 1AW—197 meters; Operator H. P. Maxim (HP) and all others listed take a run out now and then. 1MO —176—200 meters, Same ops as at 1BHW.

MASSACHUSETTS—1CPN has been working overtime and heads the list for the New England Division. This station handled 2028 messages. We look for some further good work from this station. 1SK handled 145 messages.

Dist. No. 1: A. V. Johnson, D.S. for Dist. No. 1 reports that 1DY is again on the air with a spark but is getting ready for a C.W. equipment. 1LT in Lowell, has just opened up with 15 watts and handled 47 messages in eight days. Watch this boy's smoke, by the fifteenth of next month. 1CM will open up soon with two 50-watters. P. F. Robinson, A.D.M. for E. Mass., has resigned on accuont of lack of time to cover the job. 1BDU, Mr. Boardman H. Chace, has been appointed for the job and has accepted. 1BBM is working spark coil I.C.W. 1AIR handled 86 mesages. 1RR handled 115 msgs. 1CJR handled 56 messages, 1AAC 182, and 1BT 57. 1ADN handled 406 messages. 1JV handled 172 messages this month.

Lee Bates, D.S. of Worcester County, has resigned and a general election will be held to elect a man in his place. 1AQY reports that his transmitter has been dismantled but hopes to be on within a couple of weeks. 1AFA handled 20 messages. Miss Helen G. Daniels, Exec. Asst. to Mr. McLean in Western Massachusetts, reports an unofficial dog-roast. Those present were 1JQ, 1BSZ and two members of the Springfield Radio Asociation and their lady friends. 1ARF, Dist. No. 3, has no traffic to report. 1IL, Dist. No. 4 and 5, reports some traffic, but states that the gang is not turning in reports as they should.

1KC and 1BOM seem to head this district with 92 messages each. 1BCN handled 4 messages. 1CIT handled 26 messages.

NORTHWESTERN DIVISION
Glen E. West, Mgr.

The work of reorganizing the Northwestern Division is now practically complete and the old gang in this northwestern neck of the woods is hitting off in fine style. It has been a big job, but system and order are gradually growing out of the chaos. Too much credit can not be given to the A.D.M.s for they have worked their heads off. Your D.M. is very grateful for the fine spirit of cooperation which has been shown by every man in the division. Many thanks, OM!

Traffic is moving through this division in gobs now. Many of our best stations are QSO with the 8th and 9th districts.

Our supervisor of radio, Mr. O. R. Redfern, has just completed a tour of the whole 7th district. He held exams and addressed public meetings in practically every large town in the district. Several of our new men are now the proud possessors of extra-first-grade amateur tickets. A number of new "X" and "Z" licenses were issued. Mr. Redfern in his address boosted amateur receivers. We are glad to know that such friendly relations exist between the hams of the 7th Dist. and their supervisor.

The following new appointments have been made: Leslie Crouter, 7AJD, former 7ZU op. has been appointed D.S. for Dist. No. 4, Montana. Crouter is an old timer and we can depend on his reports being in on time. 7AR, E. L. Wagner, has been appointed D.S. for Dist. No. 8, Washington. O.R.S. certificates were issued during the month to the following: 7TQ, 7JE, 7TO, 7KS, 7AGE, 7BR, 7GQ, 7NT, 7ACI, 7EI, and 7WP.

Mr. Ed. Kensky, 7DG, of Cordova, Alaska, reports that his 10-watt, 500-cycle set is now on the air and working FB with 1000 volts on the plates. Fensky should be able to work the states regularly. There are nine different ops. up there at 7DG and all of 'em are anxious to handle A.R.R.L. traffic. WNP ought to come in FB there. (Good luck to you, Fensky. The Northwestern gang will be on the lookout for you.)

MONTANA—The outlook is good in Montana.

Dist. No. 1: Bailey says there is little activity in his district. Only two consistent stations, 7WP and 7AGF are heard on the air.

Dist. No. 2: 7NT and 7ACI are doing good work. 7ZL takes the box seat for the state this month, and has been getting new A.R.R.L. members.

Dist. No. 3: ND—absolutely DEAD from the heels up!

Dist. No. 4: Crouter, our new D.S., has his 10-watt set nearly ready to go. (Good luck, OM.) Gardner, 2nd op. at 7ZU, the D.M.'s station, is back on the job and regular watch is stood every night. Traffic has been handled direct with 4KU. The big superheterodyne at 7ZU is working FB.

IDAHO—Dist. No. 1: 7JF has not been heard on the air for some time. He is building a 100-watt C.W. set to blow up this part of the countdy.

Dist. No. 2: Several new stations are opening up in the southern part of Idaho. In Boise we have 7PJ, 7OB, and 7PX all active stations. 7PJ has been on with 10 watts and is working east like 100. 7OB has begun his traffic handling for the first time, and 7PX is warming up his 5-watter. The gang will be glad to hear of the famous 7YA opening up for the winter with a powerful C.W. set. 7ZI comes through with a wallop. Bliss of 7ZN has left us for a few years. 7IO and 7LN in Nampa have been reaching out, both east and north.

WASHINGTON—Nearly all stations are on the job and the activities have taken a swing towards the regular routine. Some new stations are coming in and with the present regulars on the air a QSR in any direction is easy. One new appointment has been made, that goes to 7AK, E. L. Wagner at Toppenish who will act as Superintendent for Dist. No. 8.

Dist. No. 1: There are no stations on the air at present, but hope to have 7JS perking most any night now.

Dist. No. 2: 7ABB is ready to QSR any direction, and is doing good DX. 7MT is with us for the winter with three operators. 7PE has 100 watts going but handles little traffic. In Seattle three new stations have made their debut with calls 7AEE, 7OY, and 7BK (a re-issue and in the past a similar call to all stations on the coast.) The new 7BK will have to step to hold up the reputation of old 7BK. Regular as the clock, 7OO has switched from B.C.L. to ham again.

Dist. No. 3: 7WS takes the honors altho he popped a tube at the end of the month. 7ACA is doing good work on a single sky wire. 7PC has worked WNP altho it was a poor night to DX. 7AIF is on regularly and 7NG, also 7AAO will be with us soon.

Dist. No. 5: The only station reporting is 7GP, who, as usual, cops the box seat with 396 messages. GP has had M.G. trouble with the big set so has been forced to rely on the 20-watter.

Dist. No. 6: 7LY deserves special mention for pulling off unheard of DX with one 5-watt bottle. He works into Florida, Ontario, Ohio and all points on the way. Since he got his set perking thusly he has been a steady member of the "Order of High Potentials and Owls." 7BJ was out of town part of the month but handled some messages. 7AJV and 7AJY are on again.

Dist. No. 7: 7AIY is working nicely altho the traffic is shy. He reports hearing WNP. 7NE still has his thunder factory working but failed to report any traffic.

Dist. No. 8: A new D.S. has been appointed.

Dist. No. 9: 7GE says that he has not been on the air much and consequently has little traffic to report.

OREGON—Dist. No. 1: In Eugene traffic can be moved in any direction thru 7GQ, 7IW, 7LR, and 7SY. 7EZ is also working out with 5 watts. Due to antenna trouble and burned out tubes, 7NL and 7HF are off again.

Dist. No. 2: 7HA and 7AGE are holding the ether with 5 and 50 watts, respectively. 7OH is pounding into wee hours at Corvalis. 7VF is now in the city with 7QU and 7SO. A new station is found in 7EO from Dayton who is using the so-called "fiver."

Dist. No. 3: No stations reporting except 7SN who will be on soon.

Dist. No. 4: 7TO, and 7JW have new "sticks" for the winter season. 7BB is working into the 8th district with 20 watts. 7TT, 7QJ, and 7AKK say they will put the northwest on the map this winter.

Dist. No. 6: 7OC has been appointed D.S. A 5-watt set is being nailed together and 7BR will help pound brass.

Dist. No. 7: 7QD with 5, 7NZ with 100, 7TQ with 50 and 7FR with 5 watts. 7EM has a new 80-foot vertical cage and 50 watts. (GL, OM —A.D.M.)

Dist. No. 10: 7KR is using 20 watts D.C. (M.G.) and doing good work. 7ABY and 7JE have handled the bulk of the traffic for the last month.

PACIFIC DIVISION
J. V. Wise, Mgr.

A reorganization on a large plan has taken place in California. Certain sections of California seemed to feel that they were being neglected in the Operating Department reports. Perhaps it was true, and to meet the need of such a large state as California, it seemed advisable to divide the state into two or perhaps three sections, allowing each section to elect its own A.D.M. With the very nice cooperation of the San Francisco Radio Club and Mr. A. H. Babcock, our director, the scheme was proposed at the recent San Francisco convention and met the approval of the amateurs.

During the convention the elections for Central California were held (there are three sections, Southern, Central, and Northern) and because there wasn't a sufficient number of amateurs from the southern part of the state to elect the A.D.M. this election was held recenly in Los Angeles. Mr. B. R. Coles, (6ZAH) 16 Ellwood Ave., Los Gatos, was elected A.D.M. of Central California, comprising districts 4, 5, and 6. Mr. M. E. McCreery, (6LJ 628 W. 49th St., Los Angeles, was elected A.D.M. of Southern California comprising districts 1, 2, and 3. Northern California remains under Mr. E. C. Garrette, 6CC, Northern California takes in districts 7 and 8. Undoubtedly, this will relieve the strain considerably and we feel that amateurs of the entire state of California will have threefold better representation in the future.

Much interest will be centered around the material that comes to make up the report for next month and the fellows will watch with eager eyes for improved conditions in California, and they will see it. It is bound to come under the above arrangement.

There is a good report for this month, even tho it is rather brief. Lester Picker, 6ZH, has had the misfortune to lose the use of his right arm in an auto accident. It will be several weeks before he can use his key, he thinks. 6ZH will be missed and will be welcome back as soon as possible.

P. Neff Maynard, of 6CMR was good enough to give us some dope on amateurs around Los Angeles in the absence of a report thru the regular channels. 6KA seems to be the wonder-worker with tubes. It is claimed he can put 110 on the filament and about a million on the plate of a 5-watt tube and a bushel of amperes in the antenna. 6EN has broken lose with a mean signal that promises to reach across half the earth. 6JX has two 500-watt British tubes ready for business. 6UP and his so-called 90-H.P. rock-crusher is reported to be ready to install C.W. 6BVG reaches to the Atlantic Coast quite frequently. 6CMR is testing with 9CAA and 9AAU for regular schedules in raffic handling, east and west. 6CBI is also reaching the Atlantic Coast regularly. 6CAN is another op at 6CMR now. 6BIC was reported in the early evening as being heard in Maine.

6NX is increasing his power to two 50-watters. 6HC, the last remaining spark has been granted the call 6ZAG and will be in operation with C.W. 6BSV is a new station just opened up with two 5-watters. 6BIH is working out a schedule with 6CKL or 6CIS. 6BIH is a most consistent operator heard on the air. 6AVV with 250 watts is tor heard on the air. 6AME has been experiment-making a lot of noise ar't. 6AOI must be experimenting on short waves also.

6AWT is one of the best and most consistent stations around the Bay. Reports are rather slow, but 6CKC, 6CLZ, and 6AOR were on the job with their reports. 6ARB and 6CKC have been QSO 6CEU in Hawaii. 6BUY lost a nice mast in the recent wind storm, and 6EX lost his entire outfit during the fire at Berkeley. P. W. Dan (6ZX) C.M. requests more reports if you want space in *QST*. Mail them, phone them, or send them by radio—but get them in on time!

6BUD is closed a/c away at school. 6CBW is using his three 5-watters. 6ARF and 6CDJ are "nailing" a 250-watter together as fast as they can. 6ABX, with his 100-watt is keeping the air boiling. 6AK has been overhauled and boasts a new shack and all the fixings. 6FW, ex-6ZX, the D.M. will be on the air again by the time this is in print.

6LU and 6BUA are back again with C.W. and phone. 6BNC is rebuilding his outfit fo rthe winter. 6APE has changed his QRA and will be off the air for a short time. A good route east is via 6LU and 7ZD.

ARIZONA—Things are rounding into shape gradually. 6GS is installing C.W. Jack Paddon, formerly of Connecticut, will be on the air with C.W.

NEVADA—6AJR will be back on the air shortly. His set is being overhauled completely.

ROANOKE DIVISION
W. T. Gravely, Mgr.

A little slowing up has been noted during the past few weeks and traffic has taken a slump but, in the face of these facts, the division has splendid organization and will perform worthily during the coming months. Evidently a number of O.R.S. are not turning in their reports which doesn't speak very well for these certificate holders. To one and all let's have more cooperation.

WEST VIRGINIA—A.D.M. Bock states that his stations have the habit of sending their reports late or not at all and that this time he received only two reports; dists. No. 1 and 6. He would like to be able to give due credit to all operating stations but without the reports he is helpless, so blame only yourselves. The A.D.M. is ready and willing to do his part. Only four stations reported traffic in West Virginia, and they were 8SP, 8BPU, 8AMX, and 8BDA.

D.S. Morris of Dist. No. 6 has become a commercial op. now and is on the Pacific Coast. Mr. E. Garrison will succeed him. 8AUE is working 10 watts and has his 100-watt set ready to go so we may expect results from this one. We would like to say more but cannot dig it up by ourselves.

VIRGINIA—Dist. No. 1: Some little interest shown in the game in this one but room for improvement, and after the new D.S. gets going good we expect better reports. Mr. H. Kroskin, 1044 Highland Ave., Norfolk, Va., is C.M. of Norfolk with the following O.R.S.: 3BNE, 3BBT, 3UU, 3UV, 3OL, and 3TL.

Dist. No. 2: 3SG shot all of his tubes, borrowed 3AHE's transmitter and finished out the month with it. 3BMN always has a traffic report and is busy receiving DX and working on receiving circuits. 3AUU still working on M.G.s for the gang. He should have all straight C.W. some day if he holds out. 3ABS has just completed his new tarnsmitter and is ready for traffic as is 3BCH. 3ATB is all set with 100 watts and waiting for M.G. to arrive. 3AHE will be on the air soon.

Dist. No. 3: Things are moving nicely with a good bunch of stations working. We expect a C.M. for Richmond in the near future. 3VO is leaving the 3rd district, which is much to be regretted, but we hope he will soon return. 3MO is heard some. 3JY has handled some traffic at last, which is FB. 3BVL is on, but no report. 3CEL, with his $5.00 80-foot mast, is getting out.

Dist. No. 4: 3TJ, the only station in this district, is on very little but surely wakes them up when he is going.

Dist. No. 5: There seems to a shortage of reports in this one, only 3IW figuring, and we compliment him on his work.

Dist. No. 7: 3ASP promises that he will be back with us and get his organization in good shape. There is a fertile field in this district, which only needs a little pep. 3AJG says he will start something.

Dist. No. 8: 3AEV is on some, but business limits his activities. 3BZ has been in ill health for the past few weeks and is temporarily practically out of the game.

Dist. No. 9: 3HL seems to be lost and all efforts to raise him have so far failed. All honor for the landing of a new station is due Teddy Keck from 3BVL who put the pep in friend Gray. Call, later. 3BHS and 3BKX are on the lower waves, and the gang does not seem to reach down to them.

NORTH CAROLINA—Dist. No. 1: The Winston-

Salem bunch has been inactive for some time. Mr. Blalock has a good 20-watt set and is going strong. 4EN is back in the air with 20 watts.

Dist. No. 2: Asheville, under the leadership of T. A. Freck, is showing great improvement. With 200 watts, 4KC can be heard rattling them off right along. All men in this district please cooperate with Mr. Freck.

Dist. No. 4: Wilmington, as usual, is right on the job. Smith is going after things and his station 4BX is now back in commission. Also, he has been operating at 4FT. 4FT is on almost every evening from 5 to 8 o'clock and from 10:30 to 6:00 the next morning. He works the west coast 'most any old time and shoves his signals all over creation. His daylight transcon performance was a classic.

In conclusion, the manager has said all he could. He has faithfully coordinated all reports which have reached him, and the results, you have read in the foregoing. Pull your part of the load, and there will be a different story.

ROCKY MOUNTAIN DIVISION

N. R. Hood, Mgr.

9AMB 279

Hathaways

C.W. Denver, Colo.

COLORADO—Denver Dist.: City Manager Hathaway takes the box seat for most messages handled. The D.M. will have to get a rubber stamp made for him if some other ham does not get after his goat soon. (FB OM) 9CAA ran a close second with 219 to his credit. 9APF with 175 to his credit got along fine until his 20 watts got too hot for a five-amp. meter and took it west. 9BJI is back on the air with a new Reinartz tuner and reports sigs from all districts. 9BJK has started a cemetery for five-watters but got thru 98 while the tubes lived. Two funerals during October. 9CAA does his work after 4 A.M. as reports QRM nil then. 9QL has been out of town. 9BXM, the Warren brothers, have beat it for Colorado U. and will probably take a trick at 9XAQ. 9EEA, station of the A.D.M. has been punching thru in great style, being QSA west coast.

Dist. No. 1: 9AZG reports no traffic due to rebuilding. 9CFY has been on fairly steadily but bad WX has been reported. 9BVC has been on the job and kept that part of the state open. 9XAQ is not yet in operation but we hope to hear them on soon. The following stations did not report this month: 9AVU, 9BXA, 9COW, 9DTM, 9EKH, 9DTE, and 9XAQ. Some cancellations will be made.

Dist. No. 2: D.S. Davis reports steady progress in his district. There are now six stations in operation in this district as compared with one a few months ago. The Santa Fe storm route has been almost completed thru this district. This district also had 100% reports which is very FB. 9DFH and 9CLD are the two latest additions to the O.R.S. list in this district. Total messages for this district has gained over 100% during October. (FB men, and more power to you.) The following appointments were made during October: 9BJK, 9AVU, 9CLD, and 9DFH. The following cancellations were made on account of no reports for three months: 9CCJ and 9FV. There will be more if some speed is not shown on the part of those listed not reporting this month.

UTAH—A.D.M. Wilson reports a picking up of activity throughout the state. 6RM takes first for Utah with 151 messages. 6CBU runs him second with 117. 6AJA, 6ZT, and 6BKE have been on the job and kept traffic moving. The A.D.M. cannot give much of a detailed report on the doing of each individual station due to a great many stations not reporting. There is to be a heavy cancellation of O.R.S. certificates made by the D.M. unless this condition improves with next report. There are a great many new stations being built and we hope to hear them on the air soon. In the meantime let the A.D.M. know that you are still alive and send in that card. 6CBU reports 32 messages thru after rebuilding. Now let those cards go to the A.D.M. for next report.

WYOMING—Wyoming now only has four stations left after 7DH left the state. 7LU has been on steady first part of month then left for a few days in the hills. 7ZV has moved to Casper and will be back on the air as soon as possible. 7ZO has been on fairly regularly, with a promise to be on more. 7HW, a new station in Laramie, has opened up. The storm route from Billings to Denver thru Wyoming is now complete. Cancellation of 7DH is made due to removal from state.

WEST GULF DIVISION

F. M. Corlett, Mgr.

NORTHERN TEXAS—Dist. No. 1: Greenville; 5GN leads 'em here with 97 and has been sick too. 5DW with 71, 5ACQ third with 47 and 5AL just tells the story. Sulphur Springs; 5JH nil, 10-watter coming. Grand Saline; 5ALI, an O.R.S., QSR here. Denton; 5NW reports 71 and gonig OK. 5NY is down for repairs. Terrell; 5UD is on Friday and Saturday nights. 5FX with 1 5-watt bottle works Hawaii, Cuba, Canada and all U.S. districts except first and third. Denison; 5AMB and 5AHC are passing 'em along at this point.

Dist. No. 2: Waxahachie; 5AJT is now C.W. 5TD and 5QT are also active. Cleburne; 5AGH is a new A.R.R.L. relay station. 5AFH heads the list with 30. 5UY is ready for traffic now. Waco; 5SD has a new QRA, 1317 S. 7th St. 5QW with 40 and 5CV reports 14. Tyler; 5PH is doing the trick here. Jacksonville; 5FC earns the honors for the division, having relayed 196 messages. West; 5FA still QSR here. Nacagdoches; 5ADV was on only 11 days on account of mast trouble. He has a new 68 footer up now and 50 watts rar'n' to go. Holland; 5AWM handled 47 on C.W. and fone.

Dist. No. 3: Wichita Falls; 5UO, with a 50-watter, seems to be holding the fort.

Dist. No. 4: Grandbury; 5NS is rebuilding. Abilene; 5EZ is a new A.R.R.L. station.

Dist. No. 5: Lubbock; 5AIL is on the job here and will QSR any direction. 5AGE moved to Paris, Texas. Amarillo; 5ZH handed a few and entertained the radio inspector about 7 hours. The R. I. didn't seem to know very much about radio and 5ZH was writing it all out on paper for him. (?) Fort Worth; 5SF reports that he is now anchored at the La. State University, chief opr., 5YW. 5KO is going OK now. 5QI is on regularly now. 5LC leads with 47 and 5AHT is next with 23 for the city, while 5TI takes second honors for the divison with 188 mesages. Dallas; 5HY is QSR all directions. 5VA is out of commission on account of generator trouble. 5AIC, a recently converted C.W.ist, says C.W. is much better than spark ever could be. 5AJJ's new QRA is 3704 Oak Lawn Ave. 5CT reports 25. 5LR has been showing the Texas State Fair public how the amateurs handle messages "free, gratis, for nothing," he moved the works out to the fair ground for sixteen days and and has been piled up with message traffic ever since. 5LR's total will probably be far ahead of the other reports.

SOUTHERN TEXAS—Dist. No. 6: Galveston; 5AHH leads the Island City and is on mostly Saturday and Sunday nights. Rumor has it that 5ZG-5VY has turned "jelly-bean" but surely it can't be so, he reports 26 but admits he has been QRW, YL's. Houston; 3 stations, 5NN, 5PB, and 5ZX report 65, 43, and 4 respectively. 5PB is on only once a week on account of school. 5ZX is on spasmodically. Port Arthur; 5XV-5RC, stacks up 59. 5XV is broadcasting A.R.R.L. news Saturday and Sunday, 10:30 P.M. on 125 meters as an experimental test. Orange; 5AMA is still holding down the relay game here having moved 66. 5XAD is rebuilding and will be going soon.

Dist. No. 7: Austin; 5ALR is remodeling. 5RN, is out of commission. 5EN has gone to South America to live. 5ZU is going strong now. He is on every night, QSR all directions. 5FT and 5ZU are about the only stations working here. New Braunfels; 5YK is going strong with 100 watts. Beeville; 5GR is not on much on account of business. Cuero; 5JT is holding 'em down for this place.

Dist. No. 8: San Antonio; 5AJZ is a new A.R.R.L. station. 5RR has boved to Harlingen, Texas, 12 miles north of the border, near Brownsville. 5VO is moving his station, nil. 5AEW, QRW school, is acting D.S. in L. D. Walls absence. 5KG handled 47, and has a regular schedule with "BX", Mexico City, 7 P.M. C.S.T. and will QSR for that point. Laredo; 5MT is silent just now, 5MT Sr. reports 5MT Jr. at Texas U. trying to get some radio out of and geology and engineering into his head, while 5MT, Sr., is working a buzzer overtime daily and expects to be on the air soon.

Dist. No. 9: 5ADB has been reported in all districts, and Canada, and is also QSR with "BX" in Mexico City.

OKLAHOMA—Dist. No. 1: Enid is represented by seven real relay stations, 5JE leading this month with 120 messages handled and 5ANC right close to him with 119. 5PA was third with 69. 5ZM is on mostly in daytime and reports 46. 5CE reports 50 and 5ANF 24. 5ZM reports working all districts and Canada on 15 watts, He hasn't worked Hawaii or Australia yet, but can hear them QSA. Oklahoma City; 5AJB has a new QRA, 228½ W. 10th St. 5AGN is a new A.R.R.L. station. 5ZAV reports 159 messages and worked 125 stations during the month. He worked all districts including Canada the night of October 21st.

Dist. No. 2: Tulsa; This place seems to thrive on "Martial Law." 5GA reports 37 and his signals were heard in London, England. 5XBF, 5SG and 5QQ all report traffic moving OK. 5ABL is a new A.R.R.L. station. Muskogee; 5BM is working again and reports 37.

Dist. No. 3: Ada; 5AFU passed 21 along their way and says business is going to pick up from now on.

Dist. No. 4: Altus; 5AHD is the relay station for this point, reports 39 received and 41 sent. Ft. Sill; 5IA handled 4. He is on 172 meters, 2.2 amps., and wants you fellows to get a good receiver so you can hear him. Norman; 5VG is rebuilding and will be ready for traffic during November. Chickasha; 5ANY, LeRoy Scott, 427 N. 9th St. is a nwe A.R.R.L. station for this point.

NEW MEXICO—Roswell; 5ZA, QRN at last leaving, R.I. here checking us up, moved 37.

MEXICO—Mexico City; "AX" has been sick but is better now and hopes to have a new 20-watter percolating by November. "BX" handled 12 messages out of 16 messages in. Been having some trouble raising 'em with his 50-watter. He was doing better with his 20 watts and 2.5 amps. Will somebody report what is the trouble with his sigs. His operating hours are 9:30 to 11 P.M. M.S.T. Guanjnato; "CX" will have a 20-watt set stepping out shortly from this point.

HAWAIIAN DIVISION
K. A. Kantin, Mgr.

Dist. "A", Honolulu: With DX conditions improving with the coming winter weather, Hawaii is ready to do her share in breaking DX records. 6ASR, after having his 20-watt C.W. set reported heard 200 miles east of Yokohama, is now installing 50 watts. 6CCR whose signals have been logged by numerous 6th and 7th district amateurs, has joined forces with C. J. Dow, of 6ZAC fame, and they are expected to establish new DX records. 6CMH is still off the air due to the reconstructing of his C.W. set. 6TQ continues to be unsuccessful in working coast stations.

Dist. "B", Hawaii: 6CEU, the star station of this division is doing excellent work with his 20-watter. He is QSO with 6th, 7th, and 9th district stations and established a new low power DX record for Hawaii when he worked 9BEZ with 15 watts. Mix of WNP reports 6CEU's signals QSA while working 6ARB.

MARITIME DIVISION
W. C. Borrett, Mgr.

In Nova Scotia A.R.R.L. is coming fast and we now have several first class relay stations in operation. We in Nova Scotia, can compare favorably with any in Canada. We do considerable listening in as well as sending and we look with pride upon the logs of some of our stations that think they should reach us. Another point that we want to bring to the front is our geographical position. We often get messages which we in turn have to send right over the heads of the same stations to Upper Canada. The star station is 1AR. He has been heard as far west as Regina and as far east as England and is sending every Saturday night messages for England and is being received almost regularly by English 2ZS of Stoneycroft, Liverpool. Some DX for regualr traffic. 1AR has recently increased his power from 20 watts to 500 watts and we would not be surprised to hear of one of his signals hitting him in the back of the neck after traveling around the globe. Pacific coast stations duck your heads. Hi. Last year's star station is at present temporarily off the air. We refer to 1BQ. With 20 watts, 1BQ was reported at Berkeley, Calif. and also off the English coast. 1DD is still pounding away at the key handling traffic which he mostly clears through Maine stations of the U.S.A. District No. 1. He has worked quite a few Upper Canadians. He created quite a stir among the gang on October 21st by copying the full address and text of a message sent by U.S.A. 6BCL at Monterey, California to U.S.A. 6BSS at Vallejo, Calif. 1AI is on a visit to the U.S.A. He is president of the Halifax Wireless Association and has donated a room and site for a club transmitter which is now being built. Many young A.R.R.L. new members are being developed by 1AI who is also going to build a C.W. set to replace his famous spark set. 1EF and 1DJ each should be in operation for relay work by next month. 1DF, who by the way is now famous, his mug having appeared in *QST* last month, is also a 5 watt fiend. 1DT has now only 5 watts but should be back at 10 watts soon. 1EB, another 5-watter, is busy these days building a receiver for the Halifax Wireless Club. 1CD is finishing his fourth year at the N. S. Tech. and is putting in 20 watts. 1BV has 10 watts going strong. 1EA is another 10-watter who has just started up in Dartmouth. 1DQ has 20 watts going strong. 1DE spends most of his time operating Amateur Broadcasting station 10-AR, but reaches out when he operates 1DE. 1CK has the material for a 10-watt set all ready to assemble. 1ED, and 1CG are located at Sydney and will form a very necessary link in the chain of A.R.R.L. stations that we hope to establish. In St. John, New Brunswick, 1EI, is the big noise. He now has 10 watts going and is QSA at Halifax and will have 200 watts. 1DN has the material for 10 watts ready to assemble.

ONTARIO DIVISION
C. H. Langford, Mgr.

It seems that Western Ontario is leading in activity at present. Certainly it isin its reports. The Aurora has hit the more northern cities very hard, making it impossible to get out at all. Trans-Canada tests are on the way and some real relay team will be doing business soon. Ontario broadcasting stations will be in operation by the time this is printed. Watch for them on Saturday and Sunday at 10:30 P.M. local time. This Canadian broadcast will be different—covering Canadian news, tests, etc., and important Yank broadcasting.

EASTERN ONTARIO—The entire report is Nil. (What's the matter 3HE?) Ditto from Niagara D.S. If you fellows have sent in reports to the D.S., let me know about it and things will be changed.

CENTRAL ONTARIO—3CO reports all fellows coming back strong and with higher power. (FB) 3HT is working on 5 watts. 9AL working on super station to be on the air shortly. New O.R.S. certificates are coming, which require the holder to be a real honest radio man. These certificates will be dealt out very carefully so watch your step and follow the narrow path. London is still on the map, the whole gang doing fine work. C.M. 3LW is now using 10 watts D.C. Byerlay of 9ARR at Windsor is on 100 meters C.W. The St. Thomas gang are coming up in good style. 3OM has been appointed C.M. He is operating 100 watts at present. The Kitchener fellows are doing fine work. Gowan reports new masts and tubes around town.

3NI of Northern Ontario reports the empty socket trouble invading his district. Also the Aurora bothering, and ability to work Canadian 4s easily.

QUEBEC DIVISION
J. V. Argyle, Mgr.

Traffic has kept fairly lively, there being more active stations with good keyman behind them than ever before. 2BN leads both in traffic and DX. He uses four UV 202's and has been repeatedly copied in England and California. The gang are eager to overtake his records. 2AM, 2BG, 2BE, and 2CG being hot on his heels. 2CG is working the Texans and was logged by friend Mix way up the Labrador Coast. 2BG is reaching out in old time style and says he has heard a rumor to the effect that C.P.R. is putting on a new liner in order to carry the huge number of cards that will be sent to him during this season. 2BG has been appointed an O.R.S. 2IC has aerial trouble; getting more amps but less cards. 2AM put over a new Transcon record, having got

(Concluded on page XVI)

Calls Heard

HEARD DURING OCTOBER
Unless Otherwise Specified

Hiroshi Ando
13, Kitaiga-cho, Yotsuya, Tokyo, Japan
1AW, 1KC, 1YK, 2FB, 2ZL, 2ZN, 2BIR, 4FT, 6TU, 6ZH, 6BAW, 7OM, 7ZF, 9DGW.

F. D. Bell, 4AA.
Palmerston South, New Zealand.
(Aug. 4th to Sept. 20th.)
1FB, 1ACU, 1AJP, 1ALJ, 1ALF, 1BES, 1BRO, 1BWJ, 2BRD, 2BQD, 4FT, 5GA, 5LR, 5PB, 5SK, 5VM, 5XAJ, 5ZAK, 6BD, 6JX, 6KA, 6PL, 6VK, 6AJF, 6ALK, 6APW, 6ARB, 6AWT, 6BJQ, 6BPZ, 6BUO, 6BUY, 6CFZ, 6CGW, 6CHL, 6CMR, 7GO, 7JE, 7LY, 8WY, 8AIO, 8CGR, 8CWU, 9BP (possibly Canadian), 9MF, 9MR, 9ZT, 9AAU, 9AIM, 9BPM, 9BTL, 9EKY, 9CCS, 9CVO, 9DAW.
Hrd on 8 foot loop: 6PL, 6ALK, 6ARB, 6AWT, 6BVS, 6BUY, 6CGW.
A.R.R.L. Headquarters has a copy of Mr. Bell's log and can help confirm the above receptions.

H. J. Swift, 2WY,
Kassala, 77 Upper Tulse Hill, London, S.W.2
1AJ, 1AR, 1ARY, 1AW, 1BMA, 1BRJ, 2AGB, 2AMK, 2BGU, 2BLS, 2BQH, 2BS, 2BY, 2CCX, 2CK, 2CXL, 3OD, 8ASV, 8AT, 8BQ, 8CEI, 8CTP, 8HV.

F. J. Dinsdale,
14 Highfield View, Stoneycroft, Liverpool, England
(September and first of October)
1CQ, 1II, 1JW, 1MV, 1RR, 1RB, 1ACU, 1ANA, 1AJP, 1AXN, 1BIN, 1BMK, 1BWF, 1BWJ, 1BES, 1CDM, 1CKP, 1CMP, 1CMY, 1CPN, 1CRW, 2BY, 2FP, 2RB, 2RS, 2RW, 2SN, 2ZG, 2AAR, 2AFP, 2AGB, 2BNC, 2BQH, 3AB, 3BG, 3CP, 3KM, 3KQ, 3TJ, 3QO, 3PF, 3TK, 3YO, 3ZO, 8BFU, 3BGT, 3BNU, 4FC, 4FT, 4GL, 4GX, 5MA, 5NL, 5HDM?, 5NWM?, 8FU, 8GZ, 8HV, 8HN, 8KM, 8RQ, 8UE, 8ZZ, 8AMM, 8ASV, 8BCI, 8BCT, 8BXF, 8CDZ, 8CTP, 8CRW, 9AAU, 9ARC, 9AUY, 9BZI, 9CTT, 9DQU, Can. 1AR, 3HE.

J. L. Leistra,
Walenburgstreet 4, Rotterdam, Holland.
1AJ, 1AW, 1PA, 1PU, 1WL, 1AAR, 1BAN, 1BCF, 1BGC, 1BWJ, 1CMX, 2AV, 2JF, 2KM, 2OR, 2SZ, 2WA, 2XW, 2AFP, 2BQH, 2CPA, 2CXL, 3BN, 3BU, 3ZS, 3AAO, 3BOF, 4BQ, 4ER, 4PE, 5HD, 9GZ, 8HV, 8PT, 8SJ, 8SZ, 8TT, 8UE, 8UF, 8VE, 8ZX, 8ABX, 8AIB, 8BJV, 8BKZ, 8BZC, 8CTP, 9AAU, 9APE. Canadian: 1AR, 2BN, 3XN.

Juan E. Chibas,
Gral. Portuendo baja 12, Santiago de Cuba
1ASI, 1CAZ, 1MO, 1PA, 1YB, 2BLS, 2BQU, 2BUM, 2CEE, 2CJR, 2CQZ, 2CXL, 2KF, 2XAB, 3AAO, 3ATB, 3BDO, 3BWT, 3CBM, 3CBZ, 3CFV, 3TJ, 3TR, 3VO, 4EQ, 4FT (CW & Voice), 4IZ, 4IZ, 4LJ, 4MB, 4NA, 4NV, 4OM, 4ZA, 5AC, 5AFS, 5AGJ, 5AHD, 5AIU, 5AMA, 5AMH, 5EK, 5FC, 5FD, 5HL, 5HT, 5JN, 5JR, 5KC, 5LR, 5NN, 5OV, 5PB, 5UP, 5XA, 5XV, 5ZAV, 5ZG, 6AWT, 6CBI, 6CGW, 6ZAH, 8AIB, 8ASV, 8AVD, 8BDA, 8BF, 8BNH, 8CEI, 8CPP, 8DIG, 8ER, 8GZ, 8KG, 8PI, 8UF, 8XE, 8ZC, 8ZZ, 9AAU, 9ACI, 9AIM, 9APF, 9BAK, 9BRK, 9BSH, 9BSP, 9BZI, 9CAH, 9DLW, 9DR, 9DWK, 9EEA, 9IH, 9MC, 9OX, 9ZV. Can. 2BG.

H. T. Mapes, BX,
Guanajuato, Gto., Mexico.
2XN, 4BY, 4FT, 4KU, 4MB, 4XJ, 5AKW, (5AMA), 5ADO, 5AHD, 5AEW, 5AKN, 5AKJ, (5ACR), 5AIU, (5ADI), 5AMB, 5AMJ, (5ADB), 5AIB, 5ADH, 5AFH, 5AHH, 5ANA, 5AF, 5AKY, 5AIH, 5AIC, 5AIJ, 5AMP, 5BM, 5BE, (5BX), 5CV, 5DR, 5DW, 5EN, 5EK, (5FT), (5FA), 5FC, 5FX, 5GW, 5GA, 5GN, 5GI, 5GF, 5GM, (5HZ), (5HT), (5IN), 5IF, 5JF, 5JE, 5JI, 5JC, 5JE, (5KG), (5KC), 5KF, 5LJ. (5LR), 5LL, 5LP, 5LC, 5MT, 5MCG, 5MN, 5NR, 5NG, 5NH Spk, 5NJ, (5NK), 5NZ, 5NN (5OV), (5PB), (5PH), 5QI, 5QL, 5QY, 5QQ, 5SD, 5TJ, 5UO, 5VV, 5VY, 5VF, (5XAJ), (5XV), 5XAB, (5YG), (5YK), 5YK Spk, 5ZH, 5ZG, 5ZAX, 5ZAK, (5ZA), 5ZAV, 5ZX, 5AMW, 6ALK, 6AND, 6AWT, 6ASX, 6ARB, 6AGK, 6AVV, 6AAK, 6ACG, 6ASX, 6AVR, 6AO, 6AUP, 6AVA, 6AUY, 6ALV, 6BBC, 6BIC, 6BIH, 6BUR, 6BRF, 6BWZ, 6BSN, 6BQC, 6BTS, 6BLG, 6BWP, 6CGW, 6CGD, 6CFI, 6CBI, 6CHL, 6CFZ, 6CIC, 6CMR, 6CKP, 6CKR, 6CMU, 6CMI, 6CGA, 6FH, 6FF, 6KM, 6MH, 6MG, 6TS, 6VF, 6ZH, 6ZI, 6ZZ, 6ZAH, 7ABB, 7ZU, 8AWP, 8AME, 8ASV, 8BDA, 8EF, 8KH, 8VK, 8XE, 8YV, 9AVZ, 9APE, 9AAU, 9AIM, 9APS, 9AVN, 9ATN, 9APF, 9AUY, 9AMB, 9AON, 9BX, 9BZI, 9BED, 9BBW, 9BEZ, 9BXQ, 9CCZ, 9CCV, 9CZW, 9CA, 9CNS, 9DXY, 9EKY, 9CFY, 9OX, 9XAQ, 9YAJ, 9YY, 9ZT, 9ZV.

Aux. Sch. Bowdoin, WNP
Refuge Harbor, Greenland. (Sept. 20 to Nov. 1.)
(Received via Can. 9BP, Prince Rupert, B. C.)
1AW, 1BDI, 1CKP, 1YB, 2AAY, 2AWF, 2BQH, 2BY, 2CQZ, 2CUI, 2CXL, 2CXX, 2IU, 2RS, 3AAO, 3ALN, 3IW, 3ME, 3VO, 3ZM, 4FT, 4KU, 4MB, 4MY, 5ACR, 5ADB, 5ADO, 5AEO, 5AIE, 5AIU, 5AKN, 5AMA, 5ANC, 5BM, 5EN, 5GA, 5GJ, 5GM, 5HT, 5HZ, 5IF, 5JE, 5KW, 5LC, 5LR, 5MN, 5MO, 5PH, 5PV, 5QI, 5QL, 5QQ, 5QY, 5SD, 5TJ, 5UO, 5XV, 5ZAV, 5ZB, 6AFQ, 6AGE, 6AHU, 6AIV, 6AJF, 6AJH, 6AKT, 6ALV, 6AMS, 6ANB, 6AO, 6AOI, 6AOS, 6AOU, 6ARB, 6ASX, 6ATZ, 6AUP, 6AUY, 6AVV, 6AWS, 6AWT, 6BBC, 6BDS, 6BEG, 6BFB, 6BFL, 6BIC, 6BIH, 6BIQ, 6BMD, 6BNU, 6BON, 6BQZ, 6BQC, 6BQL, 6BRX, 6BSJ, 6BUO, 6BUR, 6BVE, 6BVG, 6BVS, 6BWP, 6CBD, 6CBI, 1CBU, 6CBW, 6CFI, 6CFT, 6CFZ, 6CGA, 6CGG, 6CGW, 6CHL, 6CKC, 6CKF, 6CKP, 6CKR, 6CMQ, 6CMR, 6CMU, 6CNH, 6CNL, 6DD, 6EA, 6EB, 6ET, 6FH, 6FY, 6GX, 6HQ, 6II, 6IQ, 6JM, 6JX, 6KJ, 6LU, 6NX, 6OD, 6OH, 6OM, 6PL, 6TI, 6UX, 6VD, 6VF, 6XAD, 6XH, 6ZAH, 6ZAR, 6ZH, 6ZI, 6ZK, 6ZL, 6ZO, 6ZP, 6ZW, 6ZX, 7ABB, 7ACI, 7ADP, 7ADS, 7AEL, 7AFE, 7AFO, 7AGE, 7AGV, (7AHB), 7AIS, 7AIY, 7BB, 7BJ, 7DC, 7EI, 7FD, 7FL, 7GI, 7GO, 7GP, 7GQ, 7HW, 7IT, 7JE, 7JS, 7KS, 7LY, 7OH, 7OY, 7QD, 7QF, 7QJ, 7QN, 7RC, 7SY, 7TK, 7WM, 7WS, 7YA, 7YL, 7ZL, 7ZU, 7ZZ, 8AB, 8ADA, 8AJH, 8AME, 8AMM, 8AMQ, 8APT, 8AQ, 8AWP, 8BDA, 8BDU, 8BDV, 8BF, 8BFH, 8BHN, 8BWZ, 8BZD, 8CDZ, 8CKO, 8CNO, 8CYO, 8CYX, 8DCZ, 8ER, 8ES, 8FU, 8GZ, 8HV, 8IB, 8IG, 5KG, 8KJ, 8KR, 8PD, 8RJ, 8VT, 8WA, 8XE, 8YAE, 9AAL, 9AAU, 9AAW, 9ACI, 9ACK, 9AEC, 9AEM, 9AGL, 9AIC, 9AII, 9AIM, 9AJH, 9AJV, 9AQK, 9ALK, 9ALY, 9AMB, 9AMF, 9AON, 9AOU, 9APE, 9APF, 9APS, 9AQZ, 9ARH, 9ATN, 9AUA, 9AUU, 9AUY, 9AVP, 9AVZ, 9AWG, 9AWS, 9AWV, 9AXX, 9AYI, 9AZX, 9BAB, 9BAF, 9BAK, 9BAV, 9BAZ, 9BBR, 9BBW, 9BCH, 9BED, 9BFB, 9BFQ, 9BG, 9BHZ, 9BIH, 9BIK, 9BJK, 9BLT, 9BMU, 9BMX, 9BQJ, 9BQQ, 9BQY, 9BRI, 9BRK, 9BRS, 9BRX, 9BTL, 9BTT, 9BUZ, 9BYZ, 9BIZ, 9CAA, 9CAJ, 9CBJ, 9CCS, 9CCV, 9CEE, 9CFK, 9CFZ, 9CQU, 9CHC, 9CIN, 9CJC, 9CKQ, 9CMK, 9CNB, 9CNH, 9CNS, 9CP, 9CPG, 9CR, 9CTE, 9CTR, 9CVV, 9CYF, 9CZS, 9CZW, 9DAP, 9DCW, 9DFH, 9DGJ, 9DGV, 9DIS, 9DJM, 9DKB, 9DKQ, 9DLF, 9DLG, 9DLI, 9DOE, 9DOF, 9DQ, 9DQU, 9DRN, 9DSW, 9DTT, 9DUG, 9DVW, 9DWA, 9DXN, 9DXY, 9EAE, 9EAP, 9EAU, (9EBT worked), 9EEA, 9EHJ, 9EHN, 9EIL, 9EKY, 9EQ, 9GD, 9IG, 9JF, 9LZ, 9MC, 9MF, 9MM, 9NR, 9OX, 9RC, 9UH, 9US, 9VC, 9VM, 9VZ, 9XM, 9XN, 9YAJ, 9YB, 9YY, 9ZG, 9ZT, 9ZV, 9ZY.
Spark: 9BDH, 9BOF.
Canadian: 2CG, 3HE, 3NI, 3XX, 3ZS, 3ZT, 4CL, 4DY, 4ER, 4HF, 4HH, 5AH, 5CN, 5CT, 5GO, 5HB, (9BP worked), 9BW, 9BX.
Hawaiian: 6CEU.

S.S. Natirer
Sept. 20th to 26th. All over 1200 miles from New York: 1ER, 1FB, 1FM, 1GV, 1HK, 1IL, 1MY, 1OL, 1PA, 1QP, 1RR, 1UH, 1YK, 1AAO, 1ABC, 1ADN, 1AIR, 1AJT, 1AJX, 1ALI, 1ALJ, 1APC, 1AQU, 1ARY, 1ASK, 1AUR, 1AZS, 1BCF, 1BDU, 1BES, 1BKQ, 1BLN, 1BNS, 1BQK, 1BRI, 1BSJ,

1BVB, 1BWJ, 1CCX, 1CCZ, 1CKQ, 1CMP, 1CMX, 1CPN, 1CRI, 1CRW, 1CSX, 1CVS, 2AW, 2BY, 2EL, 2FC, 2GK, 2GO, 2IU, 2KK, 2OM, 2RB, 2TS, 2WA, 2WR, 2ABZ, 2ACD, 2AGB, 2AJW, 2APD, 2BBX, 2BQC, 2BQH, 2BMR, 2BSC, 2CCX, 2CFB, 2CJX, 2CKK, 2CMK, 2CPD, 2CQZ, 2CUJ, 2CXD, 2CXL, 3AB, 3BG, 3CC, 3DQ, 3DS, 3HB, 3IW, 3JY, 3LG, 3MB, 3ME, 3MO, 3OQ, 3XN, 3AAO, 3ACY, 3AIS, 3ALN, 3AUA, 3AUV, 3BDO, 3BFU, 3BNU, 3BOF, 3BTA, 3BUC, 3BWT, 3CEL, 3CFV, 4BY, 4DB, 4EL, 4FT, 4HS, 4KU, 4LJ, 4MB, 4MY, 4NA, 4OM, 5BM, 5EK, 5GA, 5GF, 5GN, 5LR, 5MO, 5NJ, 5PF, 5UK, 5UP, 5ZA, 5ZB, 8AB, 8CP, 8DO, 8FU, 8GD, 8GZ, 8HV, 8HN, 8IJ, 8IG, 8KG, 8KH, 8KJ, 8PL, 8TH, 8TT, 8UF, 8VQ, 8VN, 8WX, 8ZO, 8ZZ, 8AGO, 8AGP, 8AHQ, 8AIB, 8ALX, 8AMM, 8APN, 8APT, 8APY, 8ARD, 8AVL, 8AVN, 8BCP, 8BHY, 8BKL, 8BUM, 8BVX, 8BWZ, 8BXT, 8BZC, 8CDC, 8CDD, 8CDZ, 8CHB, 8CKN, 8CSJ, 8COI, 8CUR, 8DAT, 8DFI, 8DKM, 8YAE, 9BK, 9CP, 9CR, 9HK, 9IG 9LZ, 9OX, 9QI, 9QR, 9RC, 9UH, 9YY, 9ZT, 9AAR, 9AAU, 9AAW, 9AEN, 9AIM, 9AON, 9AOU, 9ATZ, 9AUA, 9AUY, 9AWK, 9BED, 9BMU, 9BQY, 9BRK, 9BRX, 9BTH, 9CTE, 9CVI, 9DCT, 9DHQ, 9DHG, 9DKY, 9DOE, 9DWK, 9EKF, 9EKY. Can.: 1AR, 2BN, 3CG, 3GE, 3HE, 3KG, 3ZS, 3ADN, 9BW. English: 2KF. QSL to David L. Cawman, 518 Clifton Ave., Clifton, N. J.

Leon Deloy, F8AB enroute to France

Oct. 12th, 300 miles E. of N.Y.: 1AJT, 1ARP, 1ARY, 1AUR, 1BES, 1BGC, 1BHK, 1CMP, 1FB, 1MC, 1YB, 2AMO, 2CVU, 2CXL, 2CJR, 3AAO, 3BTP, 3BUY, 3JJ, 3VO, 3XA, 3ZO, 8ACY, 8BDA, 8BIQ, 8BDU, 8BNH, 8BOA, 8BWK, 8CJD, 8CSJ, 8NB, 8OW, 8UF, 8UK, 8XE, 8ZAE. 9VZ. Can.: 1AR, 1DD, 3BA, 3ZS, Phone: XWZ calling ABC, 100 meters: 8CHV, 1ARY, KDKA phone.

Oct. 13th-14th, 614 E. of N.Y.: 1AJA, 1ARY, 1ASI, 1AYI, 1BEL, 1BCR, 1CAB, 1CMP, 1FD, 1II, 1IL, 1PA, 1YB, 1YK, 2AAY, 2AGB, 2AH, 2AJW, 2AMO, 2ARS, 2TS, 2BQU, 2CJR, 2CJX, 2CQI, 2CXL, 2IG, 3AF, 3AS, 3AUV, 3CBM, 3JJ, 3TR, 5AIF, 5AMA, 8AJE, 9APY, 8BDA, 8CLC, 8CSJ, 8ZZ, 9DXN, 9UH. Can.: 1DD, 1YB. 100 meters: 1CMP, 1FD, 1KC, 1MO, 1RR, 2AMO, KDKA phone.

Oct. 14-15th, 947 m. of N.Y.: 1AF, 1AJA, 1AJT 1ARJ, 1ARP, 1AUR, 1BHK, 1BNT, 1BQM, 1BQL, 1BSD, 1BWF, 1CPN, 1CSX, 1ER, 1GV 1MC, 1RR, 1YB, 2AGB, 2AGD, 2AMO, 2BGI. 2BQU, 2BRB, 2CEI, 2CFB, 2CPQ, 2CSR, 2CXL, 2CXY, 2EL, 2FC, 2IF, 3AFS, 3AS, 3BDO, 3CDN, 3JJ, 3WF, 3ZO, 5HL, 5ZAV, 6ZZ, 8AB, 8AJE, 8AZO, 8BF, 8BNA, 8BNH, 8BOA, 8BZC, 8DHQ, 8GZ, 8XE, 9AWV. Can.: 2AU, 3TB. 100 meters: 1MO, KDKA carrier wave.

Oct. 15-16th, 1923, 1900 to 0050 E.S.T. (position at 2200 E.S.T., 1276 m. E. of N.Y.): 2CXL. 100 meters: 1MO, KDKA carrier wave only.

Oct. 17th-18th: 1910 E. of N.Y. Very few sigs; unreadable thru induction.

Oct. 18th, 900 W. of Havre: B6NI, F8BM.

Oct. 19th, 600 W. of Havre: B2JF, B6NI, F8BM.

Oct. 20th, 300 W. of Havre: H-ODV, B2DF, B2JF, B2KW, B2NA, B2OD, B2VW, B5GX, B5TT, B6TM, F8BF.

S.S. Myriam,

Oct. 10th in Gibralter Strait, and Oct. 13th in Entrance to English Channel: 1AJX, 1ALZ, 1ANA, 1AUR, 1AW, 1BDI, 1BEP, 1BES, 1BEW, 1BHW, 1BR. 1BY, 1CMP, 1ER, 1MO, 1PA, 1RR, 1XC, 2AH, 2AMO, 2AV, 2BES, 2BOR, 2BQH, 2BSC, 2BY, 2BZY, 2CCX (ICW), 2CEE, 2CLA, 2COA, 2CXL, 2IW, 2PC, 3BGT, 3BNU, 3IW, 3JJ, 3OH, 3OM, 3TB, 4FT, 8APY, 8BDA, 8BQU, 8BV, 8CDA, 8CGU, 8CS. 8SF, 8UF, 8VQ (ICW), 8XE (ICW), 8ZA, 9AUC, 9BRK. Canadian: 1AR, 3BUC. Total: 58. The most QSA are: 1AW, 1BEP, 2BY, 2CCX, 2CXL, 8VQ, 8XE with 2CCX and 2CXL the best of all.

Pse QSL to A. Vasseur, 53 rue de Chabrol, Paris 10, France.

1DD, Dartmouth, N. S.

3AB, 3ACQ, 3ADT, 3APR, 3ASA, 3ATG, 3ATS, 3BAI, 3BER, 3BFU, 3BJJ, 3BMS, 3BQP, 3BRW, 3BUY, 3BVL, 3BW, 3CAH 3CBZ, 3CDV, 3CEL, 3CGM, 3GC, 3HH, 3IW, 3JY, 3OQ, 3SI, 3TR, 3VW, 4DB, 4DN, 4EB, 4EP, 4EQ, 4FM, 4FT, 4GX, 4LJ, 4RB, 4ME, 4NA, 4XF, 5AGJ, 5AKN, 5BA, 5BE, 5BW, 5HT, 5JR, 5KG, 5NJ, 5NN, 5NQ. 5PB, 5QQ, 5UP, 5ZA, 6BCL, 6CBI, 6PL, 8AA, 8AGO, 8AGW, 8AHQ, 8APU, 8AVN, 8AWL, 8BDF, 8BDU, 8BIM, 8BKM, 8BL, 8BNH, 8BPN, 8BQU, 8BSS, 8BTA, 8BTO, 8BVR, 8CAE, 8CDZ, 8CED, 8CEI, 8CEO, 8CHB, 8CJS, 8CKE, 8CKN, 8CNK, 8COZ, 8CPV, 8CZZ, 8DBL, 8DDA, 8FM, 8FU, 8GZ, 8JJ, 8KG, 8LX. 8PL, 8RV, 8UF, 8VN, 8ZL, 8ZZ, 8ZAE, 9AAF, 9AAU, 9ALQ, 9AMB, 9AOF, 9AUA, 9BAK, 9BAN, 9BFI, 9BLG, 9BSN, 9BYX, 9BZI, 9CAH, 9CCS, 9CDO, 9CFK, 9CT, 9DUW, 9DZY, 9EK, 9MC, 9NN? 9QR, 9ST. 9YY.

Canadians: 2BE, 2BG, 2BN, 2CG, 2CT, 2HG, 2IC, 3AA, 3BA, 3BQ, 3DS, 3HT, 3TB, 3XI, 4TX (?).

2CQ, Montreal, Quebec.

(4KU), (4MB), 5GA, (5GJ), 5GM, 5HT, 5KC, 5NZ, 5TJ, 5AIU, 5AMH, 5ZAV, (9HK), 9JP, (9OX), 9RC, 9SK, 9VZ, 9ZT, 9AAU, 9AHY, 9AIM, 9AJZ, 9APS, 9ASV, 9AXX, 9BAK, (9BFI), (9BGY), (9BRK), 9CAB, 9CAH, 9CCK, 9CCS, (9CEE), (9CJC), (9CSY), 9CTE, 9CTB, 9CTN, (9CTR), (9DIS), 9DKQ, 9DKT, (9DLG), (9DLR), 9DMJ, 9DQU, 9DWK, (9DZY), (9EKF), (9EKY).

3BQ, Kitchner, Ont.

4CY, 4EQ, 4GI, 4GW, 4JI, 4MI, 4QF, 5AIR, 5AKI, 5ATR, 5NJ, 5PB, 5SQ, 5SR, 5UI, 5VC, 5ZA, 5ZAV, 5ZB, 5ZK, 6AFQ, 6AJH, 6AMI, 6ANE, 6AOL, 6BCL, 6BIH, 6BM, 6BQL, 6BUA, 6BVA, 6CBU, 6CBW, 6CFZ, 6CGW, 6CRN, 6FY, 6KM, 6PL, 6VAD, 6ZAH, 6ZAR, 7ABB, 7ARE, 7BB, 7BJ, 7BZT, 7CBU, 7LR, 9AMB, 9BJI, 9BUN, 9CAA, 9CAS, 9CFY, 9CNN, 9CTX, 9DCJ, 9DJV, 9DRC, 9DXP, 9DXU, 9DZA, 9EBY, 9MF, 9NR. Can.: 1AR, 1DE, (1DD), 1DQ, 2AM, 2BE, 2BG, (3NI), 4AW, (4CL), 4CR, 4HH, 5CN, 9BX.

1ER, Stearns Road, Welesley, Mass.

(4AG), 4DB, (4EQ), (4JK), 4JV, 4KU, 5ABN, 5ADB, 5AIU, 5AKN, 5AMH, 5ANP, 5AXN, 5DW, 5EK, 5GJ, 5IA, 5IN, 5KG, 5NN, 5OV, 5QY, 5XV, (5ZAV), 6ALV, 6ANB, 6ARB, 6AWS, 6AWT, 6BCL, 6BGD, 6BIH, 6BJQ, 6BLY, 6BQL, 6BUA, 6BUN, 6BUZ, 6CBU, 6CBW, 6CFZ, 6CGD, 6CGW, 6CHL, 6CKR, 6CMR, 6CXU, 6FH, 6KM, 6MG, 6NN, 6OL, 6PL, 6TS, 6XAD, 6ZAH, 6ZAR, 6ZC, 6ZU, 7CZ, 7HG, 7IF, 7KS, (7LU), 7WP, 7WX, 7ZD, 7ZU, 9AIM, 9AOU, 9APE, 9APF, 9AVN, (9AXX), 9BBW, 9BFI, 9BUN, 9BZI, 9CAA, 9CCV, (9CEH), 9CFY, 9CHQ, (9CHE dalite), 9CJC, (9CNB), (9CSY), 9CTR 9CVC, 9CWC, 9CWF, 9CVF, 9DCH, (9DEH), 9DFH, (9DKY), 9DKB, (9DMJ), (9DSW), (9DXY), (9EHT), (9EKF), (9EKY), 9EQ, 9HK, 9YU, (9ZT).

1AMI, Southington, Conn.

4AI, 4AY, 4DB, 4EB, 4EQ, 4FT, 4GX, 4KU, 4MY, 4OA, 4QF, 4RR, 4RH, 4BVH, 4FJ, 5ABJ, 5ABY, 5AC, 5ADS, 5AFQ, 5ACM, 5AGJ. 5AGO, 5AIU, 5AKN, 5AKY, 5AM, 5AMS, 5DT, 5DA, 5GA, 5GN, 5GX, 5KC, 5LR, 5MA, 5NA, 5NJ, 5NN, 5OV, 5PF, 5QL, 5RQ, 5TI, 5UP, 5UU, 5VT, 5VZ, 5ZA, 5ZAS, 5ZAV, 5ZB, 5ZZ, 6ALY, 6AVR, 6BCL, 6CMN, 6FF, 6GZ, 6IU, 6WZ, 6ZZ, 7LU, 9AAD, 9AAU, 9AB, 9ACY, 9AEN, 9AHR, 9AIM, 9AIU, 9ALB, 9ALQ, 9ALR, 9AMB, 9AMJ, 9AMU, 9ANF, 9AON, 9ADU, 9AOY, 9ARC, 9ARH, 9ARM, 9ASV, 9ASE, 9AT, 9AUS, 9AUY, 9AWV, 9AXH, 9AXX, 9AZX, 9BAK, 9BRR, 9BBW, 9BDE, 9BDJ, 9BFF, 9BFI, 9BG, 9BGM, 9BHH, 9BIS, 9BK, 9BKH, 9BLY, 9BMU, 9BNA, 9BQY, 9BRX, 9BSM, 9BSP, 9RTA, 9BUK, 9BUJ, 9BWC, 9BWP, 9BWV, 9BYX, 9BZ, 9CAA, 9CAH, 9CAJ, 9CBA. 9CCV, 9CDJ, 9CFK, 9CFU, 9CFY, 9CGV, 9CHB, 9CHC, 9CHD, 9CHE, 9CIG, 9CJR, 9CHA, 9CND, 9CNV, 9CDG, 9CP, 9CRW, 9CSB, 9CTB, 9CTC, 9CTE, 9CTF, 9CTR, 9CTT, 9CVI. 9CVS, 9CXL, 9DAW, 9DBF, 9BDU, 9DCE, 9DCH, 9DCJ, 9DCR, 9DCW, 9DDY, 9DGL, 9DGV, 9DHG, 9DIX, 9DKV, 9DLG, 9DLW, 9DMJ, 9DOZ. 9DQU, 9DRO, 9DUF, 9DWA, 9DXL, 9DYY, 9DZH, 9ECB, 9ECV, 9EDO, 9EFZ, 9ELD, 9ELL, 9EJV, 9EQ, 9ERR, 9HK, 9IR, 9JG, 9LR, 9MF, 9NC, 9NR, 9PW, 9QB, 9QR, 9SK, 9TA, 9UB, 9US, 9UZ, 9VZ, 9ZT, 9ZV.

Can.: 1AR, 1DD, 1JT, 2BE, 2FC, 2IC, 3AA, 3CE, 3HE, 3HT, 3KG, 3NI, 3QS, 3TB, 3XI, 3XN, 3ZS, 8AQ; 8TAN, 9BW.

1BWJ, Natick, Mass.

5ABT, 5AGN, 5AIU, 5AJB, 5AMH, 5AMR, 5ANC 5BW, 5BX, 5DO, 5EK, 5FV, (5FX), (5GJ), 5HL, 5HT, 5LR, (5MI), 5NK, (5NN), 5OH, (5OU), (5OV), 5PH, 5QQ, 5UI, 5UK, 5UO, 5UP, 5UW, (5WO), 5XV, 5ZA, 5ZAV, 5ZG, 5ZM, 6AHH, 6ALT, 6AMS, 6AVV, 6AWT, 6BBU, 6BBW, 6BEJ 6BHU, 6BMD, 6BNG, 6BQE, 6CEK, 6CFM, 6CGW, 6CKA, 6CKP, 6CNC, 6CQE, 6DD, 6KA, 6PL, 6QE, 6VF, 6XAD, 6ZAH, 6ZH, 7AG, 7AIY, 7BO, 7HM, 7KS, 7LU, 7ZD, (7ZU), (9ACK), (9ACO), 9AED, 9AHQ, 9AIC, 9AJV, 9AKT, 9AMB, 9AOU, (9APF)

9APV, 9AQZ, (9AUY), 9AVN, (9AWA), 9AWV, 9BAK, (9BED), 9BG, 9BGT, 9BHH, 9BHN, 9BJI, 9BLG, (9BQJ), 9BSP, 9BYL, (9BZI), 9CAA, 9CBJ, (CBS), 9CCZ, (9CEH), 9CER, (9CFK), (9CKW), 9CLZ, 9CNO, 9COL, (9DAW), 9DCH, 9DCT, (9DES), 9DJM, (9DKB), (9DKX), (9DMJ) (9DPC), (9DQU), 9DR, (9DVM), (9DYL), 9EAK, 9ECV, (9EHH), (9EKF), (9EKY), (9ELB), 9MC, 9TA, 9TN, 9TT, 9VC, 9VZ, (9ZT).

1CNA, Hudson, Mass.

6AJR, 6ALV, 6ARB, 6ASX, 6ATC, 6AWT, 6BCL, 6BUM, 6BVG, 6BZQ, 6CC, 6CBI, 6CBU, 6CGW, 6CKP, 6CKR, 6CMR, 6KA, 6KM, 6XAD, 6ZAH, 6ZAR, 7ABB, 7ADR, 7CN, 7HG, 7IC, 7PF, 7SC, 7SG, 7WM, 7ZA, 7ZU, 7ZV.

2AWF, Albany, N. Y.

4DE, 4KC, 4KU, 4MC, 5ABH, 5ABT, 5ABY, 5AIU, 5AKN, 5AMU, (5BE), 5BM, 5CN, (5DW), 5FX, 5GI, 5IN, 5LR, 5MI, 5NW, 5PH, 5TJ, 5XA, 5XV, 5ZAV, 6ARB, 6AWT, 6AUY, 6BBC, 6BBV, 6BJQ, 6BMD, 6BVG, 6CBD, 6CBI, 6CMR, 6GO, 6HG, 6KA, 6PL, 6WP, 6XAD, 6ZO, 9ALX, 9ALY, (9AOG), 9AOU, 9APE, 9APF, 9APS, 9ARC, 9ARP 9ASE, 9ATN, 9AUS, (9AUY), 9BAK, (9BGT), 9BJI, 9BLT, 9BOE, 9BQJ, 9BRK, 9BUH, (9BUJ), 9BYC, 9BYE, 9CAH, 9CCA, 9CCS, 9CCV, 9CDQ, (9CE), 9CEB, 9CEJ, (9CFK), 9CGA, 9CHO, 9CIW 9CJC, 9CJS, 9CLJ, 9CMK, 9COG, 9COL, 9CPG, 9CSY, 9CTR, 9CUD, 9CVV, 9CWF, 9CYB, 9CZW, 9DAR, 9DCH, 9DHG, (9DKX), (9DKY), 9DLW, (9DMJ), 9DOZ, 9DPC, (9DPX), 9DR, 9DRR, 9DVM, 9DVN, 9DVW, 9DXP, 9DZY, 9EBT, 9EHJ, (9ELB), 9FP, 9KD, 9MC, 9RC, 9VM, 9VC.

2BZJ, Farmingdale, N. J.

5EK, 5KR, 5LR, 5ZA. 5ZM, 5AFQ, 5AIC, 6II, 6MH, 6PL, 6ZZ, 6ABX, 6AJF, 6AJH, 6ALV, 6ANB, 6ANI, 6AOC, 6ARB, 6ATZ, 6AWT, 6BBW, 6BCL, 6BIH, 6BKX, 6BLG, 6BUA, 6BUO, 6BVE, 6BVG, 6CBU, 6CFZ, 6CGW, 6CHL, 6CHU, 6CKR, 6CMR, 7BB, 7HG, 7LN, 7LU, 7YA, 7ZD, 7ZU, 7ABB, 9AED, 9APE, 9AUS, 9BGT, 9BJI, 9BJK, 9BZI, 9DEW, 9DKY, 9DUG.

Canadian: 4CL, 4HH, 5CN, 5GO. One tube used.

2CEG, N. Y. C., N. Y.

4AI, 4BX, 4DB, 4EB, 4FT, 4JK, 4JL, 4KU, 4MB, 4MY, 4OA, 4PW, 4QF, 4RH, 4SB, 5ABT, 5AGB, 5AKN, 5ALV, 5AMA, 5AMH, 5ANP, 5BE, 5EK, 5ER, 5FV, 5GA, 5GJ, 5HL, 5HT, 5LR, 5MA, 5MO, 5VV, 5ZA, 5ZAV, 5ZB, 6ALV, 6CBI, 6CGW, 6CHL, 6KA, 6XAD, 7ZU, 9AAU, 9AAV, 9AAW, 9ADY, 9AGL, 9AGS, 9AHQ, 9AHZ, 9AIC, 9AIH, 9AIM, 9AOU, 9APF, 9APS, 9ARH, 9ASE, 9ASV, 9AUA, 9AUS, 9AVG, 9AVN, 9AWA, 9AWG, 9AWV, 9AXD, 9BAK, 9BAV, 9BAZ, 9BBR, 9BED, 9BFF, 9BGT, 9BGY, 9BHD, 9BHH, 9BJI, 9BJR, 9BK, 9BKK, 9BLG, 9BLY, 9BMU, 9BNX, 9BOE, 9BQJ, 9BQY, 9BRK, 9BRX, 9BSH, 9BSM, 9BSP, 9BTD, 9BUJ, 9BUO, 9BYC, 9BYX, 9BZI, 9CCN, 9CCS, 9CE, 9CEH, 9CEJ, 9CFK, 9CFQ, 9CHC, 9CHE, 9CHN, 9CHO, 9CK, 9CLX, 9CLY, 9CLZ, 9CMK, 9CNB, 9CNO, 9COL, 9CP, 9CQW, 9CSY, 9CTC, 9CTE, 9CTK, 9CTR, 9CVI, 9CVS, 9DAP, 9DBU, 9DCE, 9DCT, 9DCW, 9DDT, 9DGW, 9DHG, 9DKX, 9DKY, 9DLU, 9DLW, 9DMF, 9DMJ, 9DQA 9DQQ, 9DQU, 9DRA, 9DRO, 9DRG, 9DSW, 9DVW, 9DWK, 9DXH, 9DXU, 9DZK, 9EAD, 9EAR, 9EHT, 9EIQ, 9EJA, 9EKF, 9EKY, 9ELA, 9ELB, 9ELD, 9EQ, 9ER, 9HK, 9JG, 9MC, 9NU, 9OI, 9OX, 9PF, 9QR, 9QW, 9RC, 9TD, 9UR, 9UZ, 9VM, 9XI, 9XM, 9ZT, 9ZY.

3AB, 3HS, Washington, D. C.

5AAT, 5ABH, 5ADI, 5AIU, 5AKF, 5AKN, 5BE, 5CV, 5DW, 5FA, 5FJ, 5FX, 5GA, 5GJ, 5GM, 5HT, 5JE, 5KG, 5KW, 5LR, 5MA, 5NN, 5NW, 5OU, 5QE, 5QL, 5SK, 5SR, 5TJ, 5TN, 5UK, 5XV, 5ZAV, 5ZH, 5ZM, 5ZT, 6AJH, 6ALV, 6AOL, 6ARB 6ASX, 6AUU, 6AVV, 6AWT, 6BBC, 6BCL, 6BJJ?, 6BMD, 6BQE, 6BVG, 6CBI, 6CBU, 6CCR, 6CDG, 6CEK, 6CFI, 6CGW, 6CHH, 6CHL, 6CKR, 6CMR, 6CNC, 6KA, 6MG, 6MH, 6PL, 6UA, 6XAD, 6ZAR, 7ABB, 7CU, 7GO?, 7HG, 7HW, 7IH, 7KS, 7LN, 7LU, 7WM, 7WP, 7YA, 7ZD, 7ZU, 9AMB, 9AOD, 9APF, 9AUA, 9AWM, 9AWV, 9BAB, 9BET, 9BEZ 9BFI, 9BIS, 9BJI, 9BLY, 9BQJ, 9BUY, 9CAA, 9CCV, 9CGA, 9CJI, 9CWC, 9DAW, 9DCH, 9DDP, 9DGW, 9DLF, 9DND, 9DSW, 9EBA, 9EBT, 9EHT, 9IG, 9ZG, 9ZT.

Canadian: 1DD. 4CL, 4HH, 5CN, 5GO.

3AOX, Waynesboro, Pa.

4OI, 5ABG, 5ADV, 5AIJ, 5AKN, 5BE, 5DW, 5FX, 5GJ, 5HT, 5IF, 5JE, 5KG, 5LB, 5ME, 5NN, 5NT, 5PB, 5QE, 5QL, 5QQ, 5SK, 5SR, 5TJ, 5WR, 5UO. 5VV, 5XV, 5ZA, 5ZM, 6ACG, 6AJH, 6ALV, 6ANB, 6AO, 6AOL, 6ARB, 6ASX, 6AVV, 6AWS, 6AWT, 6BBC, 6BCL, 6BEO, 6BIC, 6BIH, 6BLG, 6BLY, 6BM, 6BPZ, 6BQE, 6BRF, 6BUA, 6BVG, 6BVS, 6BWE, 6CBI, 6CBU, 6CDG, 6CFI, 6CHL, 6CKR, 6CMR, 6CNC, 6CU, 6EB, 6IQ, 6UD, 6KA, 6MH, 6PL, 6UA, 6TS, 6XAD, 6ZAH, 7ABB, 7AGE, 7AGV, 7BB, 7HG, 7KS, 7LU, 7LY, 7RB, 7VE, 7ZD, 7ZU, 9AAB, 9AED, 9AHZ, 9AJV, 9ALQ, 9AMB, 9AUS, 9BFI, 9BGI, 9BHN, 9BHZ, 9BJI, 9BLT, 9BOC, 9BOG, 9BQY, 9BRF, 9BSH, 9BWC, 9CAA, 9CAJ, 9DIA, 9DJB, 9DKB, 9DLF, 9DNF, 9DSW, 9DTT, 9DVK, 9DWK, 9DXU, 9DTY 9DR, 9HK, 9LW, 9PW, 9SS, 9UH, 9YU, 9ZT.

Spark: 9DIL, 9DWK.

Canadian: 4CL, 4DY, 4HH, 5CN.

3APV, Chevy Chase, Md.

5AAW, 5ABD, 5ABY, 5AC, 5ACU, 5ADB, 5ADO, 5ADS, 5ADV, 5ADW, 5AER, 5AFQ, 5AFS, 5AGD, 5AHC, 5AHJ, 5AHR, 5AHT, 5AIJ, 5AIR, 5AJE, 5AIU, 5AJP, 5ALF, 5AME, 5AMG, 5AMH, 5ANP, 5ANT, 5OAT. 5ATR, 5BM, 5BP, 5BW, 5DO, 5EK, 5ER, 5FM, 5FV, 5GA, 5GJ, 5GP, 5HL, 5HT, 5IN, 5IU, 5JE, 5JR, 5KC, 5HM, 5LB, 5LC, 5LR, 5MI, 5MO, 5MZ, 5NJ, 5NN, 5NR, 5OH, 5OV, 5PB, 5PH, 5PV, 5PX, 5QQ, 5RA, 5RD, 5SR, 5UK, 5UP, 5VV, 5YG, 5ZA, 5ZAS, 5ZAV, 5ZG, 6AVV, 6AWT, 6BBU, 6BCL, 6BEO, 6BIC, 6BIH, 6BJY, 6BM, 6BQL, 6BSG, 6BUO, 6BVE, 6BVG, 6BWE, 6CBI, 6CBW, 6CC, 6CFI, 6CGD, 6CGW, 6CHV, 6CKP, 6CKR, 6CU, 6EN, 6FH, 6GH, 6NX, 6PL, 6TC, 6TU, 6XH, 6ZAG, 6ZAH, 6ZAR, 6ZH, 6ZW, 6ZZ, 7ABY, 7KV, 7LU, 7WM, 7ZD, 7ZT, 9AAD, 9AAL, 9AAU, 9AAW, 9ACI, 9ACQ, 9ACX, 9ADP, 9ADY, 9AED, 9AEM, 9AFB, 9AGU, 9AHE, 9AHJ, 9AHQ, 9AHY, 9AIM, 9AIN, 9AJV, 9ALM, 9AMB, 9ANB, 9ANY, 9AOU, 9AOX, 9APD, 9APE, 9APF, 9APS, 9AQD, 9ARB, 9ARH, 9ARP, 9ASE, 9AUA, 9AUS, 9AVN, 9AWG, 9AXH, 9AXD, 9AYX; 9AZJ, 9AZP, 9AZX, 9BAS, 9BAV, 9BAZ, 9BBG, 9BBR, 9BBU, 9BBW, 9BDE, 9BDU, 9BFD, 9BEP, 9BEZ, 9BFF, 9BFI, 9BGB, 9BGC, 9BGH, 9BGY, 9BHH, 9BHI, 9BHN, 9BHU, 9BIK, 9BJI, 9BJK, 9BJP, 9BJR. 9BKC, 9BKH, 9BKO, 9BKR, 9BLG, 9BMU, 9BMX, 9BNA, 9OP, 9BPU, 9BQY, 9BRK, 9BSH, 9BSM, 9BTH, 9BTT, 9BUN, 9BUO, 9BVA, 9BWC, 9BWV, 9BXJ, 9BXL, 9BXQ, 9BXT, 9BYX, 9BZI, 9CAH, 9CAJ, 9CCN, 9CCS, 9CDO, 9CEE, 9CEH, 9CEJ, 9CFI, 9CFH, 9CGA, 9CGR, 9CGY, 9CHC, 9CHD, 9CHE, 9CHF, 9CHJ, 9CHO, 9CKF, 9CKW, 9CLJ, 9CLQ, 9CMK, 9CNO, 9COL, 9CRA, 9CRS, 9CTB, 9CTG, 9CUD, 9CWC, 9CWF, 9CWX, 9CXI, 9CZS. 9DAV, 9DBJ, 9DCH, 9DEQ, 9DFH, 9DGE, 9DHG, 9DHY, 9DIL, 9DJB, 9DJM, 9DKH, 9DKT, 9DKX, 9DKY, 9DLM, 9DLT, 9DMJ, 9DND, 9DOE, 9DOF, 9DOZ, 9DPC, 9DPR, 9DQU, 9DRO, 9DSL, 9DSV, 9DSX, 9DWA, 9DWK, 9DXL, 9DXN, 9DXY, 9DYT, 9DYY, 9DZY, 9EAR, 9EAU, 9ECB, 9ECB, 9ECV, 9EDN, 9EDO, 9EHI, 9EEA, 9EFJ, 9EIF, 9EJA, 9EKY, 9ELB, 9ELL, 9BA, 9BK, 9DK, 9EQ, 9ES, 9FP, 9GR, 9IH, 9IR, 9JY, 9JY, 9KD, 9LF, 9LN, 9MC, 9NA, 9ND, 9NR. 9OX, 9OY, 9PB, 9PF, 9QI, 9QR, 9QW, 9RC, 9ST, 9TA, 9UB. 9UH, 9UQ, 9UZ, 9VM, 9VZ, 9WY, 9ZT, 9ZY.

Canadians: 1AR, 1DD, 1DQ, 2AU, 2BE, 2BG, 2BY, 2CG, 2CT, 2HV, 3AA, 3AD, 3BA, 3BQ, 3FC, 3GK, 3JT, 3MV, 3NI, 3OM, 3PG, 3SI, 3TY, 3WG, 3XI, 3ZT, 5GO, 9AL, 9BW.

3CHG, Kenneth Square, Pa.

5AR, 5AE, 5DA, 5EK, (5ER), 5FJ, 5GJ, 5GM, 5GN, 5HL, 5JR, 5LR, 5MO, 5NK, 5NN, 5OV, 5UA, 5UP, 5VV, 5WO, 5XB, 5ZA, 5ZB, 5ZG, 5ZK, 5ZAS, 5ABY, 5ADB, 5ADH, 5AFQ, 5AFS, 5AGJ, 5AGO, 5AHH, 5AHT, 5AIJ, 5AJP, 5AMH, 5AMI, 6KM, 6PL, 6ZH, 6ZZ, 6ZAH, 6AWT, 6BIC, 6BQE, 6BSG, 6CGW, 6CKP, 6CMR, 7GL, 7ZU, 7ABB, 9BA, 9CP, 9CU, 9DP, 9EQ, 9FP, 9HK, 9IR, 9JR, 9LH, 9MM, 9NA, 9UR, 9VZ, 9ZT, 9AAU, 9ACD, 9AIM, 9AJV, 9AMB, 9AMJ, 9AOS, 9AOU, 9APF, 9ARC, 9ARH, 9ARP, 9ASV, 9AUS, 9AUW, (9AWF), 9AWU, (9AZJ), (9BAK), 9BAV 9BBF, 9BED, 9BFB, 9BFI, 9BGI, 9BGY, 9BJI, 9BJR, 9BOP, 9BQG, 9BSH, 9BSM, BUK, 9BXQ, (9BZI), 9CAH, 9CBJ, 9CCS, 9CCV, 9CDO, 9CFK, 9CFO, 9CGT, 9CKP, 9CKW, 9CMK, 9CNY, 9CTB, 9CWF, 9DBF, 9DBU, 9DCH, 9DGW, 9DHQ, 9DKV, 9DLR, 9DND, 9DQU, (9DTT), 9DWK, 9DXN, 9DXP, 9DYY, 9EEA, 9EHI, 9EIF, 9EKF, 9EKY.

Canadian: 1AR, 1DD, 2BE, 2BN, 2BY, (3AA), 3AK, 3BQ, 3CO, 3JJ, (3KG), 3TY, (3XI), 3ZT, 3ADN, 4CL, 5GO

HB, WX5, WZV, QRA???

4BL, Lakeland, Florida

1AJP, 1BWJ, 1AW, 1ER, 1JT, 1MO, 1RQ, 2AAY, 2AGB, 2BRB, 2BZV, 2CEC, 2CEE, 2CJR, 2CXD, 2BY, 5AAT, 5ACN, 5ACS, 5ADB, 5ADH, 5ADI, 5ADO, 5ADV, 5AFH, 5AFQ, 5AHH, 5AHT, 5AKN, 5AMA, 5AMJ, 5AMU, 5AMW, 5AC, 5AZ, 5BE, 5BI, 5BX, 5CV, 5DE, 5DR, 5DU, 5EK, 5ER, 5ES, 5FC, 5GI, 5HM, 5HT, 5IF, 5IN, 5JL, 5JR, 5KC, 5KG, 5KM, 5LG, 5LR, 5MO, 5NJ, 5NK, 5NN, 5OV, 5PB, 5PF, 5PV, 5QL, 5QV, 5QW, 5QY, 5SD, 5TJ, 5UA, 5UK, 5UP, 5VC, 5WG, 5XV, 5ZA, 5ZG, 5ZS, 5ZAV, 6ADK, 5ADT, 6AFQ, 6AGJ, 6AGK, 6AHH, 6ALV, 6AOI, 6AUR, 6AVR, 6AVV, 6AWT, 6BAH, 6BBK, 6BBW, 6BCL, 6BIC, 6BIH, 6BPL, 6BPZ, 6BQC, 6BQE, 6BQH, 6BQL, 6UO, 6BUR, 6BVE, 6BVS, 6BWE, 6CAI, 6CBU, 6CDG, 6CEK, 6CFI, 6CGD, 6CGW, 6CKR, 6CMR, 6CWE, 6ZAH, 6ZAR, 6BM, 6CC, 6EN, 6KA, 6KM, 6MH, 6PL, 6TU, 6TV, 6ZH, 6ZZ, 7IO, 7LU, 7NN, 7PJ, 7ZD, 8AAF, 8ADK, 8AFI, 8AGO, 8AHQ, 8AJE, 8AJH, 8AKS, 8APN, 8APY, 8ATP, 8BDA, 8BDQ, 8BDU, 8BJV, 8BMB, 8BNH, 8BRM, 8BRO, 8BXH, 8CAB, 8CBP, 8CCT, 8CDK, 8CEO, 8CGX, 8CJD, 8CNO, 8CTP, 8CVG, 8CXM, 8DHQ, 8DKJ, 8DKM, 8DLO, 8ZAE, 8DO, 8FI, 8FU, 8GZ, 8KG, 8PD, 8PL, 8PX, 8RR, 8SB, 8SD, 8SP, 8XE, 8YN, 9AAB, 9AAV, 9ACI, 9ADY, 9AEC, 9AIM, 9AJV, 9AKI, 9ALQ, 9AMB, 9AMC, 9AMS, 9ARH, 9ASE, 9AUS, 9AUU, 9AUY, 9AVG, 9AVN, 9AWU, 9AXX, 9AZX, 9BAK, 9BAZ, 9BGY, 9BHI, 9BHK, 9BIZ, 9BJG, 9BJI, 9BJK, 9BJR, 9BKH, 9BQO, 9BSH, 9BSP, 9BTT, 9BUN, 9BWP, 9BXM, 9BXQ, 9BYX, 9BZI, 9CAA, 9CAH, 9CCS, 9CT, 9CCV, 9CDV, 9CEE, 9CEU, 9CFI, 9CFY, 9CHC, 9CHD, 9CJC, 9CLQ, 9CLZ, 9CMC, 9CSY, 9CTB, 9CTC, 9CTE, 9CTR, 9CVS, 9DBP, 9DBU, 9DDT, 9DFH, 9DGH, 9DJQ, 9DLM, 9DMJ, 9DND, 9DRH, 9DRO, 9DUU, 9DWX, 9DWK, 9DXN, 9DYY, 9DZY, 9ECV, 9EDB, 9EDO, 9EEA, 9EHJ, 9EJA, 9EKF, 9EKY, 9AC, 9BK, 9EQ, 9ES, 9IH, 9JG, 9KM, 9KU, 9LL, 9MC, 9MF, 9MM, 9PF. 9PW, 9QR, 9UU, 9UZ, 9VM, 9ZG, 9ZT, 9ZV. WX-5 (QRA?) J (QRA?).

Spark: 3ACY, 5JD, 8EB, 9DWK.

I.C.W.: 3BG, 6BSG, 8VQ, 9AAU, 9DQU, 9DCW 9DIH.

Fone: 4FT, 5ABY, 5ALL, 5HL, 6CBI.

Can. C.W.: 1AR, 3HW, 3JT, 3KP, 3XI, 3YN, 3YP, 3ADN.

Mex. C.W.: BX, MI (?).

4FG, Athens, Ga.

5ZA, 6AVV, 6AWT, 6BCL, 6BDI (fone), 6BIC, 6BM, 6BPZ, 6BQC, 6BRF, 6BUO, 6CBI, 6CMR, 6CBU, 6CBW, 6CEB, 6CGW, 6CKP, 6KA, 6PL, 6TU, 6VF, 6ZAH, 6ZO, 7ZU, 7ZO, 9AMB, 9ALQ, 9BFI, 9BJK, 9BXT, 9CFY, 9EBT, 9EEA, 9HU, 9MF, 9ZV.

4KU, Atlanta, Ga.

6AO, 6BY, 6CU, 6BA, 6FH, 6KA, 6KM, 6LR, 6LX, 6MG, 6TS, 6ACM, 6ANB, 6ANI, 6AOC, 6ARB, 6ARD, 6ASX, 6ATC, 6AUG, 6AVV, 6BBW, 6BCL, 6BCS, 6HK, 6BHU, 6BIC, 6BIH, 6BIS, 6BMD, 6BPZ, 6BQZ, 6BRK, 6BUZ, 6BVG, 6CBD, 6CBH, 6CBU, 6CCW, 6CDE, 6CGA, 6CGO, 6CGW, 6CHL, 6CHV, 6CKP, 6CKR, 6CMR, 6CNG, 6EBX, 6ZA, 6ZI, 6XAD, 7DC, 7GO, 7OP, 7WX, 7YA, 7ADR, 7ADV, 7AFE.

4JR, Gastonia, N. C.

1AJX, 1ARY, 1BHW, 1BOG, 1BQD, 1BVL, 1CKP, 1CMQ, 1CPV, 1II, 1JJ, 1KC, 1OZ, 2BJO, 2CDV, 2CEE, 2CNK, 2CTE, 2CUA, 2CXD, 2CXE, 2CXL, 2GK, 2WR, 5ABY, 5ADB, 5AFS, 5AIX, 5AJB, 5AJT, 5AKI, 5AMB, 5AME, 5AMJ, 5ANP, 5BM, 5CV, 5DW, 5EK, 5FC, 5HT, 5JN, 5KC, 5LG, 5LR, 5NJ, 5NN, 5OV, 5PV, 5QL, 5QY, 5UO, 6BBU, 6BCL, 6BHI, 6BIC, 6BIH, 6BM, 6BSG, 5UR, 5ZA, 5ZAV, 5ZB, 5ZG, 6ABX, 6AFQ, 6AWT, 6BUO, 6BVE, 6BVS, 6CBU, 6CGD, 6CGW, 6EN, 6KM, 6MH, 6PL, 8AHQ, 8AJH, 8ATH, 8AZO, 8BBI, 8BDM, 8BGJ, 8BHF, (8BIQ), 8BKB, 8CBP, 8CDC, 8CFQ, 8CGJ, 8CGU, 8CKN, 8CKO, 8CMB, (8CRW), 8CXT, 8CZZ, 8DAC, 8DFC, 8DFK, 8DFV 8DGP, 8DGR, 8DHQ, 8DIG, 8DKM, 8DLB, 8DLO, 8FI, 8HJ, 8HL, 8JJ, 8PL, 8QN, 8UF, 8YN, 8ZZ, 9AAU, 9ACI, 9ADY, 9AHQ, 9AHZ, 9AIM, 9AJV, 9AMB, 9AMI, 9AMU, 9ALI, 9ALQ, 9ALY, 9APE, 9ARC, 9ARH, 9ARP, 9ASV, 9ATP, 9AUW, 9AVG 9AZY, 9BBR, 9BED, 9BFB, 9BFI, 9BGC, 9BGH, 9BGT, 9BHN, BJK, 9BMO, 9BOE, 9BRK, 9BRT, 9BSH, 9BSP, 9BXL, 9BYX, 9BZI, 9CAA, 9CAH, 9CCS, 9CCV, 9CCZ, 9CEE, 9CEH, 9CFY, 9CGN, 9CJC, 9CKW, 9CLN, 9CNO, 9COL, 9CTB, 9CVS, 9CWC, 9DBU, 9DCH, 9DCH, 9DCT, 9DCW, 9DDA 9DDJ, 9DHU, 9DIS, 9DKY, 9DLG, 9DMN, 9DOZ, 9DPR, 9DQU, 9DSW, 9DSX, 9DTT, 9DVP, 9DW, 9DWK, 9DXL, 9DZO, 9ECV, 9EFQ, 9EFU, 9EKY, 9ELL, 9EQ, 9IH, 9IR, 9KD, 9MC, 9QW, 9ST, 9WY, 9ZT.

Canadian: 2BE, 2BG, 2BN, 2CG, 2IC, 3AD, (3BA), 3IA, 3KP, 3OJ, 3PG, 3TB, 3XI.

Spark: 1CJP, 2OM, 3UD, 9AIM, 9DIL, 9DWK, 9GT.

Phone: 5EK.

5BD, Arlington, Texas.

1ALZ, 1ASI, 1AYA, 1BBO, 1BES, 1BOQ, 1CKP, 1CPN, 1II, 1JV, 1JY, 2AAY, 2AG, 2ANA, 2BSC, 2BZV, 2CEI, 2CQR, 2CQZ, 2CRQ, 2CXL, 2KF, 3AB, 3AHP, 3AJD, 3AS, 3ATS, 3AUW, 3BGT, 3BMN, 3BOF, 3BVL, 3BVN, 3CEL, 3HS, 3IW, 3JJ, 3JY, 3TR, 6AFQ, 6AHC, 6ALV, 6AMG, 6ANB, 6AOS, 6AQQ, 6AQW, 6ARB, 6ASA, 6ATZ, 6AUP, 6AUY, 6AVV, 6AWT, 6BAH, 6BBC, 6BBH, 6BBW, 6BCL, 6BEH, 6FB, 6BIC, 6BIH, 6BJC, 6BKX, 6BLG, 6BM, 6BMY, 6BPZ, 6BQE, 6BQL, 6BRI, 6BRF, 6BSG, 6BUA, 6BUO, 6BUZ, 6BVE, 6BVS, 6BWP, 6CBU, 6CDG, 6CFZ, 6CGW, 6CHL, 6CHZ, 6CKR, 6CNG, 6EC, 6EQ, 6FY, 6HV, 6KJ, 6NB, 6PI, 6PL, 6VF, 6ZAH, 6ZAR, 6ZH, 6ZQ, 6ZZ, 7ADP, 7ADR, 7ADS, 7AGE, 7AGV, 7AHQ, 7AIY, 7BJ, 7BZ, 7DC, 7DU, 7GO, 7LU, 7OB, 7OH, 7PJ, 7RS, 7SH, 7QT, 7WM, 7ZD, 7ZI, 7ZU, 8AAF, 8AAJ, 8AB, 8AEG, 8AHQ, 8AJE, 8AJH, 8ANB, 8APN, 8ASV, 8ATH, 8ATP, 8AVN, 8AWL, 8BBW, 8BDA, 8BDM, 8BEK, 8BGT, 8BHN, 8BIW, 8BLR, 8BLX, 8BNH, 8BNZ, 8BRM, 8BWK, 8CBA, 8CBU, 8CGJ, 8CJP, 8CNW, 8CP, 8CVG, 8CWK, 8CWU, 8CYX, 8CZZ, 8DAW, 8DDB, 8DHQ, 8ES, 8FI, 8GD, 8IB, 8IG, 8JA, 8JJ, 8JU, 8NB, 8OM, 8PL, 8QC, 8QN, 8RB, 8SK, 8TH, 8WY, 8YN, 8ZAE, 8ZC, 8ZX, 8ZZ, nine's too numerous.

Can.: 2BN, 3TC, 3ADN, 3BA, 3CO, 3DH, 3OH, 3OM, 3QS, 3SP, 3TB, 3ZS, 4CW, 5GO.

Mex.: BX.

5XV, Port Arthur, Tex.

1ADN, 1AJX, 1ALX, 1BEP, 1BKQ, 1BWJ, 1CAB, 1CMP, 1ER, 1FB, 1IL, 1IV, 1KC, 1KWX, 1PA, 1RV, 2ACY,2AGB, 2ANA, 2BQB, 2BSC, 2BUM, 2BY, 2CCX, 2CQZ, 2CUA, 2CXL, 2CZV, 2IG, 2WR, 2ZA, 3AAU, 3AB, 3AFS, 3ALN, 3ATS, 3BDO, 3BNU, 3BP dalite, 3BVL, 3BOF, 3CH, 3HD, 3HS, 3JJ, 3JY, 3MO, 3TJ, 3TR, 3VO, 6AGJ, 6AMS, 6AOS, 6AUP, 6ARB, 6AWF, 6AWT, 6BEO, 6BBC, 6BIC, 6BIH, 6BKO, 6BMD, 6BM, 6BPZ, 6BRF, 6BUO, 6BVG, 6CFZ, 6CGW, 6CHL, 6CID, 6CTC, 6CU, 6ET, 6FLD, 6GGA, 6GGX, 6KA, 6QG, 6PL, 6OD, 6TS, 6XAD, 6ZA, 6ZAH, 7ABB, 7AHI, 7IG, 7LU, 7LY, 7OH, 7WP, 7YA, 8AB, 8ADG, 8AGO, 8AGE, 8AIG, 8ATC, 8AP, 8BNH, 8BNN, 8BPM, 8BRM, 8CGJ, 8CNW, 8CQH, 8CUX, 8CVG, 8CWK, 8CXI, 8DAT, 8DAW, 8DDJ, DAQ, 8DIG, 8DIL, 8DJF, 8DLS, 8GZ, 8HN, 8HWL 8KC, 8KR, 8LX, 8MZ, 8OE, 8PA, 8WG, 8XE, 8XK, 100 mtrs., 8YY, 8ZZ, 9AAD, 9CAH, 9ACI, 9ACK, 9ACX, 9AGL, 9AGN, 9AIM, 9AOG, 9APF, 9AUC, 9AUW, 9AUY, 9AXX, 9AWP, 9AYN, 9BDS, 9BED, 9BEO, 9BEZ, 9BFB, 9BFI, 9BFP, 9BIK, 9BKK, 9BQQ, 9BRK, 9BTT, 9BVN, 9BXQ, 9BZI, 9CCV, 9CCX, 9CEH, 9CEJ, 9CFK, 9CHC, 9CHG, 9CK, 9CLZ, 9CNN, 9COL, 9CP, 9CTD, 9CTE, 9CTG, 9CTK, 9CTR, 9CZW, 9DAP, 9DEW, 9DKT, 9DKX, 9DMJ, 9DMT, 9DND, 9DSL, 9DXY, 9DYZ, 9DZY, 9EAR, 9EKF, 9ER, 9EKY, 9GC, 9MC, 9VC, 9YAJ, 9ZT.

Canadian: 2CR, 3SI, 4HH, 4CN, 5CN.

I've quit sending cards to those I hear. Got 50 answers out of about 200. 5XV answers all cards tho, you bet.

5ZAV, Oklahom City, Okla.

1ARY, 1AJX, 1BDI, 1BWJ, (1BQD), 1BES, 1CBU, (1CMP), 1DWJ, (1ER), (1FD), (1MO), 1MC, (1FM), 1UJ, (1YB), (2AGB), (2BQH), 2BWL, 2BZV, 2CCX, 2AWF, 2CXL, 2CXA, 2CGJ, (2CXD), 2CG, 2DRB, 2RK, 2KG, 2RM, 2HH, 2XAP 2ZA, (3AOG), (3AB), 3BBV, 3BDA, 3BML, 3BFE, 3BVC, (3AJD), 3BOF, 3BV, 3BQ, 3BZ, 3CKJ, 3CJM, 3DB, 3GC, (3HS), 3IW, 3JJ, 3JK, 3HE, 3TB, 3TR, 3TJ, 3MV, 3XM, 3SU, 3YP, 3YW, 3ZM, 3ZS, (3ZT), (5AGV), (5JR), (5VV), (5UP), (6ANB), 6ANY, 6AHZ, 6AJD, 6AJH, 6ARB, 6ATC, 6ALV, 6ASX, 6AUP, 6AWT, 6BAS, 6BEO, 6BEZ, 6BCL, 6BHK, (6BHU), 6BHW, 6BIC, 6BMA, (6BMY), 6BIH, 6BOE, 6BPZ, (6BQE), 6BRF, 6BSG, 6BUO, 6BUR, (6BVG), (6BVS), (6BWE), 6BZL, 6CBU, (6CEK), (6CFZ) 6CGD, 6CGJ, (6CGA), 6CGW, 6CGK, (6CHL), 6CLL, (6CQR), (6CMR), 6CJB, 6COD, 6CKP, (6CU), 6CA, (6EA), 6EB, 6EC, 6ET, (6KA), 6LU, 6KM, 6LJ, 6RM, 6OB, 6LL, 6MS, 6PB, 6PL, (6UA), 6UX, 6XAD, (6ZAH), 6ZAR, 6ZH,

6ZZ, (7AFE), 7ABB, (7AGE), (7AGV), (7ACI), 7AIY, 7ADG, 7EI, (7HG), 7DC, 7LN, 7LU, 7LY, 7IY, 7HW, 7OX, 7QK, 7RB, (7OH), 7IW, (7WM), 7YA, 7ZD, 7ZL, 7ZO, (7ZU), 7ZV, 7ZS, 8ACJ, (8AME), 8APN, 8AIB, (8ALX), 8AGP, 8ADA, 8AJE, 8AAB, 8ARL, (8AEG), 8ACH, 8AJD, 8AJH, (8ASV), (8AIH), (8AZO), (8ARD), 8AB, 8BDA, 8BDS, (8BDV), 8BBA, (8BDM), 8BFV, 8BSS, 8BMB, (8BBW), 8BKM, 8BCU, 8BPN, 8BGT, (8BQI), 8BNN, 8BIZ, (8BZD), 8BZT, 8BWZ, 8BXH, (8BYD), 8BYQ, (8CCI), (8BJV), (8CDZ), (8CED), (8CSJ), 8CRW, 8CAN, 8CSE, 8CEI, 8CBP, (8COD), 8CMU, 8CGJ, (8CVG), (8CVM), 8COI, 8CXI, 8CXM, (8CYT), (8CHB), 8CMO, (8CWU), 8CWC, 8CUX, 8CZZ, 8DAD, 8DAW, (8DGE), (8DGJ), (8DHQ), 8DKA, (8DAC), 8CS, 8CP, 8FM, 8EF, (8ER), 8FI, (8GT), 8HN, (8HL), 8FS, 8IP, 8IJ, 8IG, 8GZ, 8JJ, 8KH, 8ML, (8NB), 8MR, (8ON), 8OM, (8PD), 8PI, 8PX, 8QK, 8OE, (8QC), 8SW, 8SE, 8VQ, 8WA, 8WD, 8WG, 8VY, 8XBF, (8XE), (8ZAE), (8ZC), 8ZF, 8ZZ, (9AAW), (9APF), (9BMX), (9CEJ), (9CMD), (9DIS), (9DPX), (9EHI), (9MC), 9ZT.

Canadian: 1EZ, 2CG, 2IC, (3ADA), 3BP, 3DE, 3HE, 3OH, (3NI), 3SI, 3XI, 3XN, 4BX, 4AG, 4HH, 4BV, (5CN), 5GO, 9AL, (9BX), (9BP.

6AWT, San Francisco, Calif.

1BBC, (1CMP), 2BY, 3CEJ, 4BY, 4DB, 4EB, (4FT), 4HH, (4KU), 4MB, (4MY), 4OM, (4QF), 4ZA, 5BE, 5DW, 5EK, 5FX, 5GF, 5GJ, 5HL, 5HT, 5IF, 5IN, (5JF), 5KG, 5KR, (5KW), 5LG, 5LL, (5LR), 5MI, (5MN), (5NN), 5SF, (5SK), 5TJ, 5UE, (5UO, 5WE, (5ZA), 5ZH, 5ADB, 5ADO, 5AGE, 5AHD, (5AIJ), (5AIU), 5AMA, 5AMV, 5AUA, (5ZAV), (6CEU), 7DG, (7ZD), 8AJ, 8ER, 8ES, 8FU, 8GT, (8GZ), 8HN, (8JJ), (8PH), 8UE, (8VQ), (8VY), (8YV), (8ZC), (8ARO), (8BDA), (8BDT), (8BFH), (8CDZ), 8CXI, 8DGE, 8XAB, 9AN, 9BG, (9CP), 9DR, 9MC, 9MF, (9OX), 9VM, (9XI), 9ZG, (9ZT), (9AIM), 9AJH, 9AMB, 9AOG, 9AON, 9AOU, (9APE), (9APF), 9AUA, 9AUU, 9AVZ, (9AWM), (9AXX), (9AZX), (9BAK), 9BAN, 9BAW, (9BED), 9BHD, 9BIK, (9BJI), (9BJK), 9BMX, (9BRK), (9BSG), (9BTT), 9BWV, 9BXQ, (9BYX), (9BZI), (9CAA), 9CCK, 9CCS, 9CGV, 9CCZ, 9CEE, 9CED, 9CGA, 9CGU, (9CJY), (9CNS), 9CPU, 9CTE, (9CTR), 9CVC, (9CVS), 9CZW, (9DAW), 9DFH, 9DGW, 9DKB, (9DKX), (9DKY), 9DLI, 9DMJ, 9DQE, 9DRH, (9DTE), 9DWK, 9DZY, 9EBT, 9EEA, 9EHT, 9EKF, (9EKY), 9YAJ, (9YAT).

Canadians:: 3CO, (4CL), 4HF, 5CT, (5CN), (5GO), 9BP.

6CEU, 113 Ululani St., Hilo, Hawaii

1CDM, 1BCG, 1ABS, 2FP, 2RS, 3AB, 3BNU, 3BUC, 4CS, 5GN, 4FT, 5AE, 5ADO, 5MN, 5UN, 5ZAV, 5AMA, 5QQ, 5SG, 5LR, 5MKN, 5BM, 5GA, 5HT, Sixes too numerous over 80, Sixes Wrkd, (6ARB), (6CKC), (6ASJ), (6ALV), (6ZH), (6AOS), (6ZAR), (6BQC), (6ASN), (6CFZ), (6BNU), (6AAK), (6ASX), (6CFI), (6FY), (6PL), (6BBC), (6BEZ), (6BUZ), (6AWT), (6CKP), (6AUY), (7ADR), (7BJ), 7ADP, 7ZF, 7ZN, 7SF, 7AKV, 7GO, 7TK, 7ZO, 7LR, 7SH, 7KS, 7ATN, 8VY, 8AWP, 8GZ, 8APY, 8TT, 8AMM, 8XE, 8BDA, 8ZZ, 8ZC, 8AJH, 9AIM, 9AMB, (9BEZ wrkd wi 15 watts), 9BAN, 9ZT, 9CCS 9AHZ, 9ME, 9AAU, 9BTT, 9BZI, 9DLI, 9BQQ, 9AEC, 9BJK, 9AUU, 9AVC, 9AEY, 9EJB, 99DRK, 9AVZ, 9CVC, 9ACI, 9BJK, 9CNS, 9EBT, 9CCZ, 9CZW, 9AXX, 9APS, 9AFM, 9EKY, 9BXT, 9APF, 9MC, 9BEZ, 9DLG, 9YAT.

Can.: 9BP, 5CN, 3XN, 5GO, 3BP, 3CO.

The above shows that Hawaii is agn QSO and QRV for BIZ.

7AIY, Frank A. Mueller, Jr., 514 2nd St. N., Wenatchee, Wash.

1ASI, 1BBO, 1CCZ, 2AFF, 2BJG, 2CCD, 2CXL, 2BY, 2GK, 3ATZ, 4BC, (4EB), 4EL, 4DU, 4NQ, 4OS, 5ABZ, 5AGO, (5AIU), 5AMH, 5BM, 5BP, 5EK, 5FA, 5GJ, 5HH, 5HT, 5HZ, 5LV, 5PH, 5PX, 5UK, 5VV, 5XV, 5ZA, 5ZAV, 6CEU, 7IT, 8ABX, 8AMM, 8APT, 8AQO, 8ASV, 8AVN, 8AWP, ICW, 8BDA, 8BDW, 8BFH, 8BFQ, 8BFS, 8BYM, 8DHQ, 8CED, 8CRC, 8AB, 8BF, 8DW, 8FR, 8GD, 8HN, 8IJ, 8PL, 8TT, 8WX, 8XE, 8ZZ, 9AAW ICW, 9AAY, 9AEN, 9AIC, 9AIM, 9AJF, 9AMB, 9AMU, 9ANY, 9AOG, 9AOM, 9AOU, 9APF, 9APS, 9AUA, 9AUS, 9AVN, 9BAV, 9BED, 9BFE, 9BHZ, 9BJK, 9BKC, 9BQJ, 9BQK, 9BQQ, 9BMM, 9BMO, 9BRI, 9BSZ, 9BUN, 9BVN, 9BZI, 9CAA, 9CAJ, 9CBJ, 9CCV, 9CCZ, 9CFI, 9CFK, 9CFY, 9CLQ, 9CME, 9CNS, 9CSY, 9CTR, 9CVC, 9CVH, 9CVS, 9CZG, 9CZW, 9DAW, 9DCH, 9DGE, 9DGI, 9DGW, 9DHA, 9DJM, 9DKB, 9DKQ, 9DKY, 9DLM, 9DQM 9DQU, 9DUG, 9DYS, 9DXN, 9EBT, 9EEA, 9EKF, 9EKY, 9EMF, 9YAJ, 9AM, 9BG, 9BW, 9CK, 9DR, 9EH, 9GD, 9HK, 9JK, 9LZ, 9NA, 9PM, 9RC, 9UH, 9VM, 9YY, 9ZG, 9ZN, 9ZT, 9ZY, WNP.

Canadian: 2AB, 3DTI, 3GE, 3NI, 3ZL, 9BP.

7IX, Selah, Washington

1BQS, 2AG, 2CCX (ICW), 2CLA, 5FT, 4BK, 5AKU, 5AMA, 5JN, 5LR, 5PB, 8AB, 8ACY, 8ADG, 8APR, 8APY, 8AVU, 8BCH, 8BDA, 8BXH, 8FU, 8IY, 8TT, 8VQ, 8XE, 8ZC, 8ZZ, 9AIM, 9ANY, 9AWV, 9BG, 9BRI, 9BRV, 9BXQ, 9BZI, 9CCS, 9CCV, 9CKR, 9CZG, 9DGV, 9DKK, 9DKQ, 9DLG, 9DSU, 9EKY, 9IX, 9MC, 9UH, 9YAJ, 9ZT, 9ZY.

Can.: 3OO, 3KO, 3TB.

8FM, Roscoe, Pa.

(4BY), (4DB), (4FT), (5ADS), (5AJB), (5ANC), 5BE, 5DW, (5FA), (5GJ), 5GN, 5HT, 5IN, (5JR), 5KG, 5LG, (5LR), 5ZA, 5ZG, 6ABT, 6AGJ, 6AJF, 6ALV, 6ANB, 6AWT, 6BCL, 6BIC, 6BIG, 6BIH, 6BM, 6BUA, 6BUO, 6BUR, 6CBI, 6CBU, 6CDG, 6CFZ, 6CGW, 6CKP, 6CKR, 6KA, 6KM, 6MH, 6PL, 6VF, 6WD, 6WZ, 6ZAH, 6ZAU, 6ZH, 6ZZ, 7ABB, 7AF, 7BJ, 7DU, 7FF, 7GO, 7LY, 7OB, 7RS, 7VE, 7ZD, 9AJV, 9AMB, 9APF, (9BHQ), (9BIK), (9BTT), (9BZI), 9CAA, (9DKY), (9DPC), (9PW), 9UH.

Can.: (2BE), (3IV), (3QS), (3XI.

8ADA, Cleveland, Ohio

5FX, 5GA, (5QF), (5QQ), (5ABT), 5ACR, 5ADO, (5AHJ), (5AIU), 5AJP, 5AKN, 5AMB, 5AMF, 5ANA, 5ZA, (5ZAV), 5ZM, 5ZX, 6BM, 6KM, 6PL, 6TJ, 6TV, 6VM, 6ACM, 6ADT, 6ALV, 5ARB, 6ASX, 6ATY, 6AUY, 6AVV, 6BBC, 6BBR, (6BCL), 6BGY, 6BHG, 6BIS, 6BMD, 9BRF (ICW), 6BVG, 6CBI, (6CBU), 6CBW, 6CDG, 6CFZ, 6CGD, 6CGW, 6CHL, 6CKA, (6CUI) QRA?, 6ZAH, 7CA, 7HG, 7KS, 7OH, 7PO, 7SH, 7WP, 7ABB, 7AKZ, (9AMB), (8AOG), (9APF), 9AVS, 9AVU, 9BJI, 9CAA, (9CCZ), 9CFY, 9CVC, (9CZW), 9DLF, (9YU), WNP.

8CNL, Dayton, Ohio

6AFQ, 6AGJ, 6AGW, 6ARB, 6AVV, 6AWT, 6AZO, 6BCL, 6BGT, 6BIH, 6BM, 6BQC, 6BRF, 6BSG, 6BU, 6BUA, 6BVE, 6BVG, 6BXQ, 6CBI, 6CBK, 6CBU, 6CBV, 6CDO, 6CFZ, 6CGD, 6CMR, 6CQW, 6CWE, 6CZ, 6EI, 6FH, 6KC, 6KM, 6MH, 6PL, 6TU, 6UH, 6XAD, 6ZAH, 6ZAX, 6ZO, 6ZW, 6ZZ, 7ADR, 7GI, 7IO, 7IW, 7IY, 7QL, 7SC, 7ZO, 7ZT, 7ZV.

Hrd between 8:30 P.M. and 9:30 P.M. C.S.T.

8CZI, Ithaca, New York

4FZ, 4OB, 5ABD, 5ABH, 5ABY, 5AC, 5ADO, 5AFQ, 5AHD, 5AIH, 5AIJ, 5AIU, 5AJB, 5BI, 5CE, 5DW, 5FX, 5GA, 5GB, 5GF, 5GI, 5GJ, 5GM, 5GO, 5IF, 5IN, 5KC, 5NN, 5OV, 5UI, 5UW, 5WR, 5WX, 5XAB, 5XB, 5XV, 5ZA, 5ZAV, 6AGJ, 6ANB, 6AOU, 6ASX, 6AVV, 6AWT, 6BBC, 6BCL, 6BEO, 6BHS, 6BHU, 6BIC, 6BIH, 6BUA, 6BUO, 6BVS, 6BWE, 6CBI, 6CBU, 6CDG, 6CEJ, 6CFZ, 6CGW, 6CID, 6FH, 6FY, 6KA, 6KM, 6LJ, 6PL, 6TI, 6VF, 6XAD, 6ZAH, 6ZAR, 7ABB, 7ABY, 7ADR, 7AGE, 7AGX, 7DC, 7GO, 7IO, 7KS, 7PJ, 7VE, 7YA, 7ZD, 7ZU, 9AMB, 9AOD, 9AOG, 9APF, 9APN, 9AUW, 9BDH, 9BFI, 9BGX, 9BHZ, 9BJI, 9BQY, 9BRI, 9BWC, 9BWH, 9BXQ, 9CAA, 9CAS, 9CCV, 9CCZ, 9CFI, 9CFY, 9CKI, 9CNB, 9CNS, 9CVC, 9DLL, 9DTE, 9EAK, 9EFE, 9OE, 9UH, 9VJ, 9ZV, Canadian: 4CL, 5CN, 5GO.

9BFI, 4511 Colfax Ave. So. Minneapolis, Minn.

1AAC, 1AFP, 1AJT, 1AJX, (1ARY), 1ASI, 1AQI, 1BCF, 1BCG, 1BOQ, 1BWJ, 1CMP, (1CPI), (1CPN), 1ER, 1FB 1FK, 1GL, 1II, 1IL, 1KC, 1KX, 1SK, 1XC, 1YB, 1YE, 2ABV, 2AFP, 2AGB, 2AJD, (2BMR), 2BOB, 2BQU, 2BZV, 2CFB, 2CQZ, 2CXL, 2XNA, 2IC, 2SG, 2TS, 3AAO, 3ABW, 3ADJ, 3AVA, 3BCH, 3BDO, 3BWA, 3CEL, 3AV, (3AB), 3DE, 3JY, 3MC, 3SU, 3TY, 3VO, 3XN, 4AI, 4CL, 4CO, 4CW, 4DB, 4DO, 4EB, 4FT, 4FS, 4KC, 4KU, 4KJ, 4MB, 4MY, 4QU, 4QR, 4SB, 4TR, 5ABT, 5ABY, 5AEO, 5AGJ, 5AHD, 5AIU, 5AJB, 5ALJ, 5AMB, 5AMJ, 5AMS, 5ZAV, 5AU, 5BE, 5CN, 5DO, (5DW), 5EK, 5FK, 5GA, 5GJ,

(5GM), 5IF, (5HT), (5IN), (5JE), 5KC, 5LC, 5KH, (5LR) ? 5MO, 5NK, (5NN), 5UO, 5OV, 5NZ, 5PH, 5QE, 5QL, 5QQ, 5QW, 5RD, (5SK), (5SR), 5UA, (5UK), 5UP, 5VV, 5XA, 5XV, 5ZA, 5ZB, 5ZR, 6AGJ, 6AIX, 6ANB, 6ALV, (6AOI), 6AOC, 6ARB, 6ASX, 6ATB, 6AUP, 6AVV, 6AWT, 6BBC, (6BCL), 6FL, 6BHK, 6BIH, 6BLG, 6BMD, 6BOU, 6BPG, 6BRR, 6BSJ, 6BCG, 6CBI, 6CBP, 6CFI, 6CHU, 6BUR, 6CHL, 6CKR, 6CFZ, 6CHL, 6CGW, 6CJB, 6CKR, 6CMR, 6CNC, 6ZAM, 6ZAR, 6CK, 6EA, 6FY, 6GX, 6HQ, 6KA, 6KM, 6MH, 6NX, 6PL, 6TU, 6ZX, 6ZZ, 7ABB, 7ADR, 7HG, 7HM, 7HW, 7KS, 7OH, 7OI, 7LU, (7WP), 7ZD, 7ZU.

Can.: (2CG), 3ADA, (3AD), 3GH, 3KO, 3OH, 3OJ, 3OM, (3NI), 3SI, 3TB, 3ZT, (4HH).

9EKY, St. Louis, Mo.

(1ACU), (1AF), (1ALZ), (1ASI), 1AW, (1BBO), (1BES), 1BVB, (1BWJ), (1CMP), (1CPN), 1CPO, (1ER), (1FB), 1FD, 1GK, 1GV, (1II), (1KC), 1KX, 1MC, (1ON), (1SX), 1UH, (1YB), (2ACD), (2AFP), (2AGB), (2AL), (2ANA), (2AWF), (2BQB), (2BQD), (2BQH), 2BRB, (2BUE), (2BY), (2BZV), 2CCX, (2CJR), 2CKE, (2CPA), (2CUI), (2CUV), (2CXD), 2CXL, (2DX), (2GK), 2RS, 2TS, (2WA), (2WR), (2ZA), 3AAO, (3AB), (3ABW), (3ACY), (3ADV) (3AJG), (3ALV), (3AUV), (3BDO), (3BJI), (3BVA), (3CHG), (3MB), (3SU), (3TR), (4AG), (4AI), (4BK), (4CS), (4CY), (4FS), (4FT), (4GW), (4HZ), (4JH), (4KU), (4MY), (4QF) ?, (5ADB), 5ADO, (5CV), 5ZA, 6AAG, 6AAK, 6ALK (6ALV), (6AOC), (6AOS), (6ARB), (6ATZ), 6AVV, (6AWT), 6BBH, 6BCL, 6BJQ, (6BLG), (6BPZ), (6BQB), 6BQC, (6BQE), 6BQL, 6BUO, (6BVG), 6CBD, 6CC, 6CDM, (6CFI), 6CGA, 6CGW (6CHL), 6CID, (6CKP), 6CMR, (6CNC), 6CU, 6EA, (6ET), 6KA, 6MG, (6PL), (6TV), 6UA, 6XAD, (6ZAR), 6ZAH, 6ZH, 6ZO, 7ABB, 7AK, 7AGV, 7BJ, 7FD, 7LU, 7LY, (7OH), (7SF), 7TO, (7WP), (7ZD), 7ZU, 7YL, 8's and 9's too numerous.

SPARK: (4IO), 8EB, (9AXK).

CANADIAN: 2BN, 2CG, 2DG, 3ADN, (3BP), (3HE), (3NI), (3OH), (3PG), (3SI), (3TB), (3WS), (3XN), 3ZS, 4CL, (4HH), 5CN, (5GO),

9BJI, Denver, Colo.

1AJT, 1AP, 1BOQ, 1CMP, 1RV, 1YB, 2AGB, 2CFD, 2CLA, 2COX, (2CXL), 2EL, 2RB, 2WA, 2XAT, 2ZA, 3BDO, 3BMT, 3BQV, 3GK, 3RF, 3SU, 3TB, 3TJ, 3VH, 3WE, 3YW, 4CW, 4EB, 4GX, 4JH, (4KU), 4QF-QRA ?, (5AKN), (5IF), (5IN), (5LR), (5ZAV), (5ZG), (5ZM), (6ACG), (6AJH), (6ALV), (6AMS), (6AOL), (6AOQ), (6AOS), (6AUY), (6AVV), (6AWT), (6BIH), (6BJY), (6BNF), (6BPF), (6BQE), (6BUO), (6BWE), (6BWP), (6CMR), (6COD), (6FH), (6FY), (6ZAH), (6ZZ), 7ABB, 7AGV, (7BB), 7BJ, 7CX, 7EM, (7HW), (7IO), 7KS, 7LN, 7LY, 7OM, 7PJ, 7SF, (7SY), (7WM), 7WS, 7YA, (7YL), 7ZD, 7ZI, 7ZK, (7ZT), 7ZU, 7ZX, 8AAJ, 8ADG, 8ADK, 8AI, 8AIB, 8AIH, 8AGP, 8AJE, 8AJN, 8AMM, 8AMS, 8APN, 8APY, 8ARD, 8AVD, 8AVS, 8AZH, 8BAH, 8BCH, (8BCP), 8BCU, 8BDA 8BF, 8BFV, 8BNH, 8BOD, 8BWZ, 8BXH, 8BYM. 8BZC, 8CGJ, (8CJD), 8CLC, 8CLK, 8COD, 8CQX, 8CRW, 8CRM, 8CWR, 8CWU, 8DAW, 8DCG, 8DCZ, 8DKI, 8DZC, 8EO, 8ER, 8FU, 8GT, (8GZ), 8IJ, 8KJ, 8LB, 8PD, 8PL, 8RJ, 8TT, 8VY, 8WX, 8XE, 8YE, 8YN, 8YV, 8ZAE, 8ZC, 8ZX, 8ZZ.

Can.: 3BF, 3BP, 3BQ (3NI), (4CL), 4CN, 4DY, 4HH, (5GO).

9DWN, Pierre, South Dakota

1ALZ, 1ARY, 1BBO, 1BES, 1PW, 1YB, 1YK, 2AR, 2AGB, 2ANA, 2AWL, 2BY, 2BQH, 8BSC, 2CT, 2CCX, 2CMK, 2CXL, 2GK, 3AAO, 3ALN, 3BGT, 3CHO, 4BY, 4DB, 4FT, 4GW, 4JK, 4OF, 5ABT, 5ADH, 5AEO, 5AFH, 5AFQ, 5AGJ, 5AHD, 5AHQ, 5AIU, 5AHJ, 5ALJ, 5AMJ, 5AMW, 5BE, 5BM, 5BW, 5BX, 5CE, 5CV, 5EK, 5ES, 5FT, 5GA, 5GJ, 5GN, 5HQ, 5HT, 5JC, 5JE, 5JG, 5KC, 5KG, 5LR, 5MM, 5MO, 5NN, 5NW, 5OI, 5PF, 5PV, 5QL, 5QQ, 5QY, 5SK, 5UO, 5UP, 5UW, 5XBR, 5YG, 5ZA, 5ZAV, 5ZB, 5ZG, 5ZU, 6ADT, 6AFG, 6AFN, 6AFQ, 6AGK, 6ANB, 6ASA, 6ASX, 6ATC, 6AUY, 6ARD, 6BAW, 6BBU, 6BEO, 6BFB, 6BFG, 6BIC, 6BIH, 6BIQ, 6BIS, 6BJQ, 6BNU, 6BQE, 6BQC, 6BQL, 6BRF, 6BRI, 6BTT, 6BUA, 6BUB, 6UH, 6BUY, 6BVS, 6CBD, 6CBI, 6CBU, 6CET 6CGD, 6CGW, 6CLL, 6CMR, 6CNH, 6COD, 6CXI, 6FF, 6FH, 6FY, 6JM, 6LU, 6MH, 6NX, 6PL, 6VF, 6ZAH, 6ZAM, 6ZH, 6ZO, 6ZX, 6ZZ, 7ABY, 7AEM, 7EI, 7GQ, 7EI, 7GQ, 7HW, 7KS, 7OB, 7WS, 7ZD, 7ZU, (Eight's and Nine's too numerous.)

Can.: 2BN, 3AWD, 3BA, 3CO, 3KO, 3NI, 3NY, 3OH, 3TB, 3WS, 3ZS, 4ARK (?), 4CN, 9BW.

OPERATING DEPARTMENT

(Concluded from Page X)

a msg. over to the Pacific coast and a relay back in 32 minutes. This is splendid and shows that the cooperation between divisions is excellent. If we could hear more Canuck 4s we could put over much faster relay work. We work lots of Yanks in Minnesota, but rarely even hear a Canuck 4. Quebec is proud that a Canadian 9BP, Jack Barnsley, won the Zenith Receiver prize for working WNP. (Congrats, OM, and we hope the first sigs you hear on it will be Caanuck 2s.) Connections to Halifax and west to Port Arthur are as smooth as a state highway. One new station, 2FI, opens up this moon, and being an ex-commercial pounder, should quickly win his laurels. Well that's Quebec!

VANCOUVER DIVISION

A. J. Ober, Mgr.

The situation in the Vancouver Division has cleared up. Some time ago the former manager, Mr. North, resigned, and no one was appointed to fill his place, with the result that no reports of activities were appearing in *QST*, nor was the Division getting credit for its good work.

This month a vote was called by the C.G.M. from the division operating dept. with the result that the mail vote put in 4DQ, the former D.S. of Alberta, who has now taken over the reins and will lead the division on to new triumphs in Trans-Canada work.

9BP is doing great work in Prince Rupert, having been in touch with WNP several times, and winning the Zenith receiver for the first man to get the 500 word press message. The Vancouver gang and 5CT are rolling right along, WNP reporting several of them QSA up North. Several stations from the division got in on the impromptu Trans-Canada that was pulled off early in the north.

WINNIPEG DIVISION

J. E. Brickett, Mgr.

SASKATCHEWAN—4GH at Buchannan has started up with 5 watts and will increase to 20 watts soon. We are sorry to state that we are losing one of our oldest brass pounders, 4EZ, who has been in the game in this district for a number of years and is entirely familiar with magnetic and electrolytic detectors. He has, up until the present division and allotment of call signs, been known on the air as NS9, and used a Navy spark set. We are sure of this; that he hasn't quit the game no matter where he goes The Prince Albert gang are having the time of their lives trying to keep 4GR's aerial mast right side up. No report from southern Saskatchewan. Moose Jaw has a fine line up this fall. 4ER is on the air with 5 watts. 4AO will be on in about 5 days. He has just erected a 70-foot stick and it has stayed up. 4HH is the proud possessor of a 50-watt bottle. 4DN has 5 watts ready to go, but seems to have a permanent tired feeling about 9:30 P.M. 4BB has ditched his rock crusher and is busy rewinding the transformer for C.W. 4HV has started on a 5-watt set. Mr. Paine started a while ago as a BCL, but he soon began to put things adrift to find out "why," with the usual result that he is now a key pounder. 4IW has 10 watts ready to go, and say, gang, you will likely find Mrs. 4IW at the key most of the time, and fair warning, she handles 40 per quite casually, so don't attempt to show off any speed unless you are prepared to suffer the consequences. 9BX and 4CB have their aerials down clipping some of it off so that they can get down to 200 meters. 4AL (introducing our new Publicity Manager for this division) is starting up with 5 watts.

MANITOBA—4AG with his 20 watts D.C. C.W. promises to be a great asset this year. 4DY works 3NI regularly and is FB in Saskatchewan. 4CM and 4CR work 4CL and are QSA in Toronto. 4FZ was on for a short time but his 5-watter refused to stand up under the strain. He is stalling around to keep his fist off his spark set. Hi! 4DK, 4DM, 4EA, and 4DY will also be contributors to traffic clearing in the district this winter.