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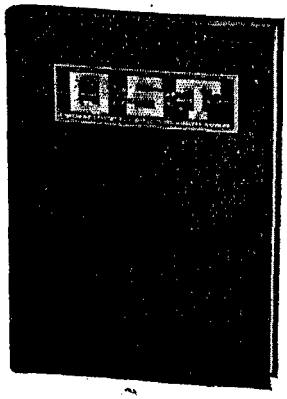

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AMERICAN RADIO RELAY LEAGUE, Inc.

HARTFORD, CONN.

QST

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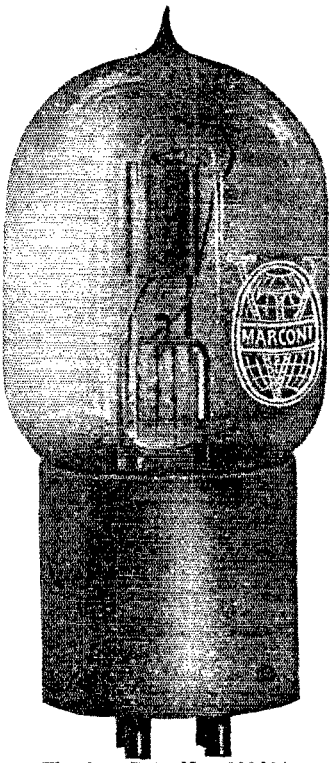

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Q S T

A Magazine Devoted Exclusively to the Radio Amateur

Efficient Trans-Ocean Reception for the Amateur

By William E. Woods

This is the first of a series of articles by Mr. Woods on war-time improvements in long-wave undamped reception and their practical application by amateurs. Mr. Woods will be remembered by all pre-war amateurs as the owner of 9HS, St. Louis, and is the originator of the "Dear Eddy" letters which used to appear in QST. We regard this article as a most important contribution to amateur knowledge.—Editor.

THE average amateur possess little or no practical knowledge of undamped reception as it is being accomplished in the present day and in view of this fact the writer will endeavor to give detailed plans and specifications for a real, practical, and at the same time efficient receiver of undamped oscillations which should prove the ideal type for the amateur.

Little or no reference will be given to theoretical explanations as the writer, being an active amateur himself, knows that data of this sort is of little value until a practical and working knowledge of the subject in question is first gained.

The type of collector to be considered is a loop or cage. This form of antenna is far superior to the old-fashioned aerial and is much more convenient to use and install than any other type mentioned heretofore. Much has been written on the marvelous results obtained with various kinds of "laboratory loops" ranging all the way from three turns of magnet wire wound around a lead-pencil up to ten thousand feet of cable wound on a six foot square form. This is all very well for a passing experiment, but using the apparatus hereinafter described the amateur can absolutely copy European stations with as much ease as old WGG used to be copied.

A cage which will give the described results may be constructed as shown in Fig. 1. The dimensions are: length between poles, 40 feet; height between spreaders, 10 feet; height of lower spreaders above ground, not less than 3 feet; and last but not least and quite important, an 8 inch spacing between wires. The rectangle should be set up with its length running east and west and will then be directional for all stations to the east or west. This is the proper direction for nearly all the higher powered arc stations in the world. The position ought to be laid out by means of a compass but it can be remembered that a thirty degree variation from true east and west is permissible with no particular ill effects resulting. Therefore the direction of the cage can be altered to some extent, to conform with local conditions. In the case of the city amateur it would not be advisable to place the loop directly behind a building, as this would have a shielding effect and weak signals would result. If the cage can be placed a few hundred feet from the building, this ought to suffice; otherwise it can

be placed upon the roof so as to be clear of all surrounding objects. If this should prove impracticable, an excellent plan might be to wind it between the aerial poles, several feet below the aerial itself. This method of course presents new difficulties and the writer will not attempt to suggest the ways and means therefor. However, if this is done, means must be provided for opening the frame during transmission.

The poles should be not smaller than two by two inches, preferably stronger, and about fifteen feet long. They should be inserted in the ground for a distance of about one foot after the spreaders have been attached. The spreaders can be of any convenient thickness, but a good size

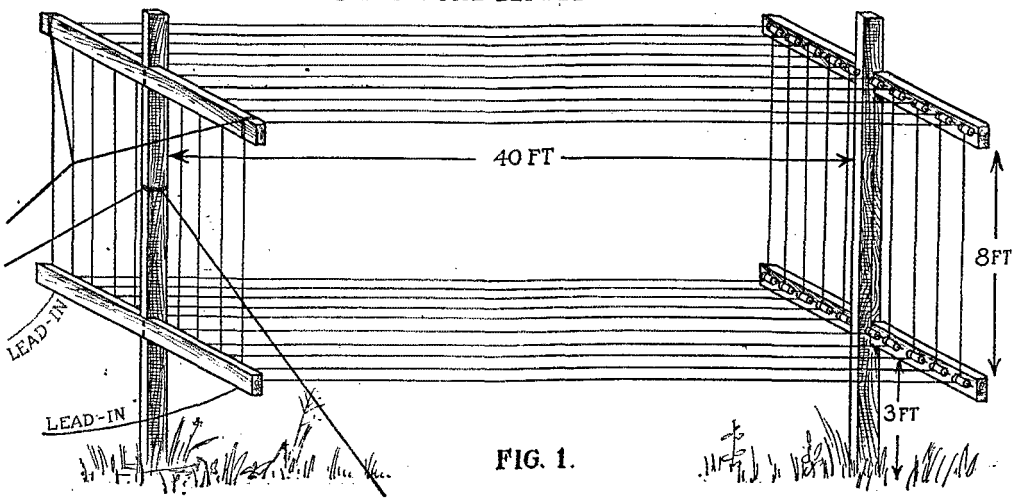


FIG. 1.

is a one by two inch piece cut to the proper length. There should be ten turns of wire spaced eight inches; therefore the spreader should be six foot four inches long. This will allow two inches beyond the end wires all around. The insulators for supporting the wires should preferably be the common porcelain knob with a hole running thru the centre, used for regular house-wiring. These are fastened to the spreaders, as shown in Fig. 2, with rather stout wire and staples, and should have sufficient spacing from the wood to allow their easy turning when the wire is wound upon them. The pole and spreaders when assembled should be securely guyed, as shown in the illustration, before the wiring is begun.

The wire to be used may be almost any kind available, but should have fair flexibility. The writer used ordinary No. 18 annunciator wire for the loops at Otter Cliffs Radio Station, with very good results. The wire should be continuously wrapped on the frame, putting it thru the first insulator on the bottom of the spreader that the leads are desired to be taken from, which will of course be the one nearest the apparatus. The wire is then put thru the corresponding insulator at the top of the pole, drawn across to the corresponding insulator at the top of the other pole, thru the insulator directly under it on the bottom spreader, then over to the second insulator on the spreader where the start was made. This will complete one turn and the others are made correspondingly until all insulators have been filled, with a total of ten turns. It will be found that several persons will be needed to do the winding, as the wire must be pulled along from three or four points simultaneously. After the loop is completely wound, the ends should be permanently fastened, and leads then run to the operating room. It is quite important that these leads be SPACED a distance equivalent to the spacing between turns on the rectangle. It is also important to keep the leads as short

(Concluded on page 6)

The Amateur Situation

FOR some time we have been aware that there was something in the air regarding the amateur situation, so we have gone down to Washington and investigated the matter. We found two requests for new legislation pending in Congress. The first of these, "A proposed bill authorizing the use of radio stations under the control of the Navy Department for commercial purposes", known as House Document No. 159, contains nothing of interest to us. It is exactly what its title intimates and contains no possibilities of complexities from our standpoint.

Another document, however, No. 165, is of very great interest to us. This is a letter from the Secretary of the Navy, addressed to both houses of Congress, setting forth the "Views of the Navy Department in connection with certain aspects of radio communication". After reviewing the situation in detail from the Navy standpoint, the letter asks (1) the appointment of a special commission to study radio problems; (2) authorization to the President to designate specific bands of wavelengths for different classes of work; (3) a Navy monopoly of ship-to-shore radio; (4) a Navy monopoly of transocean and international radio; (5) authorization to use Navy radio stations for commercial and press business; (6) authorization to the Navy to assist American enterprise in the general development of American radio.

A sub-committee of the Senate Committee on Naval Affairs, headed by Senator Poindexter, is apparantly functioning as the special commission asked to study conditions, and is engaged in reviewing the status of "world-wide radio" problems. This committee has now called upon the Navy Department to tender a draft of their idea of adequate legislation embodying the desires of the Navy as set forth in Document 165, to which the committee will then give consideration. In the House, the matter is in the hands of the Committee on Merchant Marine and Fisheries—a body which has always been opposed to government ownership of utilities.

We found the Navy Department surprised that we should feel any alarm over the proposed legislation, as they point out that no mention of amateurs is made and that the amateur situation was not even considered by them in this matter. In turn, however, we have been obliged to point out to the Navy that they previously attempted to eliminate us and that the resulting scepticism, coupled with their postponement of our re-opening August 1st as planned, causes the amateur to regard with distrust any move on their part to get control of radio. We really wanted to ask what assurances they could give us that, if they secured control of all radio, the stringency of restrictions would not be increased to an extent resulting in our virtual elimination; but the legislation is not yet drawn up and we found the gentlemen wholly in sympathy with the cause of the amateurs and desirous of dispelling the distrust with which we have been regarding them. We told them we desired **recognition** in their contemplated legislation; i.e., rather than make no mention of amateur radio and leave our future to the discretion of some individual, we wanted our status defined in the new bill. The Office of the Director of Naval Communications, which is handling this matter, then invited us to tender our views of how the amateur should be recognized in the new law, and accordingly, as QST goes to press, a meeting of the A.R.R.L. Board of Direction is being called to formulate our ideas for presentation to the Navy Department and it is probable will also arrange to have us represented in force at the hearings of the bill, to make sure nothing goes wrong, and that nothing inimical to our interests is contemplated in the Navy's requests for "a comprehensive system of regulation and control" to achieve "the full utilization of radio for internal communication".

We are surprised to find no apparent connection between the postponement of

our re-opening on Aug. 1st and the simultaneous request of the Navy for new legislation. They deny that we were held up to enable them to railroad thru a bill which would endanger us before their control automatically expires with a declaration of peace. But the sad fact remains that we are **not** opened, and no information is forthcoming **why.** Mr. Daniels is in Hawaii and the Assistant Secretary of the Navy stated Mr. Daniels personally disapproved the re-opening order and that he (Mr. Roosevelt) did not know why. It is vaguely rumored that the Navy discovered at the last moment that the orders giving them war-time control of radio did not leave the return of these functions discretionary with them, but we were not able to verify this. Mr. Roosevelt stated we would be released "as soon as Mr. Daniels would permit it" and in response to an inquiry addressed by a Senator, wrote that "the Department has decided to remove the war-time restrictions on radio co-incident with the proclamation of peace by the President." We pointed out to Mr. Roosevelt the bad odor overhanging the whole affair and the extreme desirability of a statement by the Navy explaining why we are held up and what we may expect, if the suspicion with which the amateur world regards the Navy Department is to be eliminated. Mr. Roosevelt promised to immediately radio Mr. Daniels, and we hope soon to know just where we stand. Apparently Mr. Daniels personally is responsible. The whole proposition is so basicly unjust, so uncalled for, that we do not believe it will long obtain. This seems to be an entirely different matter from the question of a Navy monopoly on commercial radio, and we see no reason why we should be compelled to await the ratification of the treaty—an act that from present appearances might be judged to be several months off. Accordingly, we call upon every A.R.R.L. man who can make his weight felt to take this matter up with his Congressmen and Senators and demand the early release of amateur radio or an **American** reason why it can't be done. All together now; let's get some action!

Efficient Trans-Ocean Reception for the Amateur

(Concluded from page 4)

as possible, as long leads tend to destroy all the advantages of the cage by creating the so-called "antenna effect" to an appreciable degree.

In conclusion it may be well to say that the writer has built and tried many loops

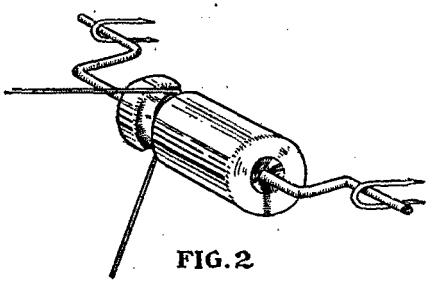


FIG. 2

of various kinds and sizes while in the Naval service, and that this loop has been agreed upon unofficially as being a size that is well suited to all ordinary requirements. A world's record was established using this type of loop at the Naval Radio Station, Bar Harbor, Maine, when the President's ship, the U.S.S. George Washington, was copied while lying in the harbor at Brest, France. The ship used a low power arc on 3600 meters, and her signals were quite readable both day and night. There is a world of possibility for the experimenter along these lines, especially in the direction of static prevention, as the loop will be found to give a much better initial ratio of signal-to-static energy than the open antenna.

In the next issue of QST there will be given a detailed description of an easily and cheaply constructed receiving set to be used in conjunction with this loop, which should enable amateurs to copy foreign stations, to say nothing of the many American stations, with utmost ease. The writer will be more than pleased to answer any question or give any information within his power, upon addressing him care of QST.

An Undamped Receiver

By J. A. Crowdus, Ex-9HN

Q S T readers contemplating building C.W. receivers for the coming season should not fail to give the following one a trial. It is the most compact and most efficient little receiver that ever happened, and when we think of the immense coils and inductances that used to be characteristic of a long wave receiver we certainly agree with our editor when he says that "concentrated inductances are the greatest improvement since the audion".

The circuit shown herewith involves the use of nothing that is not generally found about the average amateur's radio shack. Fig. 1 shows the circuit itself while in Fig. 2 is given the sizes and dimensions of the most important part, the inductances. Fig. 2 is practically self-explanatory. The spools shown can be turned up in a few minutes on a lathe from any wood available and are three in number, P, S, and T, representing primary, secondary and tickler, respectively. The primary coil is wound ⅜ inch deep with three strands of No. 32 D.S.C. magnet wire in parallel and the two ends brought out to two small binding posts. The secondary likewise is wound ⅜ inch deep but with a single strand of No. 32 D.S.C. The tickler is wound ½

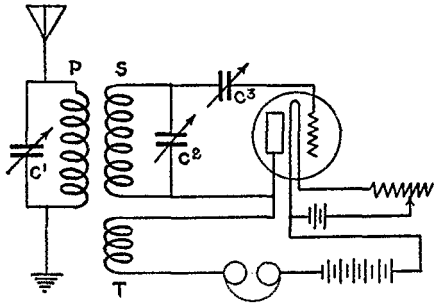


FIG. 1

inch deep with a single strand of the same size wire. These values of inductance were determined by experiment and with the aerial described later gave a wave length range of 3000-12000 meters. Other size wire may work as well as the size given, this merely being the one that I happened to have on hand.

The coils are placed in inductive relation as shown, the secondary being between the primary and the tickler. In parallel with the P and S coils are variable condensers of about .001 mf. capacity, these being the tuning elements of the circuits. Assuming that the audion is at its correct adjustment as shown by its characteristic

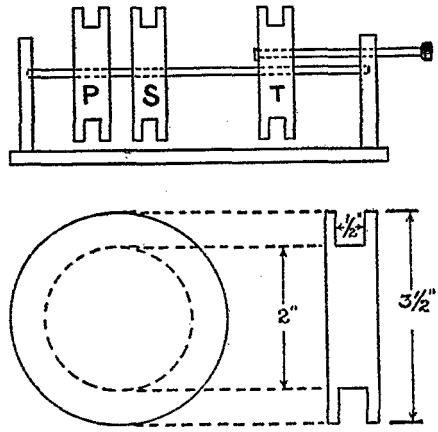


FIG. 2

curve or by experiment, the following tuning procedure should be followed: Place P and S as close together as possible and move the tickler about an inch away from the secondary. With the primary condenser set at about half its capacity move the secondary condenser slowly across its scale. You will no doubt quickly strike some station's tune. (It may be Germany and it may be China; if in doubt write to the Old Man). Adjust the signals to the desired frequency by varying both condensers. Now slowly move the tickler coil closer to the secondary. At a certain critical point the audion will, if oscillating properly, spill over and sing and howl loudly. (This was the Old Man's trouble.) The position of the tickler just before this point is reached is the proper adjustment and the signals come in beautifully loud and clear. The operator will find that the secondary condenser tunes exceedingly fine, while the primary makes not as much

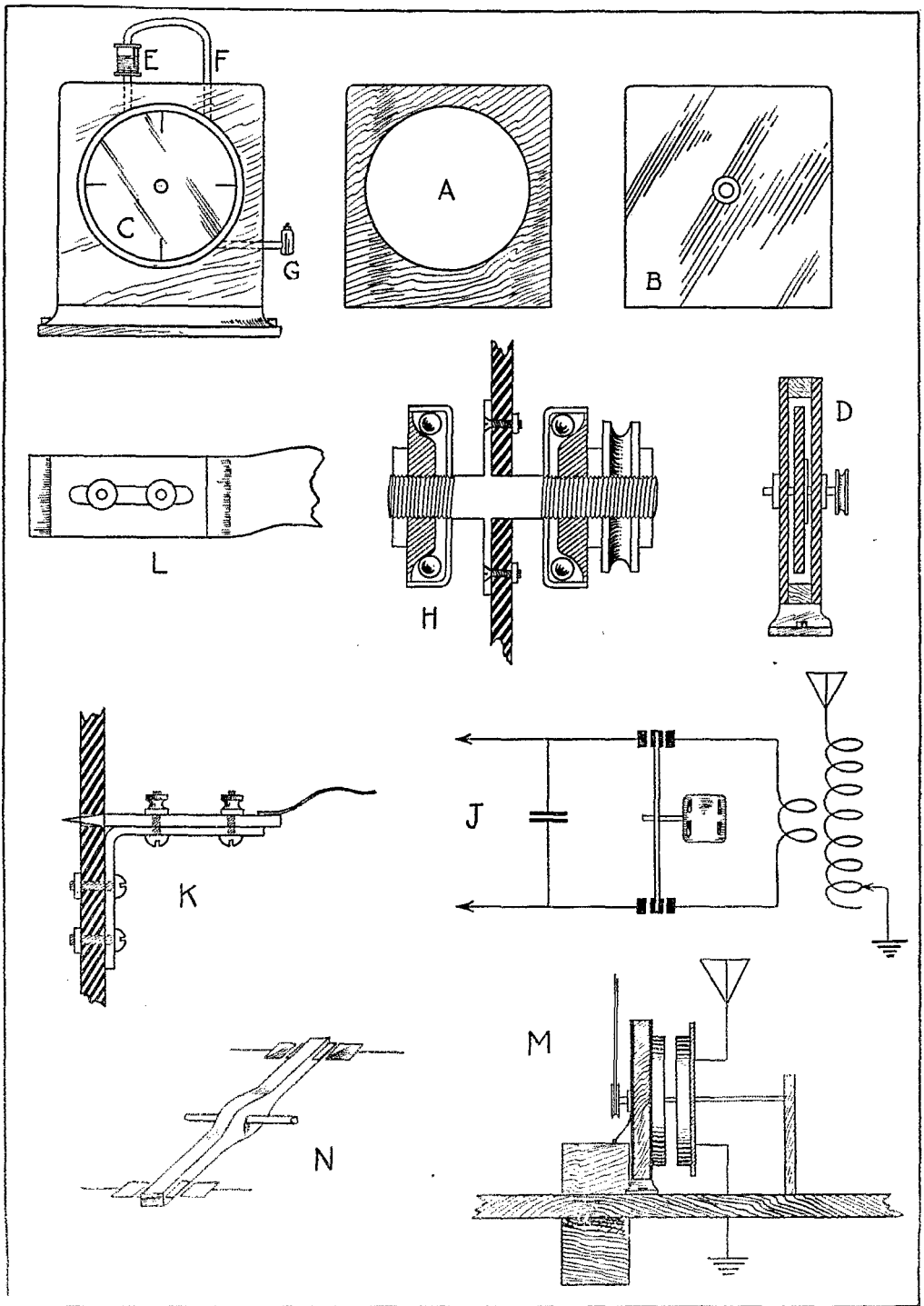
(Concluded on page 12)

Nonsynchronous Rotaries

THE nonsynchronous rotary will probably be an important part of amateur transmitting equipment so long as amateurs use spark transmitters. Except on the very smallest powers, there is no satisfaction in a fixed gap; very few of us have motor-generator sets where a synchronous rotary is possible; and most of us operate on 60-cycle lighting current so that a quenched gap is undesirable.

We have before confided to our readers that we are cranks about gaps. We love the "non-sink" rotary, the most characteristic feature of amateur transmitters. It has served us faithfully, and we like the spark tones obtainable from it better than a 500-cycle quenched; but we believe that most amateur gap construction has been done blindly, with no insight into the theory of the thing, and we are convinced that more improvement can be effected in gaps and larger increases in efficiency gained in their scientific construction than attends the devotion of time and thought to any other detail of the amateur transmitter. And because nearly all of us who want a musical note will use the non-synchronous rotary, we feel that any light which can be shed on the subject will be welcome, and the final creator of a super-efficient gap of this type will have done much for amateur radio.

Dr. Radio, in "Efficient Short Wave Transmitting", in QST for February, 1917, wrote a most interesting article on this subject, pointing out that the primary merit of a gap was its quenching qualities. This is the term given to the quality of a gap whereby it quickly opens up the condenser circuit after a discharge, certainly no later than when the first train of oscillations in the primary circuit reaches zero. In a straight gap this condition does not obtain after the gap begins to warm up, for a portion of the metal comprising the electrodes is vaporized and hangs in the gap, and this so reduces the effective resistance of the gap that the secondary circuit is able to feed back energy into the primary, which itself once more repeats into the secondary when that circuit comes to rest, and so on. The result is two frequencies, and both of heavy damping, and the only remedy is to so loosen the coupling that the efficiency of energy transfer is extremely low. Rotary gaps largely avoid some phases of this evil because the ionized gas and the products of combustion are thrown away from the revolving electrodes, the electrodes are kept cooler, and the tendency to arc is overcome. But they do not have that faculty of the quenched gap of absolutely preventing the return of energy to the primary from the secondary, once the primary has come to rest; at least, the ordinary amateur rotary hasn't. The mathematical theory involved in investigation of the behavior of non-synchronous gaps is very complex, and not much data is available. Dr. Radio pointed out that apparently the presence of the feedback was due to the discrepancy between the length of time required to transfer the energy and the length of time that the electrodes of the gap were sufficiently close to permit sparking in ordinary rotaries. It is commonly agreed that four oscillations of the primary are sufficient to transfer its energy to the secondary. On the wavelength of 200 meters, this is accomplished in .00000266 second. Computation of the time of actual sparking in gaps, however, is not so easily done. We might arbitrarily assume that the time equalled that fraction of a second necessary for a rotating electrode to pass the fixed electrode, and so arrive at a value by taking into consideration the width of the stud, the diameter of the rotor, and the r. p. m. This would be extremely approximate, however, for in all these gaps the spark leaps ahead to meet the electrode, and observation of the wearing of the studs will show that sparking rarely takes place past the center line of the electrodes and the "far" side of the electrodes never shows any wear whatever. These features make it impossible to arrive at any definite time value for a given gap,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which is unfortunate, for then we could compute exactly the excess sparking time. There seems to be very little question, however, but that in most amateur gaps this required time of opposition, or more correctly, of sparking, is greatly exceeded, perhaps by several hundred times, and it seems very logical to reason that during this excessive period the same alternate transfers of energy take place between primary and secondary (unless coupling is so loose as to be impracticable) as were mentioned in connection with the fixed gap; and it is in this respect that we believe there is greatest room for improvement in design. If we had a rotary wherein sparking would occur only when the electrodes were in opposition and whose electrodes were opposed only for that minute fraction of a secondary necessary for four primary oscillations to take place (or for one primary train to take place, according to some authorities) and which would then by its rotation have the circuit quickly opened, preventing any back-transfer, we would achieve an efficiency comparable with quenched gaps. What this means is easily understood by considering that it is only this troublesome feedback which has made loose coupling necessary; that by its elimination the necessity for very loose coupling is removed; and that we may then use tight coupling, in fact a straight helix, with vastly increased antenna current for the same input, because reaction between the circuits has been mechanically made impossible.

This may not be the correct analysis of the matter, but there is no disputing the fact that higher efficiency attends a reduction of the sparking time below that commonly provided in amateur gaps. The first step in the right direction is the reduction in the width of the gap electrodes, and a decrease in their number with corresponding increase in speed to keep the spark frequency whatever is desired. The use of knife-edge electrodes is advocated, and it is pointed out that large disc diameter is as easy a method of achieving peripheral speed as increased R. P. M. These changes in themselves, however, while an improvement, are disappointing in that they never give the expected results, and by observation one gets the impression that the length of time of sparking is practically the same regardless of the width of the electrodes. As a remedy for this, considerable experimenting has been done by some of our more advanced amateurs in the way of enclosing the gap in an envelope of hydro-carbon vapor, by vaporizing alcohol, of even using common illuminating gas. Results that were being obtained experimentally about the beginning of the war show that there is a most promising field for amateur work along these lines, and for this reason we have worked out a few ideas on the construction of a gap designed to embody features such as should give it superior quenching. The details are not worked out, but more than enough is presented to give the general idea. This is not intended as directions on how to make a gap which will be a world-beater, but rather to point out a line of experimentation which will be immensely interesting and from which it is hoped our readers will profit.

When we first began to give thought to this subject of gap design, our general idea was to make no sacrifice of theoretical worth for any mechanical convenience, and we discovered that we were contemplating a bakelite arm bearing two knife electrodes of the "spark-thru" type, to revolve 18,000 r. p. m., as crudely shown at N in the figure. We never tried it, and are glad we didn't. If anyone approached us with such a proposition now, we would want time enough to get over into the next county before it was attempted. We believe that such speeds are impracticable, surely for average amateur use. Such a revolving "stick" would furthermore have a terrific air resistance. By calculation we found that we could afford to make a concession to mechanical convenience and still theoretically have the ordinary gap beaten several hundred times.

It is necessary to diverge a moment on the question of spark frequency. There is great diversity of opinion on this subject in amateur radio, ardent supporters of both high note and low note being on every hand. The formula

$$P = C V^2 N$$

would seem to show that the power which a set can be made to use would increase as the spark frequency N, but it must be remembered that V is the voltage to which the condenser C is charged, and with higher values of N, C is not permitted to charge to as high a voltage, and as the power increases as the square of the voltage and only as the first power of the frequency, it is seen that in many sets a reduction of N would result in increased power being utilized. Another point in favor of the lower note which most certainly we can not afford to overlook is that such notes are susceptible to much greater amplification on regenerative receivers than are higher notes. This refers, of course, to non-synchronous gaps. Personally our preference is the lower tone. For best results, the frequency used should be an odd multiple of twice the supply frequency, and for our gap we determined upon a spark frequency of 360. The gap pictured herein contemplates a rotor bearing four "spark-thru" electrodes, driven at 5250 r. p. m. by a three-to-one belt drive from a standard 1750 r. p. m. induction motor, these figures representing our concession to mechanical convenience.

The gap is housed in, with the smallest possible clearance, originally to reduce air friction but having other merits which will be apparent later. The housing is formed by cutting a circular hole in a piece of bone-dry wood of the required thickness as shown at A in the figure, and fastening on either side thereof a bakelite side-piece as at B, screwing same to the wood or bolting thru both sides. The bakelite carries ball-bearings for the mounting of the rotor, and also bears the fixed electrodes, which are here omitted for clarity. At C is shown the rotor, made from a 12-inch disc of ¼ inch bakelite, and bearing four aluminum electrodes, ⅛ inch thick, running thru the thickness of the bakelite so as to spark from both edges, and 1½ inches in length radially, providing plenty of surface. The chamber is so constructed that no more internal room is provided, over and above that required for the disc, than can be structurally avoided. The rotor electrodes do not appreciably protrude from the face of the disc--not more than .01 inch. At D is shown a cross-section of the gap, and H presents an idea for the mounting in ball-bearings, concerning which the experimenter can use his own ingenuity.

The use of spark-thru electrodes in this gap makes possible a most interesting innovation in the conventional circuit, as shown at J. Note that both sides of the circuit between capacity and inductance are broken by the gap, providing a total of four gaps in series--a most effective gain in quenching qualities, and a structural convenience in reducing the voltage handled by any one gap. Further merits of this construction will be later apparent.

The stationary electrodes are of copper. The introduction of dissimiliar metals in the gap is another feature calculated to aid in quenching, and aluminum in combination with copper is very effective, beside being slow wearing. The use of zinc should be avoided in gaps employing knife electrodes on account of its quite rapid wearing. In K and L are given a crude idea for the mounting of these electrodes. The experimenter will doubtless be able to improve upon this. The sparking end of the electrode, which should be 1½ inch wide, is dressed down to a knife edge by a long double bevel, and the flexible copper ribbon lead is soldered directly to the other end. The electrodes should be capable of exact adjustment, and the gap length should be the smallest possible for clearance. (This makes the use of ball-bearings for the rotor practically imperative) There are of course four stationary electrodes, arranged in two pairs 180 degrees apart, two on each side, and mounted directly to the bakelite sides of the chamber.

Now in our calculating we have been rather inclined to presuppose that sparking takes place during a length of time approximately that required for the face of our rotating electrode to pass the face of the stationary electrode, but this makes no allowance for the troublesome leading spark, which, in spite of the use of four gaps in series, will probably so increase the actual sparking time in air as to heavily discount any advantage we may have gained. This was discussed above. From the

work done by other investigators, the remedy seems to be the substitution for air of a hydro-carbon vapor, at a small pressure, and the means of supplying it is shown in Fig. 2. E is an alcohol drip-cup, fitted with a pipe connection F for equalizing the pressure on its upper surface so that the alcohol will feed. An air-tight oil cup of the type supplied on two-cycle gasoline engines will be found satisfactory. The slowly dripping alcohol is vaporized by the heat of the spark and a hydro-carbon vapor is formed, having a dielectric strength greatly superior to air and calculated to eliminate the leading spark, and under proper pressure permitting sparking only when the electrodes are in actual opposition. In constructing the chamber it should accordingly be made as near gas-tight as possible, and a most important adjunct is the safety pop-valve G to take care of the initial explosion and to prevent the internal pressure exceeding the desired value.

At M in the figure is given an idea for the hooking up of a circuit embodying such a gap. Note that the primary of the OT could be directly mounted on one bakelite panel, with a value of inductance determined to make the wave-length 200 meters in conjunction with the condenser used, and the condenser can be mounted on the other side of the gap at such a height that its top comes on a level with the stationary gap electrodes. Consider then the length of exterior leads necessary: about one inch each for two leads on the condenser side, one lead zero length and one lead not over three inches on the OT side; total five inches. The driving motor could very conveniently be mounted on a small stand overhead, with belt drive.

Let us now consider what this gap should accomplish. Its time period figures out about double that required for four primary oscillations on 200 meters, and should satisfy both the adherents to the theory that four is sufficient and those who think it takes more. In seeking high quenching it embodies the use of high peripheral speed, dissimiliar metals in electrodes, gaps in series, and a hydro-carbon envelope. It is compact, facilitates the use of extremely short connecting leads, and should so improve quenching that the simple old straight helix and the close coupling available therewith could be employed. We believe it presents many novel possibilities, and we are inclined to feel that the development of the ideal non-synchronous gap of the future will be along these lines.

AN UNDAMPED RECEIVER

(Concluded from page 7)

difference. The condenser C-3 may be a variable of smaller capacity or it may be fixed after the correct size is determined. It is very important to reverse the tickler connections if the audion at first fails to oscillate.

With this little set as described and while lying in the harbor of Queenstown, Ireland, where it was first tried out, we were able to copy New Brunswick, N J., (NFF) while using an aerial consisting of one wire 80 feet long and 20 feet high. And we weren't using an amplifier either. Nuf sed.

REFORMING THE SQUEAK-BOX

The old spark coil—how we have all cussed it in by-gone days! The favorite nightmare of all good A.R.R.L. men has long been "the little boy around the corner with the spark-coil", for whose proper disciplining the Old Man himself has stayed up nights bringing the Wouff-Hong to its present state of perfection.

QST has in the past commented rather pointedly upon this fatal combination, and some of our good friends have taken exception, pointing out that in proficient hands the spark-coil is capable of good work and that there are many experimenters not so fortunately located as to have alternating current available.

We know that. It's the combination that causes the trouble—the small boy **plus** the spark-coil. A properly designed spark-coil set is capable of remarkably good work, and not only does it make an excellent short-range set for a star station, but there surely exists a definite place for these spark-coil stations in the A.R.R.L.—in cross-town work in our larger terminals and for local distributing work. But the spark-coil set of the olden days, that absolute stranger to the oscillation transformer, that side-kick of the Demon Static himself—get the Wouff-hong quick! Probably because an induction-coil set is cheap and therefore very often the first transmitter of a new convert, it is frequently handled wholly without scientific knowledge and this in large part accounts for its unsavory reputation. There is room for much improvement in amateur coil sets. The subject deserves our attention, not only because many intelligent experimenters haven't the "city juice" and are compelled to resort to spark-coils, but also because just as surely as we raise the standards of efficiency in design and operation in such sets, to that extent will "spark-coil QRM" be lessened in our relay-work.

We would therefore like to publish in QST a description of a really good and law-abiding spark-coil set—one which may be held up to the younger fraternity as something which will not only change our opinion of them as a class and do away with our petty grievances against everything related to a spark-coil, but will also enable them to do much better and more effective work than they have been able to get from the usual miscellaneous collection of beginner's apparatus, especially with the dearth of serious consideration commonly given that subject. So we ask: Hasn't some QST friend, perhaps away from city mains, succeeded in producing a really scientific spark-coil set which he would describe to us, for publication to fill this crying need? We believe it ought to be a cabinet set, small in dimensions, with a hard-rubber or fibre panel, and so disposed as to be accurately and easily adjusted. It should embody only the familiar features of such a set. Of course a step-down transformer is the logical thing where 110 a.c. is available; and certain combinations of a commutator-interrupter with synchronized rotary gap have been used, but this should be a battery-operated set, with a fixed gap that will stay cool, an efficient condenser of constants correct for such use, and embodying one genuine oscillation transformer calculated to keep the

emission within the law as regards decrement and yet being efficiently designed for conserving the small amounts of energy in such a set.

We hope someone will aid us in clearing up this difficult problem by contributing the result of his experiences in this line.

MEASURING INSTRUMENTS

The amateur of today is building a far higher grade of apparatus than he did a few years ago, and a great many of the sending and receiving sets built by amateurs are worthy of much commendation from the point of view of design. However, we believed that the average experimenter makes too little use of electrical measuring instruments to indicate the exact values of current and voltage which exist in the various set-ups.

A transmitting panel of average amateur size should have a voltmeter to measure the voltage across the primary of the power transformer, an ammeter in series with the power circuit to measure the input, and a high frequency ammeter in the ground side of the antenna circuit for measuring the current radiated. If only one instrument is used, it should be a high frequency ammeter, and if two are used, the second should be an ammeter, in the power circuit.

Receiving panels will be much improved by the addition of a small direct current ammeter to measure the filament current to the vacuum tubes, which current should be kept at a constant value to insure maximum bulb life as well as best operating conditions. A small direct-current voltmeter is also of value for reading the plate voltage; this allows various values of voltage to be duplicated at various times irrespective of the condition of the high voltage battery. For undamped sending circuits using vacuum tubes, instruments to measure filament current and plate voltage are particularly necessary, as well as high frequency ammeters for measuring the radiation.

The more ambitious experimenter will also find low reading milliammeters of great value in taking bulb characteristics, and an instrument subdivided to read microamperes will enable him to take curves which tell the whole story of any vacuum tube.

The increased use of measuring instruments in amateur radio work will enable the experimenter to do more scientific research, will enable him to reproduce previous conditions on which he has the electrical data, and by showing his actual operating conditions, will enable him to bring the efficiency of his apparatus up to the highest possible value.

A small but accurate seven-day clock, on the transmitting panel, will also be found a most convenient addition, and can be obtained to match, in general appearance, the meters used.

A. R. R. L. DUES

The Secretary desires to call attention to the matter of A.R.R.L. dues. A great many station owners, subscribers to QST, are vitally interested in relay work but are not bona-fide members of the League. There also exists a very limited class of readers who are laboring under the impression that because they are subscribers to QST they are automatically members of the League. (Members of the League receive QST, but all QST readers are not A.R.R.L. men.) Then there is that immense group of relay enthusiasts who have been members of the A.R.R.L. since its early days, whose subscription to QST has been extended on our books for the time lost during the war, but who are not in good standing **in the A.R.R.L.** at this time because they have paid no dues since before the war.

Of course it would be manifestly unfair to request the full annual $2.00 dues from these station-owners who are already subscribers, and apply it for A.R.R.L. privi-

leges for one year from date and then extend for one year a subscription to QST which may already be paid in advance for several years. The price of QST to non-members is $1.50 a year, but here at Headquarters we have always figured that of the $2.00 annual dues, $1.00 went to the support of QST and the other dollar for the defraying of miscellaneous A.R.R.L. expenses in the conduct of our organization. One dollar additional is therefore due from A.R.R.L. men, at present subscribers to QST, who have not this year paid A.R.R.L. dues.

This is of vital importance in relay work: Appointments as Official Relay Stations can not be made unless the owner is a bona-fide member of the League in good standing. Certificates are issued to all members in good standing, and unless a station owner can produce his certificate he is not eligible to appointment as a member of the Operating Department personnel, nor as an Official Relay Station Owner. This is only fair; we are sure that no one desires to obtain the benefits of our organization without contributing his small share to our operating expenses.

Accordingly, the Secretary desires to bring to the attention of all subscribers to QST who are not at present bona-fide members of the League, the fact that dues of $1.00 are payable to regain good standing and qualify for an active part in our relay work, and it is hoped that all concerned will promptly do the necessary in order that our organization may be completely rounded out by the time the restrictions are removed. Use the form below.

American Radio Relay League,
Hartford, Conn.

I am a subscriber to QST but have not yet paid my current A.R.R.L. dues. I attach $1.00 to renew my membership. Please send me membership certificate at once.

Name..... **Street Address**.....

City..... **State**.....

-:- *Here and There* -:-

Bill (W. E.) Woods, sometime 9HS of St. Louis and lately at the Naval Radio Station at Otter Cliffs, Me., is now back on his well-known job in charge of the Radio Department of the Manhattan Electrical Supply Company in St. Louis. He intends to make his house a leader in the middle west and south in this respect. An interesting innovation which should be of great assistance to the amateur will be the installation of a modern amateur station for the purpose of receiving orders direct by radio, the goods to be sent the very next day C.O.D. Great stuff, eh? May burn out the old bulb but can immediately call Friend Bill either direct or by relay, give the order, and know the bulb will be on the way early the following morning.

Have we any kind friends, artistically endowed, who would care to contribute a cover design for our good ol' QST?

Give a thought to QST. Are we on a news-stand in your town?

The Jewell Electrical Instrument Co. of Chicago have recently placed upon the market a high frequency ammeter which embodies a thermo-couple instead of the expansion wire. This thermo-couple is heated by the high frequency current, and the thermo-electric voltage developed is indicated by a direct current D'Arsonval movement which is sensitive but at the same time very rugged. The thermo-couple is placed inside the case and its calibration will remain constant throughout the life of the instrument. This type of instrument has none of the errors associated with the old expansion type of hot wire ammeter and is entirely free from zero shift and temperature error and is at the same time well damped and of unusual accuracy.

(Concluded on page 21)

The Operating Department

J. O. Smith, Traffic Manager
Rockville Centre, L. I.

THE announcement of the Secretary of the Navy that restrictions on Amateur transmitting stations would not be lifted until the peace treaty had been ratified by the Senate and peace formally declared by the President, has again raised the question as to what good is being accomplished by this continued oppression.

The telegraph and telephone systems of the country have been turned back by the government to their owners and practically all war time restrictions, rules and regulations, except the control of radio, have been rescinded. In addition, the radio amateurs of Canada have been allowed to resume operation. Why the unnecessary war-time ban on American Amateur Radio Stations should be continued, or what useful purpose the continuance of war-time restrictions is accomplishing is seemingly beyond the understanding of everybody except Secretary Daniels himself.

In preparation for the resumption of amateur radio transmitting, the following routes for the League's trunk lines have been decided upon, and instructions have been issued to all Division Managers to arrange accordingly.

Line A—New York to Seattle, Wash. via Chicago (Northern Route)
Line B—Philadelphia to SanFrancisco, via Pittsburg, Columbus, Indianapolis, St. Louis, Kansas City, Denver, Salt Lake (Central Route)
Line C—Jacksonville, Fla. to Los Angeles, Calif. (Southern Route)
Line D—Bangor, Me. to Jacksonville, Fla. (Atlantic Route)
Line E—Chicago to New Orleans, via Indianapolis.
Line F—Grand Forks, N. D. to Dallas, Texas.
Line G—Seattle, Wash. to Los Angeles, Calif. (Pacific Route)

It is understood that some of the terminals indicated may not be the most desirable, but the ones designated will be adhered to unless more favorable points can be suggested.

The Division Managers will be expected to make all necessary arrangements to put these lines into operation, with the distance between stations short enough to insure reliable work during daylight.

The regular relay work of the League will be conducted only between 9 and 12 P.M. Daylight relay work may be carried on at the convenience of the relay stations, but must stop at six P.M. Other stations not handling relay work cannot be expected to stand by except during the evening hours.

While handling the League's relay traffic, transmitting stations must not use more power at any time than is sufficient to insure reliable communication with the next station in line.

All stations should be instructed that handling the relay traffic of the League does not give them the privilege of using a wave in excess of 200 meters, unless a special license to use a longer wave has been issued by the Radio Inspector, of the Department of Commerce.

All relay stations should be cautioned against the use of a broad wave.

All amateur stations require new licenses, which must be secured from the Radio Inspector, Department of Commerce, according to the district in which the station is located.

Particular attention should be drawn to the fact that a license is required for all transmitting stations whose signals can be heard outside of the State in which located, or if the signals of such stations interfere with the receipt of signals from outside the State by another station.

The reports of Division Managers in detail are as follows:

ATLANTIC DIVISION

Chas. A. Service, Jr., Manager
Bala, Pa.

Since making the last report for July conditions in the Atlantic Division have remained substantially the same, except for the continued activity of the traffic officers and official station owners in getting more and more of the old stations signed up and new ones in line for the day of re-opening. Stations located in large cities and well populated sections of this Division have gotten in touch with their District Superintendents or Assistant Division Managers and in this way, have secured appointments as official relay stations, where it has been thought that their equipment and qualifications were

such as to warrant it, even before they have taken part in actual relay work and the Atlantic Division Manager cannot urge too strongly all station owners, especially those in outlying or thinly populated sections, to write the proper traffic officials of the League, if they want to become associated with the best known amateur activity in the country.

One requirement which a number of official relay station owners have neglected is to become members of the American Radio Relay League in good standing by payment of their dues of $2 a year, which includes subscription to "QST". Subscription alone does not constitute membership by any means and all official stations are advised to attend to this at once, in accordance with Circular Letter No. 3 from the Atlantic Division Manager, the contents of which should have reached every official station via the District Superintendent several weeks prior to the publishing of this report.

The formation of a relay route into Canada should receive careful attention by the District Superintendents and stations of Northern New York and the New England States who are in a position to work Canadian stations direct or form connecting links to them. Some of the fellows across the border are wide awake and anxious to connect with amateurs in the States, as will be seen from the report of Mr. Entwistle, Assistant Division Manager for the New England States, and it will be our part to co-operate with them in every manner possible.

Amateurs to the South of Philadelphia on a line through Wilmington, Baltimore, Washington, Richmond, and Danville and the general sections surrounding these cities have yet to be heard from but it is hoped that if few are in existence capable of carrying relay traffic southward along the Atlantic Seaboard, others will start up and make themselves known upon removal of restrictions on amateur transmitting. There has always been difficulty in getting traffic southward by the most direct route and every means available will be used to eliminate this condition.

In conclusion, it is hoped the day of re-opening will not be delayed much longer, when we will have a chance to again pound the brass, hear the old familiar sparks and break the dead silence on 200 meters - or thereabouts.

ATLANTIC DIVISION (Northern Section)

Guy R. Entwistle
Assistant Division Manager.
137 Sutherland Road, Brookline, Mass.

We have a bunch of live wires down here and will push QST to the limit. I have just closed a deal with our Editor to handle QST in the New England States. I already handle the A.R.R.L. work, and I think that both can be handled together more satisfactorily. I think this a point that all the Assistant Managers can look into, as far as it will harmonize with Mr. Warner's ideas on the matter. The District Superintendents help the Assistant Division Managers in wisely placing the magazines at the proper news stands in their districts. They also can pick up a little for postage stamps to help the A.R.R.L. work along.

Both circulars No. 1 and No. 2 are at hand and have been sent along to the Superintendents.

I made a trip to Hartford, Springfield, and Worcester recently. It's a great thing to meet the boys and get into personal relations with them. It's worth more than a hundred letters.

I received a letter from a former New England amateur who is down in Texas—Sgt. Louis Frank, of Brookline, who says he will root for QST hard when he gets out of the army.

At this writing I have no reports from Fall River or Northern Massachusetts. Miss Lorena M. Reed, of Richmond, Maine, is anxious to enter the relay game. She holds a first grade commercial ticket and has had much radio experience with several radio manufacturing companies. She held a Lieutenant's commission in the Radio Corps, a department of the Signal corps, where she did extensive work on vacuum tubes. We ought to hear from more of the men folks up that way now. The boys in New England should get in touch with the Superintendents in their districts and fall in line for the big work to be undertaken this fall. Here is the list of A.R.R.L. representatives in New England:

Asst. Div. Mgr. Guy R. Entwistle,
137 Sutherland Road, Brookline, Mass.

District Supt. for Lower Mass. and Rhode Island.
Harold C. Bowen,
168 Belmont St. Fall River Mass.

District Supt. for Upper Mass. and Lower Maine.
Wilbur H. Hardy,
776 Hale St., Beverly Farms, Mass.

District Supt. for Worcester County,
Lee A. Bates,
8 Moen St., Worcester Mass.

Amateurs in Northern Maine and New Hampshire should be directing their attention to prospective relays thru Canada. Mr. Albert J. Lorimer, of 243 Mackay Street. Montreal, Quebec, Canada, is developing a series of trunk lines in the Northeast and American amateurs should co-operate to the fullest extent possible with him.

ATLANTIC DIVISION (Middle Section)

M. A. McIntire, Asst. Division Manager
1127 Avenue G, Brooklyn, N. Y.

Work in this District is running along smoothly. Reports are coming in from different parts of the States of new stations, and it is expected that big things will be done as soon as we get "going" with the transmitters again.

Our District Superintendent in Connecticut reports that a number of the old timers, and a number of new stations will be on the job, and that he expects to have no trouble in shooting msgs up and down the eastern coast from Maine to points south over his trunk lines. This will help considerably, as we have always had trouble in getting things through to the New England States. Mr. Nichols has recently installed a 1 K W Marconi outfit in Bridgeport, Conn., which will keep the ether hot between New York and Bridgeport.

Reports come in from Northern New York State that the boys are coming back from service and are all enthusiastic over relay work, and will be on the job up in that section of the country.

Mr. Clifford Goette, of the Radio Traffic Assn. of Brooklyn, has been appointed District Supt. for Brooklyn and he will organize the work in that City so that traffic will be handled on a 24 hour basis.

Our New York City District Superintendent writes that he is so busy selling apparatus, aerial wire, etc., that he is hardly able to keep his head above water. We look for big things from him in the near future.

It is again urgently requested that all stations interested in relay work communicate either with their District Superintendents or with the writer, in order that additional District Superintendents may be appointed.

ATLANTIC DIVISION (Southern Section)

Chas. H. Stewart, Asst. Division Manager
St. David's, Pa.

Owing to the continued denial of permission to operate transmitting stations, the reports of the various District Superintendents do not contain as definite information as to progress as would otherwise be the case, and I am inclined to believe that no great activity will be shown until the removal of the ban by the President.

It is not understood why the ban against the operation of amateur transmitting stations is continued by those in authority, but there must be some very good and adequate reason that we with our limited vision cannot see, which may be plain to us later on. If such is the case no one can object, although the amateurs of the country will hold those in authority responsible unless some good reason does appear for continuing to hold up our activities if it be needlessly.

However, the matter of the establishment of relay routes is, I feel sure, receiving careful thought in the minds of the various District Superintendents, and will bear fruit in more encouraging reports later on.

Philadelphia and its vicinity can without doubt be counted upon to do its share of the relay work, especially as there were formerly a number of good stations in the city and adjacent territory, which were beginning to do considerable relay work just before the war broke out.

The reports of Mr. Cawley, Supt. Central Pennsylvania District, gives nothing of a definite nature, but states the belief that stations at Harrisburg, State College and Milton can be counted upon for efficient work.

It is my desire to hear from good stations in the Western part of Pennsylvania, and to learn of some one of energy who could qualify for the appointment as District Superintendent for Western Pennsylvania. This appointment has not yet been made because I have not heard from anyone in that part of the State.

The report of Mr. Duvall, of Baltimore (3AK) Supt. for Eastern Maryland, expresses the hope that some intervening stations may be established between Philadelphia and Baltimore and also between Washington and Danville, Va. He states that prior to the war practically the only work done by the Baltimore stations to Philadelphia was via 3PC - Lancaster, Pa., and that this was very uncertain; that the same conditions existed between Baltimore, Washington and Danville. It is suggested by him that those formerly operating stations in Western Maryland, and between Baltimore and Philadelphia and between Washington and Danville, who may still be interested in the work of the League, should communicate with us, and that our desire to have them do this should be given publicity in QST. Mr. Duvall adds that Baltimore and Washington can be counted on and will be ready with efficient stations when the ban is lifted. Stations in the vicinity of Belair and Elkton, Md. should make themselves known to Mr. Duvall, as well as stations in the vicinity of Chestertown and Centerville, Md.

The Superintendent for the District of Columbia, Mr. Schaefer, reports through Mr. Duvall that he has at least four stations lined up in Washington, and that he thinks there will be a station in Alexandria, Va., and one in Southern Maryland that will be in position to give good assistance in the relay work.

Western Maryland should also show up in future relay work, and the Assistant Division Manager is desirous of appointing a District Superintendent for that section of the State. There should be some good stations in Frederick, Hagerstown and Cumberland, Md., which might be useful in connecting up with Chambersburg, Gettysburg, York or Lancaster in Pennsylvania.

Mr. Gravely, of Danville, Va. (3RO), Supt. for Central Virginia District, advises that he is using his persuasive powers to get a reliable station in Roanoke. One of the biggest problems that confronts him is to make reliable connection with the South, as in the past the only way he could reach that section was through Pope (4AA) at Athens, Ga., or by a diversion to one of the Ohio or Indiana stations, which is not the way the traffic should go. A reliable station is also desired in Richmond, but, while there is some prospect that this may be accomplished, it is still an uncertainty.

The Assistant District Manager also desires to hear from former owners of stations in Virginia in the vicinity of Norfolk, as it may be deemed advisable later on to appoint a District Supt. for the Eastern part of that State.

It is also my desire to hear from stations located in Delaware that formerly were able to connect with Wilmington, Del., if such existed, and who think they can work to the South and West, as such stations might prove to be of value in connecting Philadelphia with Baltimore and become of considerable importance. No District Superintendent has been appointed for Delaware up to the present time, but this matter will receive my attention at the proper time.

CENTRAL DIVISION

R. H. G. Matthews, Division Manager
1316 Carmen Avenue., Chicago, Ill.

During the past month the Division Manager has found it necessary, from a standpoint of efficiency, to make a change in the Division organization. Because of the varying conditions in different parts of the Division, it became impossible to give each District the proper individual attention and at the same time keep the proper perspective on the general affairs of the Division. Accordingly, the Division has been divided into two sections, each of which is in charge of an Assistant Division Manager to be known as a Section Assistant. In addition the Division Manager has appointed one Administrative Assistant and one Traffic Assistant. The Administrative Assistant will aid the Division Manager in handling transcontinental routes which do not come under ther control of the Section Assistants, in the appointment of District Superintendents and in the general organization and determination of policy of the Division. It will be the duty of the Traffic Assistant to observe the way in which traffic is being handled by the various Stations, with a view toward the formation of routes and also to keep a check on the traffic work of the various Districts. The Traffic Assistant will take no direct action, but his recommendations will be given due weight in the appointment of District Superintendents and the formation of routes. The chart attached hereto shows this new plan of organization in detail. (See next page).

The following appointments have been made in accordance with this plan of organization:

Administrative Assistant—L. E. Dutton, 1340 N. Homan Ave., Chicago, Ill.

Assistant in charge East Section (as shown above)—P. B. Parks, 339 Ashland Ave., River Forest, Ill.

Assistant in charge West Section (as shown above)—P. S. Pfiefer, 919 Bishop St., Chicago, Ill.

Traffic Assistant—R. J. Iversen, 422 S. 16th Ave., Maywood, Ill.

Chicago City Manager—F. H. Schnell, 2220 Roscoe St., Chicago, Ill.

District of Southern Indiana (All Indiana territory south of an east-and-west line thru Lafayette, including Lafayette)—Supt., F. F. Hamilton, 117 S. Meridian St., Indianapolis, Ind.

District of Northern Wisconsin (All Wisconsin territory north of an east-and-west line thru Grand Rapids, including Grand Rapids)—Supt., H. I. Crawford, Wausau Telephone Co., Wausau, Wis.

District of Southern Wisconsin (All Wisconsin territory south of an east-and-west line thru Grand Rapids)—Supt., H. J. Burhop, 1426 Illinois Ave., Sheboygan, Wis.; Asst. Supt., C. F. Bates, 2015 Wells St., Milwaukee, Wis.; Asst. Supt., M. C. Lapp, Plymouth, Wis.

District of Ohio (All Ohio territory)—Supt., A. J. Ball, Hubbard, Ohio.

District of Kentucky—H. A. Loveless, 137 Griffin Ave., Somerset, Kentucky.

District of Kansas (All Kansas territory)—Supt., R. K. Trump, 1254 VanBuren St., Topeka, Kansas; Asst. Supt., W. A. Beasley, 1517 Western Ave, Topeka, Kansas.

District of Northern Minnesota (All Minnesota territory north of an east-and-west line thru St. Cloud, including St. Cloud; Superior, Wis., is also included in this District because of its proximity to Duluth, Minnesota) — Supt., J. A. Gjelhaug, Baudette, Minn.

District of Nebraska—Supt., D. D. Keller, 2221 Central Ave., Kearney, Nebraska.

District of Southern Minnesota (All Min-

nesota territory south of an east-and-west line through St. Cloud)—Supt., J. H. Schultz, Radio Club, Y. M. C. A., St. Paul, Minn.; Asst. Supt., H. R. Hall, 1987 Milwaukee Ave., St. Paul, Minn.

District of Iowa (All Iowa territory)—Supt., C. W. Patch, Dubuque, Iowa; Asst. Supt., G. R. Hammond, Oelwein, Iowa.

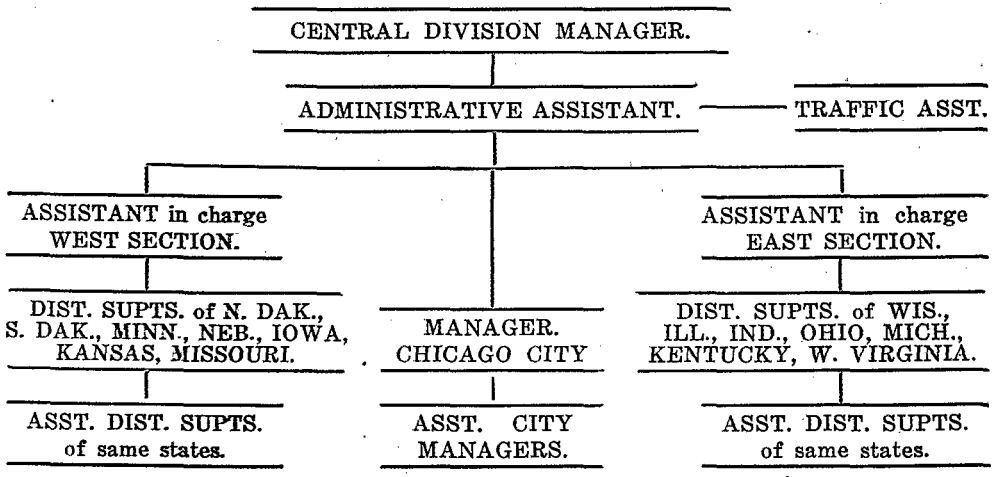
Mr. Hamilton, District Supt. of Southern Indiana announces the appointment of several new assistants as follows:

Asst. in charge of Personnel, Carl Kennen
Asst. in charge of Operating
N. C. Hilgenberg
Asst. in charge of Traffic, H. A. Silcox
Asst. in charge of Technical work,
J. J. C. Yorn

Appointments of official relay stations will be made by the District Superintendents, but will be referred for confirmation to the Section Assistant of the applicant's section.

Appointments of District Superintendents will be made ONLY by the Division Manager and his Administrative Assistant. However, before such appointments are made, the Section Assistant in charge of the applicant's section will be consulted, and approval of the application will depend largely upon his recommendation.

Appointment of Asst. Dist. Superintendents will be made only by the Division Manager and his Administrative Assistant, but the approval of such applications will be dependent upon the recommendations



Mr. Hamilton's organization work has been excellent and instructions are being issued to all the District Superintendents to follow a similar plan in organizing their Districts.

District of South Dakota (All South Dakota territory) — Supt., Harold Larson, Viborg, South Dakota.

District of Eastern Missouri (All Missouri territory east of a north-and-south line through Moberly)—Supt., L. A. Benson, 3423 Olive St., St. Louis, Missouri.

District of Western Missouri (All Missouri territory west of a north-and-south line through Moberly, including Moberly)—Supt., G. S. Turner, 124 S. Pearl St., Independence, Missouri.

Inasmuch as it is desired to have two District Superintendents to each state, and Assistant Superintendents as necessary, changes will be made from time to time in the above. These changes will be announced in the monthly report for the Division in QST.

of the District Superintendent to whom the applicant will be assigned as Assistant, and of the Section Assistant in charge of the applicant's section.

Appointments of Transcontinental Relay Stations will be made ONLY by the Division Manager or his Administrative Assistant. Recommendations of the Traffic Assistant will be given due weight in these appointments, however, as he is in a position to estimate the applicant's value as a Transcontinental relay station.

As will be seen by the above, District Superintendents are at liberty to form their state routes, connecting them with all stations within their districts, and to appoint the official relay stations on these routes, the only requirement being that such appointments must be submitted to the proper Section Assistant before final action is taken.

The work of organizing local clubs to be branches of the A.R.R.L. and of affiliating such clubs as already exist in the various

Districts, has not been progressing as rapidly as is thought possible. It is believed that perhaps the method of carrying out such an affiliation is not clear to all concerned.

The advantages of associating a local club with a nation wide organization such as our league, are so obvious that it is unnecessary to set them forth in detail here.

It is the duty of the District Superintendents to facilitate in every possible way the affiliation of local clubs with the League. This may be accomplished by following closely the article on "Affiliating the Clubs" which apeared in August QST. District Superintendents should get into touch with all clubs in their territories and explain the plan to them, setting forth the advantages of affiliation. The club will then vote on a resolution worded as shown in the club affiliation article before mentioned.

When this resolution has been passed and duly executed it should be sent to the Secretary, Hartford, Conn. for action by the Board of Direction. The affiliation of a club is not complete until this body has passed on it.

In localities where clubs do not exist at this time, it is the duty of the District Superintendent to organize them and accomplish their affiliation in the same manner as shown before.

The question of club affiliations does not affect in any way the campaign for regular memberships and QST subscriptions which has been so successfully carried on in the past by the District Superintendents and they should not relax their efforts in this direction.

Efforts will be made to keep alive the various local organizations by such means as may be possible, such as the running of tests, exhibitions, etc., and perhaps later by the assistance of some of our more prominent relay amateurs acting as speakers and giving talks before as many of these associations as possible.

It is realized that at this time it is not possible to enter into the formation of routes to any great extent, because of the fact that the interest is not at a maximum during the summer, and early fall. However it is believed that the time of reopening is not far distant, and it is therefore desired that the District Superintendents accomplish as much as possible toward the formation of routes connecting them with all towns in their Districts, so that these routes will be ready for operation when transmitting is resumed.

It is believed that traffic will be much heavier than before the war and accordingly it is our intention to discourage the "greetings by wireless" type of message as far as possible and to attempt the substitution of bona fide messages of importance. So long as our messages contain only such trivial information as has been generally the case during past, amateur radio relay work will remain in the "play" class. Every real relayer wishes to see our work given some consideration by the public in general and we can only secure this consideration by making our work of importance.

Hereafter reports on the two Sections in this Division will appear together with the Division Manager's report in QST. These reports must contain the information received from the various District Superintendents and, therefore, the District Superintendents are urged to get such matter in promptly.

ROCKY MOUNTAIN DIVISION

C. E. Hart, Manager.
Salt Lake City, Utah.

Heres news! Mr. Glen Garner of Ogden, Utah, intends to install an A1 radio outfit immediately and Mr. Wm. Reynolds, 312 Burns Building, Colorado Springs, Colorado, has been appointed District Superintendent of his state. All boys in his district please get in touch with your new superintendent. He's right "there", you'll find, and he states that he's going to install a radio-phone. Good Stuff! Lets have more of it.

Ambrose Allard of Wyoming is coming along famously, I suppose. Ambrose has neglected to leave his monthly report on my desk as requested.

Mr. Andelin, my assistant, insists that one of these days he will have some news in the way of a trunk line for us. Why don't more of you get in touch with him? He won't bite.

Jack Ensign of Northern Utah reports success. Ira Kaar of the southern part has joined Mr. Allard, it seems. He is quiet and doesn't even report that; I guess it's because there's only one station down there and that's the assistant's, Mr. Andelin.

Idaho and Montana will be heard from next time. Lets Go!!!.

HERE AND THERE

(Continued from page 15)

An excellent series of radio charts and circuits has been brot out by the Consolidated Radio Call Book Co., publishers of the new call-book which has been received with so much interest. These charts are loose-leaf, on letter-size paper, ready for insertion in note-books. One series treats of the measurement of various radio circuit constants, with hook-ups, instructions, curves, and examples worked out, including the measurement of capacity, inductance,

(Continued on page 24)

More About V. T. Transmitters

FIG. 1 shows a circuit for a tube transmitter (undamped wave) which was found quite satisfactory on some sets supplied the government during the war. It is extremely simple but whereas the ordinary set-up requires rather critical adjustment for good radiation, this set is not at all critical of adjustment. It is suggested that for 200 meter work the antenna coil consist of about 20 turns of heavy Litzendraht wound on a 4 inch tube, with a tap off about the 10th turn to complete the plate circuit, and with a tickler coil consisting of about 30 turns of No. 22 wire wound on the same tube about ½ inch from the antenna coil, with fixed coupling. This drawing also shows a new location for the key—in the grid circuit where the current is extremely small. This arrangement

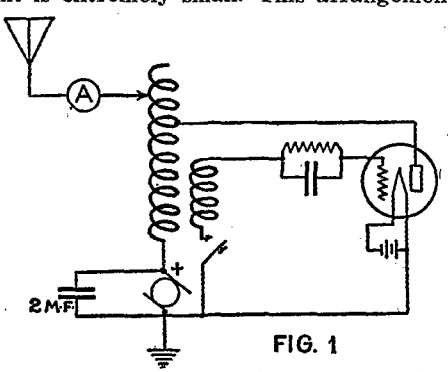


FIG. 1

is not practicable with tubes using a polarized grid, however, as was explained in our article in the July QST.

In Fig. 2 we present a hookup developed by the Marconi Company especially for use with the Marconi-DeForest V.T. as a transmitter, and said to give the best results for that tube of any circuit tested. It will be noted that the oscillating energy in the plate circuit is transferred electromagnetically to the antenna circuit but that the feedback to the input circuit is electrostatic by means of the oscillating drop across the condenser in the ground lead.

It is rather a curious fact that most of the small power tubes, designed for oscillators under a potential of several hundred volts, function perfectly as detectors in the conventional circuit using plate potentials of ordinary values. This leads us to wonder

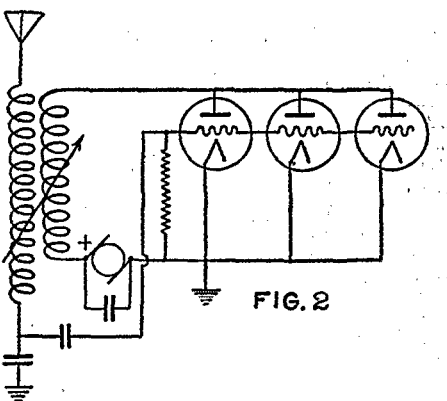


FIG. 2

how long it will be before we have sets transmitting and receiving on the same tubes and oscillating circuits. A suggestion is shown in Fig. 3. The circuit shown is a very good receiver and a fair transmitting hookup. The aperiodic grid and plate circuit windings could be proportioned for decent efficiency in both functions, and a switch provided as shown to change over from the high-voltage to the phones and normal receiving battery. There will be an inconceivable gain in operating ease with such a set. Imagine that A calls B, using 150 meters. B tunes him in, and his

(Concluded on page 24)

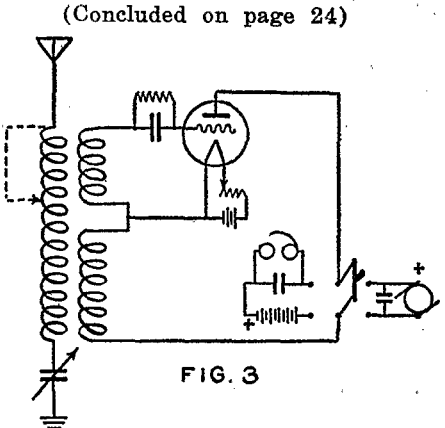


FIG. 3

The Loop Fallacy

WHILE indeed wonderful are the many developments of war-time radio, they are not all applicable to our amateur work, even in principle, and we counsel moderation in their hasty use in relay stations. As an example consider the new V.T's., concerning which we comment elsewhere in this issue; similarly V.T. Transmission, which offers immense possibilities but as surely presents a number of difficult problems in its adaption to amateur C.W. telegraphy.

Now about loops, or cages or rectangles as they are variously called. For certain work a loop is admirable, and the progress made in developing its use to such a state of perfection during the war is indeed interesting. A loop is directional in the plane of its winding, and various circuits have been devised, some of considerable complexity involving several loops, for direction finding, and it may be said that this work has been of the utmost importance during the war in guiding airplanes, giving bearings to ships, etc. A loop is also decidedly the most convenient portable aerial, which accounts for its use in small sets where extreme portability is essential. And the loop is quite desirable for long-wave undamped reception.

We eagerly seize upon any creditable substitute for a clumsy aerial of conventional design, and we do not want to be considered unprogressive when we deprecate amateur loops; for with the advance in amateur progress which is bound to come in the next few years with the war-time improvements as their basis, we do not dare to predict what will or will not be used, and surely it is logical enough to picture efficient amateur sets transmitting and receiving on the same bulbs with C.W., employing a small loop aerial in the operating room. But we do not believe that there is any very good use for the loop in amateur operation—by which we mean relay work—200 meter amateur inter-communication. The loop is not a success as a transmitter—it is a poor radiator. We have many letters from amateurs who have gotten the idea that a loop is a kind of Wonder of Wonders—that all they need is a few turns of annunciator wire hung up anywhere and they should hear everything coming and going. Nothing could be further from the truth. A loop is marvelous, for it is impossible to receive signals from a distance on a three-foot-long antenna while, with amplification, it can be done on a three-foot-loop. But we want to point out that **quantitatively** the results experienced with a loop will approach those of an aerial of orthodox construction only as the dimensions of the loop approach those of the latter. It is impossible to give accurate arithmetical comparisons but we should say, very roughly, that the energy received on an average small portable loop will be something like 10% of that received on an average flattop antenna designed for the same wavelengths. This necessitates amplifiers, which all of us can not afford, and which are rather to be avoided when decent signal strength can be otherwise obtained. We are speaking primarily of amateur work, remember; there is decidedly a place for the larger loops for copying long-distance long-wave C.W. stations, and in this issue we have a most excellent article on a large "back-yard cage" which can be easily constructed by the amateur for this purpose—a fixed loop aerial, mounted permanently in the line of the most trans-oceanic traffic. There is something also to be said in favor of loops on the subject of reducing static, and minimizing QRM by reason of their directional qualities, and the same applies to underground aerials, but honestly we do not believe that their day in relay work is at hand.

For our work the old time-tested flat-top antenna remains a favorite. With it we secure decent signal strength and the ability to receive from more than one direction without having to manipulate a steering wheel or keep six stages of amplification in working condition, and we'd rather do it and take our chances with

static and QRM for the present. For 200-meter amateur work we continue to advise a well-insulated multi-wire flattop antenna, high-tension transformer, oil-immersed condenser, and a decent rotary gap and oscillation transformer; for receiving, a short-wave regenerative tuner, the old-style audion detector, one or two stages of audio-frequency amplification using V.T's. of high exhaustion, and the best headset that can be afforded.

V. T. TRANSMITTERS

(Concluded from page 22)

set is of course therefore tuned to 150 meters also. When A finishes, B answers and his transmission is therefore on 150 meters, and A is already tuned to that wavelength and so receives him without adjustment. In the circuit shown, the series variable is the only adjustable element, and initial tuning by station B is the only manipulation required to establish intercommunication. We believe that the ideal C.W. set of the future will incorporate some such feature as this.

HERE AND THERE

(Continued from page 21)

wave-length, antenna resistance, distributed capacity, etc. Others furnish the circuit and wiring diagrams of various standard sets, including war-time radiophones, and the publishers expect to expand the series to embrace the hook-ups of every make of standard commercial apparatus. Convenient and cheap, we believe they supply much information the amateur will value.

On board a certain battleship. The set is tuned for Rome, IDO. Senior Operator to assistant, who is making his first trip: "Well, how you making it, Buddy?" The J. O: "I can't seem to pick him up. All I hear some bird saying 'I do, I do, I do.'"

The amateur test messages from NAJ, as announced in the last QST, were started Monday July 20th, and are following the schedule we announced. It will interest our readers to know that our Vice-President, Mr. Mathews, being still in uniform as District Radio Inspector, sent the first message himself. NAJ is copied here in Hartford, so no difficulty should be had in the 9th, 10th, and 11th Districts in receiving these tests.

We have been endeavoring to induce our Naval friends on the Atlantic Coast to start similar tests, but this is a very busy territory and the chances of QRM may be too great. It is possible that they may be sent on a fairly low CW, which would minimize QRM dangers and provide even The Old Man with something really interesting for which to listen in on the undamped. Further announcements will appear in QST.

We are promised that soon the amateur world will have a bulb transmitter complete, designed primarily as a radiophone but also an efficient CW telegraph, and at a reason-

(Continued on page 30)

The New "B" Batteries

THE war-time development of the audion into a true vacuum tube made possible satisfactory working with a non-adjustable B battery, an operating condition never before practicable, and we believe that information on the characteristics and care of the specially-designed B battery which was supplied the Army and Navy will be of interest to our operators, especially as these same batteries can now be obtained by amateurs thru the supply dealers.

The new VTs are designed to operate on a plate voltage of 22.5 when functioning as a detector, or 45 volts as an amplifier, and no regulation thru the voltage-depreciation range of the B battery is needed. The batteries, therefore, are made up of an assembly of fifteen individual dry cells, each having a voltage of 1.5 volts, and sealed into a unit, with positive and negative terminals marked. Where higher potentials are required, two or more batteries are used in the circuit. For operation of the old audions or other tubes with appreciable residual gas, where critical adjustment of the plate potential is necessary, two of these units and the conventional potentiometer provide a most convenient solution of the problem; or if the operator prefers a B battery tapped by a switch, one of these units is his best bet for the first tap, as they are cheaper and longer-lived than flashlight cells, correctly insul-

ated, and the annoyance of soldering up is obviated.

We are indebted to the Burgess Battery Co. for the following data on their B battery, which is being advertised in QST. Table I shows the physical characteristics of the three standard sizes. Similar to the manner in which the ampere-hour capacity of storage batteries is determined on the 8-hour basis, the capacity of B batteries can conveniently be judged by the number of hours required by the battery on a discharge test to drop to a certain predetermined voltage; and the standard adopted by the manufacturers of dry-cells is the length of time required by a 22.5 volt battery to drop to 17 volts when discharging thru a 5000-ohm resistance. The impedance of a receiving tube, however, is in the neighborhood of 40,000 or 50,000 ohms, and the hours of service will therefore be much greater than on the adopted capacity test—in fact, practice has shown that a battery will last ten to twelve times as many hours on a tube as it will on the 5,000-ohm test.

Table II shows the hours of service on this test, for batteries at various ages, and shows a life far above the experience of the average amateur with flash-light cells. There is no way of measuring the capacity of a battery without discharging it, and we must be content with making voltage and amperage tests of the batteries to determine their condition. Unfortunately there is no direct relation between the short-circuit amperes and the actual capacity, but if the amperage is very much lower than the average for other batteries, it is safe to say that the battery has been used or has depreciated. The voltage decreases with age but at no such rate as does the available short-circuit amperage. Table III shows the voltage and amperage of the batteries at different ages.

After use, if a battery is allowed to rest, it will recuperate; that is, its voltage will increase and on further use the battery will be found to have additional capacity. If a battery being constantly employed is found to be nearing the end of its life, economy of operation can be obtained by using it intermittently and substituting a fresh battery while it is recuperating.

Practical operating hints: Protect your battery from extremes of heat or cold; these impair the capacity. They should not be set on edge or inverted; the manufacturers tell us they will give better results when in the normal position. As moisture inside or on top of a battery will make them noisy, they must be kept in a dry place. They should be handled carefully so as not to crack the seals, as such abuse has a tendency to make them noisy, if nothing more. As the wax seal will flow even at room temperature, it will sometimes expand from pressure on the inside of the battery. This will not reduce the capacity, however, and it is inadvisable to try to remelt or force the seal back into shape.

We believe the new B batteries will get an enthusiastic reception, as they are a great improvement both in electrical efficiency and in economy over the old methods.

TABLE I.

Mfrs. No.	Govt. No.	Dimensions	Weight
2156	Navy 3535	6⅝ x4 x3	5 lbs.
5156		4⅛ x2 $\frac{5}{16}$ x2 $\frac{11}{16}$	1 lb., 9 oz.
4156	S. C. BA-2	3⅜ x2 x2½	1 lb.

TABLE II.

Hours continuous service to 17 volts on 5000 ohms

Mfrs. No.	New	4 mos.	8 mos.
2156	750	700	650
5156	190	170	155
4156	75	65	45

TABLE III.

	Open Circuit Voltages			Short Circuit Amperes		
Mfrs. No.	New	4 mos.	8 mos.	New	4 mos.	8 mos.
2156	22.5	21.9	21.6	5.0	3.75	3.25
5156	22.5	21.8	21.4	4.0	3.40	2.60
4156	22.5	21.8	21.4	3.5	3.00	2.10

Radio Communications by the Amateurs

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

THE A.R.R.L. SPIRIT

Mr. Porter T. Bennett, of Mesquite, Tex., writes QST as follows: "Just a few lines to tell my appreciation of our little QST. It is the one magazine whose coming I look forward to each month.

I read the July issue over, ads and all, then I read it thru again. The fellow that can't say to his set after reading one issue of QST: "Old Set, you're not up to the Okeh and I'll have to give you another raking over"—that fellow, I say, is thick in the head.

I would like to see you start publishing again the "Who is Who" and station photographs. And best of all the letters of the amateurs. Those letters put into QST that spirit of brotherly love that helps to make it what it is. They form a kind of pow-wow where we may come together and smoke the pipe of peace while chewing the fat (or shall I say QRM?) of the interesting topics of the day. In so doing we are welding friendships that no one can sever.

In closing allow me to compliment you on your work and the opening issues. Just shoot the juice to her and she'll get as proud as a little boy with a "kerflunkus" detector.

ENCOURAGEMENT

Dear Eddy:

Two years ago I eagerly devoured every printed line in the first issue of QST I had ever seen. As I read it, I began to see that there was something bigger in amateur radio than I had realized before —I saw that I had been missing something big. I immediately subscribed to QST and became the ardent follower of the Old Man and Dr. Radio, and also the true but unknown friend of every fellow connected with QST.

When the United States declared war and QST called all the amateurs to the aid of Uncle Sam's needy radio service, I joined the Naval Reserve, and after completing the course at the Naval Radio School, Harvard University, was stationed at Belmar, N. J., which was at that time the headquarters of Trans-Atlantic Radio Service. Here I became shipmates with real amateurs; fellows who had done big work in the A.R.R.L. before the war and were behind QST and symbolic of the true amateur spirit. Among them was Bill Woods, old 9HS, whose articles in the July and August 1917 issues of QST were the direct cause of my joining the N.R.F.

Now I am out of the service, and I feel myself a "real" amateur at last. All these fellows I have met are my own personal friends now, and altho they are scattered all over the country, we are bound strongly together by our common tie—QST. Every issue of QST is like a letter from all of them. Surely there must be lots of other fellows who feel the same way; and how can QST fail to grow and prosper when its supporters have such a spirit of unity? All this is just to let you know that you have at least one true supporter and booster way out west here.

I was stationed in Dr. Austin's Laboratory at the Bureau of Standards, Washington, for several months, and while there I learned to appreciate scientific radio experimenting. Now more that ever I can realize what a valuable magazine QST is to the amateur.

Wishing you all possible good luck in getting QST safely on its feet again,

I am, sincerely,

Harry H. Wickersham

Portland, Ore. Ex-CE(Ro), U.S.N.R.F.

OUR CANADIAN COUSINS

Your Editor recently requested Mr. E.T. Scholey, of Toronto, a prominent Canadian amateur, to give QST a sketch of amateur conditions in that country, and he has very kindly written us as follows:

"The average Canadian amateur, unless he has been in the government or Marconi services during the war, is apt to be more out of practice than his American confrere. In the early days of August, 1914, when "hams" on both sides of the line were copying Sayville for dear life and listening with intense interest to every whisper from the Atlantic, the order was given that all amateur stations in Canada were to be dismantled forthwith. In most cases the police went farther and carried off what they considered the essential parts of the set. The great thing was to induce the cops to make some slight mistakes in this particular, as we never expected to see again what disappeared in the direction of the police station. To give them an old loading coil was one stunt that worked occasionally. I suppose things were much the same when the time came for amateurs to be shut down in the U. S.

Nearly five years later, on May 1st, 1919, the ban was lifted and all over the country aerials went up again. The pre-war amateurs back from over-seas listen joyfully to the old familiar signals while the newly inspired "bug" painfully taps out the code to his friend across the street. (My how we love some of those fellows!)

Perhaps a brief resume of the Government regulations in Canada would not be out of place. They are rather hard for people living around the Great Lakes, for an amateur station within five miles of a government or commercial station or a route of navigation is restricted to a wavelength of 50 meters for transmission. Up to 25 miles distance the wavelength is 100 meters; seventy-five miles, 150 meters. The power input at the transformer terminals is limited to ½ K.W.

Before the war, licensed amateur stations were allotted three letter call signals beginning with X but now they begin with figures as in the U. S. Call signals beginning with "1" are alloted to the Maritime Provinces, "2" to Quebec, "3" to Ontario, and so on. It is unlikely that there will be much confusion thru duplication of American and Canadian calls; still on clear nights next winter when sigs are rolling in strongly it may be just as well to remember the point before being too certain as to the location of the distant transmitter."

DUTCH AMATEURS

Mr. G. Roes, of Dordrecht, Holland, who has long been a reader of QST, writes the Editor this letter, which is of interest to us all:

"I received your letter May 15th and am very much pleased to hear that QST soon will appear again. For renewal of my subscription I am sending you a postal money order and hope that your excellent magazine will reach me every month.

I am sure that you are interested to learn that amateur wireless is growing rapidly in Holland. In 1916 the "Nederlandsche Vereeniging voor Radiotelegrafie" (Dutch Association for Radiotelegraphy) was founded, which has at the present time more than one thousand members.

About a month ago one of the leading members suggested, at the occasion of the annual meeting, that our association should enter into connection with American and English Wireless Associations. Perhaps American amateurs are interested in the doings of their Dutch colleagues; so if you think it useful, please communicate for this purpose with Mr. Y. Carver, van Aerssenstraat 162, The Hague, who is First Secretary of our association.

Amateur wireless has made rapid progress in Holland: until November, 1917, it was prohibited, owing to the war; in May 1918 the first Dutch-made vacuum valves were put on the market, and a few months afterwards many amateurs picked up several American stations (NWW, NDD, NSS, and NFF), not only on aerials but also when using directive "wire-squares" suspended inside a room. If you want further data about Dutch amateur business I will be very much pleased to hear from you.

Hoping that American and Dutch wireless amateurs become linked within a short time, I remain, Dear Sir," etc.

An Audion Warning

By Karl E. Hassel

INTRODUCTORY NOTE

The Editor presents this article in an attempt to correct a misimpression which has evidently arisen in the minds of many amateurs concerning the high-vacuum V.T's. developed for the government during the war. These tubes have great merit for special work, their ruggedness and general fool-proofness making them satisfactory for airplane work and their stability over varying voltages makes them a fairly satisfactory piece of apparatus in the hands of the most unskilled operator. They are excellent amplifiers, and very good oscillators—"too good" in fact, as with a regenerative set they are quite prone to kick over the traces and start oscillating whenever the critical adjustment is neared, which Mr. Hassel points out is due to internal feedback on account of the large size of the elements. As detectors, however, their advantages are only as above mentioned, and it is a sad fact that they are woefully insensitive in detection as compared with our amateur tubes. At Bar Harbor recently when the NC-4 was copied at 2000 miles, an amateur tubular audion of pre-war days was used; the planes couldn't be heard on the VT-1 at all. And as detectors, some of the other government tubes make very nice little lights for Christmas Trees! We believe there is no reason for yearning for war-time tubes for detectors as long as we have the present good amateur tubes now on the market.

Because of the developments made in vacuum tube construction during the war, the great majority of vacuum tube articles now being presented in various technical publications are, unintentionally, perhaps, leading the average experimenter to the conclusion that the new 'VT' tubes, developed solely for Army and Navy work, are best for all purposes and far superior to the old style of tubes available before the war. The writer would not like to see the amateur discard the old style tubes altogether, since they have distinct advantages for some classes of work.

A great many amateurs when comparing vacuum tubes as detectors, will say that the one which brings the signals in loudest is the best detector. This does not always hold true, however. The vacuum tube which makes the best detector for 200 meter reception is the one which will respond to the weakest signal. For example, if tube 'A' brings in a given station 50 miles away with an audibility of 100, and tube 'B' brings in the same station with an audibility of only 50, it does not follow that tube 'A' is the better detector, for it may happen that tube 'B' will bring in another station 1500 miles away with an audibility of 5, while tube 'A' will fail to respond to this station at all. It is apparent then that tube 'B' is the better detector for amateur reception, since in this work the interest lies in the covering of the greatest possible distances.

The reason for the behavior of tube 'B' is that it was designed for delicate response to weak signals instead of for the production of maximum intensity in the head phones. Once a signal affects a detector it can be amplified to the required intensity, but if the detector is not effected by the signal the addition of amplifiers will be of no avail.

Now the question arises, "What is the best design for a vacuum tube so that it will respond to the weakest possible signal?" First of all, let us consider what happens when a signal is received. According to the best authorities on the subject an incoming signal impresses a charge on the grid, which charge causes a change in the current in the plate circuit. Therefore our tube should be so designed that the least possible charge on the grid will give maximum percentage of variation in the current in the plate circuit.

Now let us consider the following. We have two streams of water flowing with the same velocity but of different volumes, and it is desired to partially retard the flow and to obtain the greatest percentage of variation of the flow using a given force, when that force is small. It is easy to see that the stream of least volume will be the one easier retarded and will undergo the greatest percentage of change upon the application of this small force.

Similarly with vacuum tubes, the one with

a small value of plate current, which means a small stream of electrons between the filament and plate, will be the one affected most by the least charge on the grid, hence the most sensitive to weak signals.

The next point to consider is, "How can we reduce the stream of electrons in the tube?" Someone may suggest that we burn the filament at a lower brilliancy or reduce the plate voltage. Either of these actions will reduce the electron flow, but it will at the same time change the point on the characteristic grid-potential plate-current curve at which the tube operates. There is a certain value of filament current and plate voltage at which adjustment a tube will be in its most sensitive condition and any change in these adjustments will lower the sensitiveness of the tube. It therefore appears that we must reduce the electron stream by changing the design of our tube. The easiest and best way to do this is to reduce the size of the elements. Just how small we can make the elements and still have the tube function properly is a question to be answered only after experiments along this line.

The reduction in the size of the elements of the tube has another advantage, namely, the coupling between the grid and plate inside the bulb is reduced. While the advantage of this reduction in coupling may not at once be apparent, anyone who is experienced in the use of a receiving set employing a tuned plate circuit for 200 meter reception should be aware of the fact that the less the coupling between the grid and plate circuits, the greater the amplification obtainable, because we can tune the plate circuit nearer to the frequency of the grid circuit before the tube reaches an oscillating condition. If we can keep the coupling between the grid and plate circuits small enough so that we can tune the plate circuit to exactly the same frequency as the grid circuit before the tube reaches an oscillating state we will get maximum amplification of the received signal, without altering its natural tone. The reason for this is that when the plate circuit is tuned to the frequency of the grid circuit, which should be the same as that of the incoming signal, it will have zero reactance to the radio frequency current set up in it by the incoming signal. While some amateurs obtained good results using a hookup which depended upon coupling between the grid and plate circuits to bring the tube up to the oscillating point, this is not the best circuit for 200 meter reception of spark signals.

The next point to consider in designing a tube is the proper degree of vacuum to employ. Experiments along this line seem to indicate that a fairly low vacuum gives the most sensitive tube, and the voltage adjustments become more critical as the vacuum is lowered. The latter result would indicate that the bend in the characteristic grid-potential plate-current curve of the tube becomes sharper as the vacuum is lowered. We dare not have our tube too critical or we will have to spend too much time adjusting it.

Unfortunately, very few amateurs have the facilities for experimenting with the design of vacuum tubes and must use those obtainable on the market.

The various vacuum tubes developed during the war were designed with several ideas in mind, some of which were as follows. First, the production of good results when in the hands of inexperienced operators and under war conditions, which meant the working over a wide range of filament current and plate voltage variation; second, steady and free oscillation, and third, powerful application. To obtain these characteristics it was found necessary to use a tube of high vacuum and large plate surface. How well these tubes fulfilled their purpose is well known by the thousands of operators who used them while in the service. While satisfactory for service use, it is sad but true that none of these tubes are sensitive detectors for weak spark signals on 200 meters. It therefore appears that we amateurs who are determined to work super-long distance should use one of the old style low vacuum tubes as a detector and one or more of the new tubes as amplifiers.

The writer has had the opportunity to test some special tubes with very small elements and fairly low vacuum and found them extremely sensitive to weak signals not audible with other tubes.

HERE AND THERE

(Continued from page 24)

able price. It sounds almost too good but we believe it can be done. This set is being developed by a prominent commercial company and should be announced soon.

By the way, do you know that these Class II Marconi V. T's. can be used very satisfactorily as transmitters? We recently saw a laboratory set-up with 400 volts on the plate of one of these tubes, putting 18 watts in the antenna. True it was a large antenna, and tuned to 1100 meters, but that is surely stepping! We didn't know it could be done.

We are glad to see that the Marconi company is classifying its new amateur tubes. Class I, selected detectors, is now obtainable. All this means is that these tubes. have a somewhat lesser vacuum. There is no gainsaying the fact that a certain amount of residual gas is desirable in a detector, even tho it makes necessary the adjustment of A and B batteries. The Class II tubes, the only grade formerly offered, are good amplifiers and power oscillators, being highly exhausted, but in common with the VT-1 they are miserably insensitive detectors. The Class I tubes seem to be very good.

Mighty good chances in the commercial game right now. A good operator can get $125 and up a month, and found, and all the schools are enjoying a huge business.

We have many requests for the transmitting schedules of European stations. Below is the regular schedule on which these stations now transmit to Otter Cliffs; 60th Meridian Summer Time:

Lyons, YN, 15,500 meters; continuous service

Nantes, UA, 10,200 meters; 11:15 a.m. and 5 p.m.

Rome, IDO, 11,000 meters; 8:00 a.m. 11:00 a.m., and 7:00 p.m. to 7:00 a.m.

Carnarvon, MUU, 14,200 meters; 10:30 a.m., 12:30 p.m., and 10:30 p.m.

Nauen, POZ, 12,600 meters; 8:00 a.m. till clear, generally 6 p.m.

Eiffel Tower, FL, 8,000 meters; 5:00 p.m.

MR. GAWLER BACK.

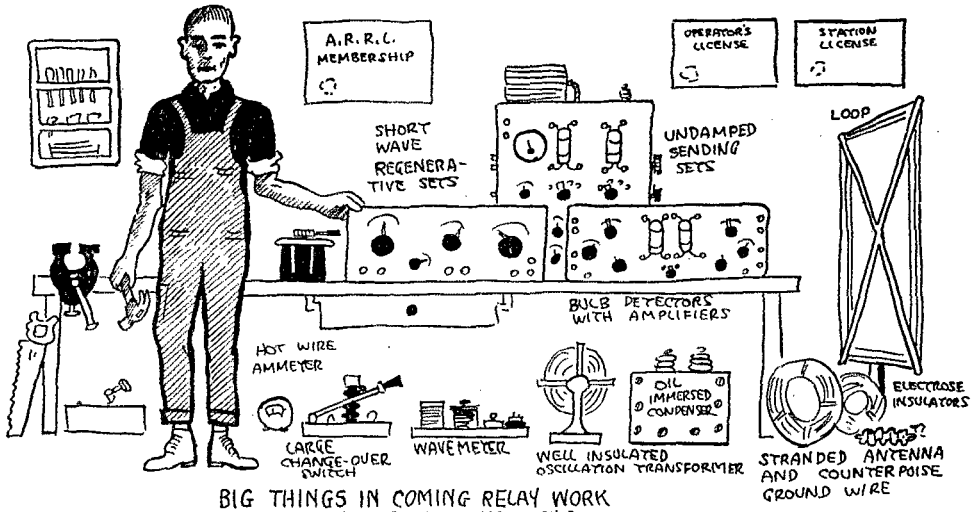
"It looks like old times again to see Lt. Gawler and Mr. Butterworth back on the job at the Custom House.

"One of the first men to go from this district in 1917 was the Radio Inspector, who was commissioned in the Navy as a Lieutenant, assigned to the local Navy Yard as assistant to the D. C. S., and shortly afterward transferred to the Azores as Radio Communication Officer, where he remained until a few weeks ago.

"That Mr. Gawler enjoys a wide circle of friends in this district is well evident from the enquiries put to the writer on a recent tour of the New England states. Everywhere they were interested as to his future plans. The amateurs of New England can well congratulate themselves on the return of their former inspector to the throne.

"As President of the New England Amateur Wireless Association, I take this opportunity to extend to Lt. Gawler on behalf of the members a hearty welcome home".

Guy R. Entwistle, Boston, Mass.



Several divisions of the Operating Department have adopted the military form of correspondence for their communication. A very commendable idea; it has proved its efficiency.

Something new under the sun! A brand-new branch of amateur radio industry: The North American Aerial Spar Mfg. Co., of Dubuque, Iowa, who furnish complete amateur antennae down to the last galvanized fitting, all ready to hoist. They contemplate soon marketing a line of amateur masts. We wish to goodness somebody would!

News item: "Communication with the dead by wireless possible—experiment with a transformer process being worked out to solve mysteries." Somebody page the Chief Squirrel—quick! P.S.: JO says maybe they are referring to the people in the Office of the Director of Naval Noncommunications; they evidently don't know the war is over.

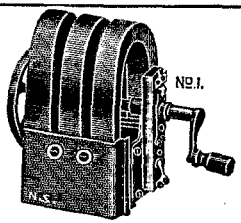
The Secretary can furnish standard A.R.R.L. message blanks, two pads for fifteen cents, postpaid.

The stork visited the home of District Supt. H. E. Nichols at Bridgeport, Conn. recently. Mr. Nichols was expecting a Junior Operator but says he guesses he will have to train this one along the lines of our friend 8NH.

NEVER BEFORE — NEVER AGAIN! AT THESE LOW PRICES

USED TELEPHONE EQUIPMENT

In perfect condition. Taken from active service of metropolitan telephone system. Adaptable to scores of experimental uses. To the best of our knowledge similar equipment has never been offered at anywhere near the low prices which we announce below.

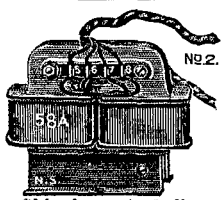


BARGAIN NO. 1

Three Bar A. C. Generator. Can be used to generate A. C. current, ring bells, give shocks, operate magnets, small induction coils, etc.

Cost $7.00 new
Our Price..... **$1.90**

Shipping wt. 9 lbs.

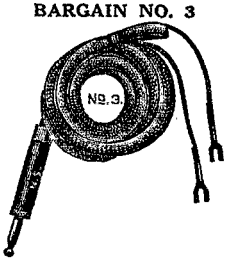


Shipping wt. 3 lbs.

BARGAIN NO. 2

Telephone Transformer, closed silicon steel core. High resistance windings. May be rewound to make powerful toy transformer or 125 watt high tension wireless transformer. May be adapted to audiron circuit amplification, etc.
Worth $5.00 new
Our Price..... **$1.65**

BARGAIN NO. 3



Telephone Jack & Cord, including a receptacle socket (not illustrated), which may be mounted in cabinet, panel or switch board. The best method of switching in head phones for radio work, etc. Double contact.

Worth $1.75 new.
Our Price..... **$0.90**

Shipping wt. 1 lb.

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YOU'LL GET A LOT OUT OF THESE GREAT BARGAINS

The Newman-Stern Co., has collected by exceptional purchase, a large number of these used telephone parts which are now placed at the disposal of experimenters at amazingly low prices.

There is hardly any need to explain what these parts may be used for in the amateur laboratory. Countless fascinating experiments may be made with them. They come in handy in a great variety of ways, particularly in the home construction of wireless, telegraph, telephone and other apparatus. NONE of the goods offered is junk. SEND in your order today.

No order for less than 50c. accepted

BARGAIN NO. 6

Telephone Transmitter, standard design. Perfect condition. May be used for telephoning, microphone work, radio amplifier, wireless telephone, etc. Present Market Price $2.25.
Our Price **$0.95**

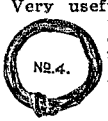
BARGAIN NO. 9

Standard Relay Magnet, used in telephone relays, drops, etc. Makes splendid electro magnet. Experimenters can make fine relays, magnetic keys and other interesting things. Worth 50c. each. Our Price

3 for $0.35

BARGAIN NO. 4

Twin Conductor Telephone Wire, size 20. Very useful for wiring up radio sets, doorbells, motors, batteries, etc. Extra heavy braided cotton cover, twisted twin (double) wire. Worth 8c. per foot. Our Price per coil of 50 feet **$0.75**



Shipping wt. 2 lbs.

BARGAIN NO. 7

Telephone Condensers. Perfect condition. May be used in too many ways to attempt listing. As a suggestion: for making kick-back preventers (use 2); for spark coil interrupters; also phantom circuits, radio work, telephone work, etc. We offer 2 sizes—1 Microfarad or 2 Microfarad. State size wanted. Worth $1.00. Our Price.. **$0.75**

Shipping wt. 1 lb.

BARGAIN NO. 8

Telephone Induction Coil An excellent shocking coil may readily be made with one. Also useful for general experimental work, telephone work, etc.

Worth $1.00.
Our Price
$0.40

Shipping wt. 1 lb.

NEW CHEMISTRY DEPT. Send for booklet describing the money-saving, value-giving "Newman-Stern System for the distribution of laboratory chemicals and Apparatus.

BARGAIN NO. 11

Midget Induction Coil. This tiny induction coil is perfect in every respect. It is only 1¾ in. long by ⅝ in. in diameter and weighs only 4 ozs. See Bargain No. 8 for a few suggested uses. Worth 65c.; Our Price.. **$0.30**

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BARGAIN NO. 5

Telephone Receiver, standard design, double pole, may be used or telephone work, short distance wireless, microphone experiments, etc. Price includes 8 foot cord (new). Worth $2.30. Our Price **$0.70**

Shipping wt. 2 lbs.

BARGAIN No. 10

Giant Coil. A large coil wound with silk wire, making a powerful magnet. Excellent or distant controls, magnetic experiments, etc. Worth $1.00. Our Price **$0.35**

Shipp'g wt. 3 lbs.

BARGAIN NO. 12 Postage 4c.

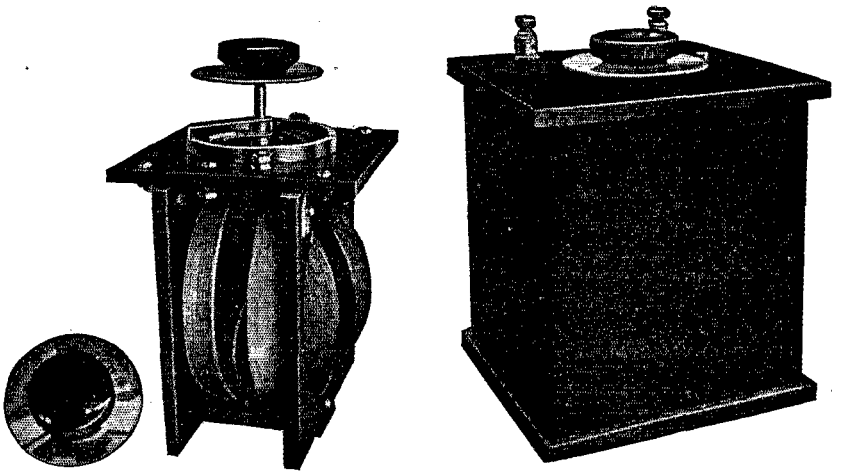
Magnetic Compass. A reliable compass for polarity work, galvanometers, field exploration, direction finding magnetic experiments. Nickeled brass case. Worth 25c. Our Price.. **$0.15**

Our new and complete catalogue of Wireless will be ready for distribution soon. Price change schedule C-3 applying to catalogue C-3 mailed on request.

The Newman-Stern Co

1874 EAST 6TH ST. CLEVELAND, OHIO

A New Variometer for the Amateur



Type S.S. Variometer, in three sizes: maximum inductances, 1 millihenry, 5 millihenries, 20 millihenries. Mounted $20.00; unmounted $16.00.

Variometers provide an inductance as easily and gradually variable as a rotary condenser. They are the ideal inductance; efficient, no poor contacts, dead-end losses or capacity losses from multiple taps.

Clapp-Eastham Variometers are designed to give the amateur a Precision Instrument at a low price. Compact in size and beautiful in workmanship. Especially designed to minimize distributed capacity. Readily adaptable to panel mounting. Equipped with a special drum switch automatically actuated by the control knob, whereby the coils are in parallel the first half revolution providing an inductance continuously variable thru 360 degrees, giving double the range of adjustment available wth other variometers.

Fully described, with other New Developments, in our interesting Bulletin Y.

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Send for descriptive bulletin describing the AudioTron and our new Bakelite Panel for ARC & Spark reception, new smooth running rheostats, knobs, levers, contacts, etc.

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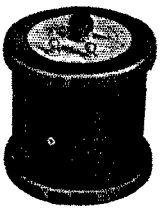

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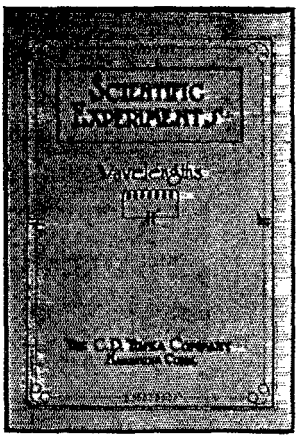

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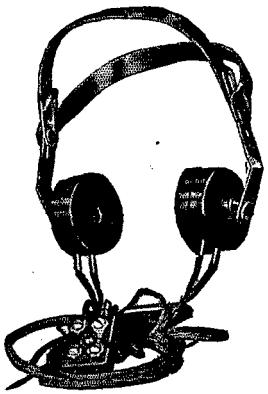

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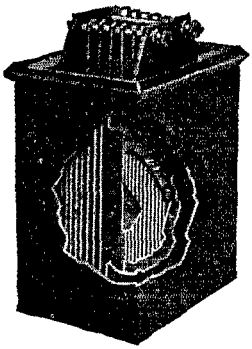

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August QST published details of our 1500 Mile Transmitting Contest. While we are waiting for the ban to be removed, let us introduce something absolutely new in our

TYPE "TC" TRANSMITTING CONDENSER

The dielectric is phenol fibre. In actual tests this insulation withstood a potential of 48,000 volts before breaking down. This permits an overload of nearly 100 per cent. when using our Type "R" 1 K. V. A. 25,000 volts wireless transformer. The edges of the sheet brass are rolled and the corners rounded, thereby preventing a loss of energy by corona or brush discharge.

Between each two sheets of brass on each terminal of the condenser is inserted a third sheet which is corrugated. This arrangement permits the oil to penetrate and circulate, and at the same time prevents heating.

There is practically no loss of energy due to heating, corona, or brush discharge, and therefore the maximum of efficiency is attained.

The outstanding feature of this condenser is the arrangement of the 10 terminals. The capacity can be increased from a minimum of .0018 M. F. to a maximum of .009 M. F. in single steps of .0009 each. This permits very fine adjustment in the closed primary circuit, and the number of turns on the primary of the oscillation transformer can be increased or decreased by merely decreasing or increasing the capacity of the condenser.

After assembling, the condenser is immersed in a container of oil, as it is a well known fact that the greater number of long distance amateurs use an oil immersed condenser.

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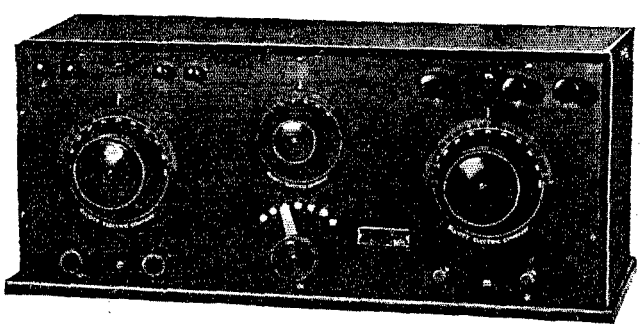

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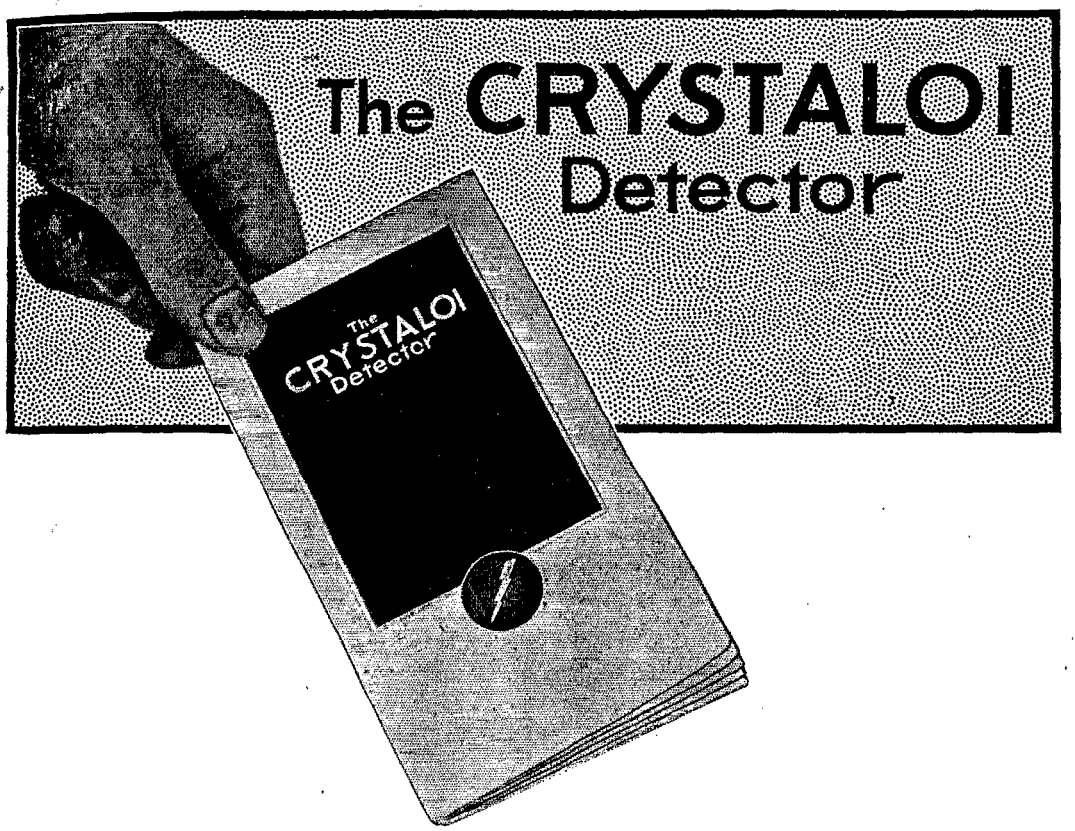

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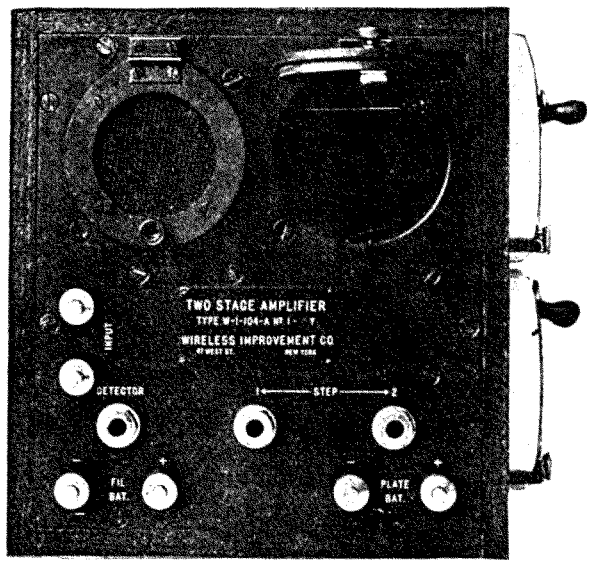

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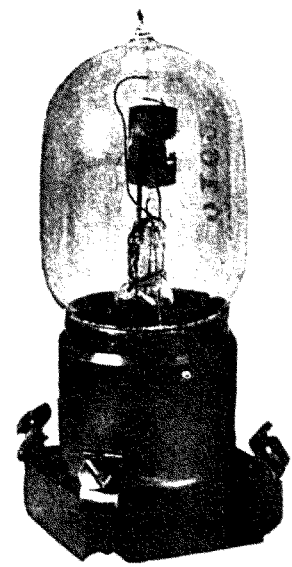

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