

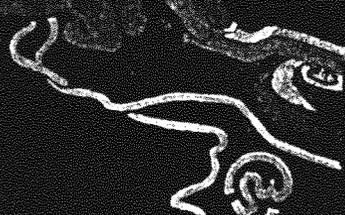
QST

A MAGAZINE DEVOTED EXCLUSIVELY TO THE WIRELESS AMATEUR



MAY 1920

PRICE 20¢



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THE OFFICIAL ORGAN OF THE A.R.R.L.

QST

MAY, 1920

VOLUME III

No. 10

CONTENTS

An Experimental C.W. Transmitter	5
Reaching Out	8
Rotten Booze	The Old Man 9
The Vacuum Tube as a Detector and Amplifier	L. M. Clement 11
Summer Work with Regenerative Receivers	R. H. G. Mathews 15
Combination Crystal and V.T. Detectors without Switches	Elliott A. White 17
Buzzer Transmission	18
Whither Are We Whencing?	Chas. S. Wolfe 19
The Magnavox Radio Telemegaphone	20
A Reply from Mars	22
Editorials	23
The Operating Department	26
Who's Who in Amateur Wireless	34
QST's Directory of Calls	35
With the Affiliated Clubs	37
Amateur Radio Stations	39
"Strays"	43
Radio Communications by the Amateurs	45
Calls Heard	51

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THE AMERICAN RADIO RELAY LEAGUE, Inc.
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Q S T

A Magazine Devoted Exclusively
to the Radio Amateur

An Experimental C. W. Transmitter

How to make a small undamped transmitter using vacuum tubes, for C.W. or modulated telegraphy or telephony.

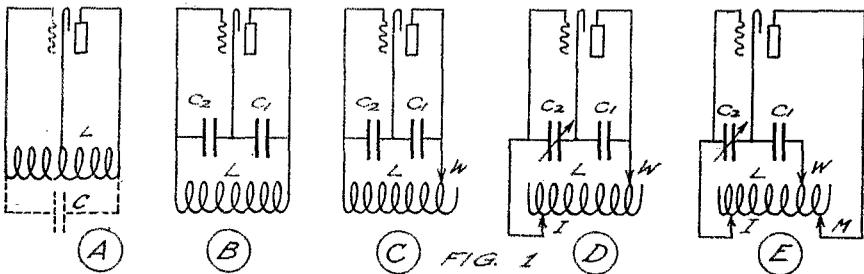
THE set described in this article employs what is known as the Colpitts circuit—an oscillator operating by capacitive feedback.

Before going into the description of the set itself it will be well to examine the theory of the circuit. It is a little complex, but beautiful in principle. The evolution of the circuit is shown in stages in Figure 1. (A) represents the more common form of oscillator where the feedback is by electromagnetic coupling between the plate and grid circuits. In this diagram note that in effect the filament lead (common to both circuits) is tapped off in such a way as to split the inductance into two parts, one in the grid circuit and the other in the plate circuit, and with the entire inductance and its distributed capacity governing the wave length. This

pressed upon condenser C_1 , which throws the circuit C_1C_2L into oscillation. When this state exists, changes in potential are occurring across condenser C_2 , and as the grid-filament connections are taken across this condenser, the potential changes are impressed upon the grid in such a manner as to sustain the oscillations thru the characteristics of the tube.

If it is desired to change the wave length, either L , C_1 , or C_2 may be varied, but the common way is to provide taps on the inductance as shown at W in (C). This is self-explanatory.

In all power oscillators it is very desirable to be able to control the amplitude of feedback. Bearing in mind that it is the potentials across C_1 which cause the feedback, it will be seen that if C_2 is varied, this will be accomplished, as the smaller



should be contrasted with (B), an elementary capacitive oscillator. Note that in (B) the capacity is split into two sections, with the filament lead connecting between. As before, the inductance and the capacities determine the period, but instead of electromagnetic feedback we have the following action: When a change of plate current occurs, a charge is im-

pressed upon the capacitor C_2 , which causes a potential drop across it, and vice versa. This is shown in (D). Varying C_2 will also vary the wave length, however, and it is often convenient to vary the feedback in another possible manner, which may in fact be combined with varying the capacity, and this is indicated at the other tap on the inductance at I in (D), the input tap.

The theory of this briefly is that inductive reactance opposes series capacitive reactance, or in other words

$$E=I(X_c-X_l)$$

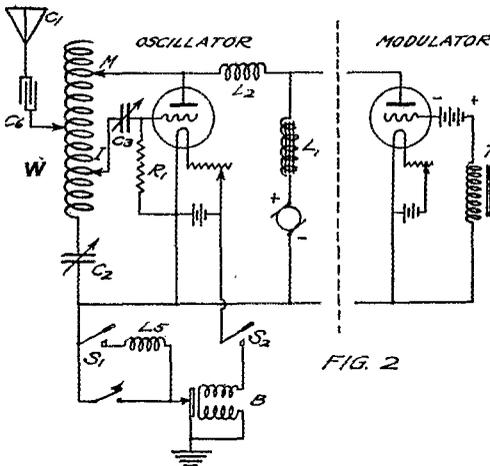
From this it will be seen that the introduction in the grid circuit of series inductance, by the variable contact I, will decrease the feedback due to a too-small capacity; or, operating with a fixed capacity of proper value, will provide a means for securing the proper value. It is desirable that both adjustments be available.

One more adjustment is necessary—the coupling between the plate-filament circuit and the oscillating circuit as such. In (B), (C), and (D), the maximum possible coupling is indicated, as plate changes impress the maximum charge on condenser C_1 . To vary this, C_1 might be adjustable, but as will be seen later this is not practicable, and so the same scheme of inserting inductance in series with C_1 is adopted as in the case of the grid circuit, and M in (E) indicates the coupling tap. Note that the coupling is NOT electromagnetic, but that on the contrary the more turns between M and W the less the coupling, for this decreases the potentials across C_1 and so lessens the vigor of the resultant oscillations in LC_1C_2 .

In practice it will be found that all these adjustments reflect upon one another and minor corrections will have to be made all around when any factor is changed. The most important is the input or feedback, for if too low the tubes will not be

capacity the grid voltage swing is sufficient to bring it to the positive side of the zero line and thus a small grid current will be registered. This reading is a criterion of the condition of oscillation. If there is NO grid current it is proof that the grid reaction is not sufficient; yet for these tubes it must never exceed a very few mils, because such a reading represents a value of positive potential on the grid which will endanger the tube.

So much for the theory, and now to see its practical application. Figure 2 shows the oscillator, schematically. The main feature of note is that the capacity C_1 is formed by the aerial and ground. This is one of the beauties of this system—all the oscillating energy is introduced directly into the antenna system. Figure 2 employs the same lettering as Figure 1, and the circuit may thus be traced out and compared with the elementary one. Tap W varies the wave length. C_2 also varies the wave length but is mainly used, and in conjunction with tap I, for controlling the feedback. Tap M varies the coupling, and for best results its position will have to be changed whenever W is moved. C_1 is a paper condenser of around 1 mfd. capacity, serving to protect the generator from short-circuit should the aerial become grounded and to reduce the aerial potentials, but having practically no effect on the wave length. Note that the power supply is connected across the plate-filament circuit, in parallel. This is necessary instead of the series connections in a capacitive oscillator. The plate voltage supply may be anything available—step-up transformer and rectifier, dynamotor, batteries, or motor generator set. For the shunt connection it should have a choke L_2 in series with the oscillator plate lead, to prevent the radio-frequent oscillations from backing thru the generator. A filter, as described below in connection with Figure 3, is also very desirable, and in fact for telephone work will be found almost a necessity. C_3 is the grid condenser, necessary simply to insulate the grid from the high voltage, and R_1 its leak.

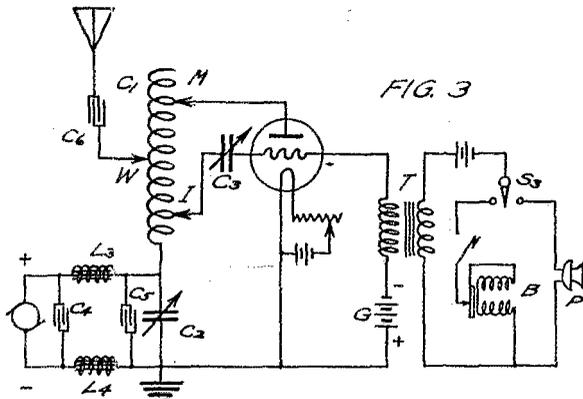


worked to capacity and the output will be small; and if too great there is danger of blowing out a tube, as well as loss in excessive grid current. A grid current milli-ammeter therefore will be found very convenient in adjusting. As an example, in such a set using VT-2's the grid normally operates at about 30 volts negative (mean), but when the tube is worked to

any amateur possessing small tubes which will withstand several hundred volts plate potential has the making of a small C.W. set which will be surprising in its results. In the last QST we told about the work some of these stations are doing with these sets. The Western Electric VT-2 and General Electric VT-14 and the Class II Marconi bulbs are all satisfactory for this work, the latter being the only one now regularly available on the market for

communication purposes. Our diagrams show a single tube, but several may be operated with grids and plates in parallel, and filaments in series or parallel depending on the lighting voltage available, the number depending on the range desired.

The dimensions of the main inductance



will vary with the antenna and likewise with the amount of power handled, but for an average amateur installation we would recommend a coil of about thirty turns of No. 18 stranded rubber-covered, or No. 16 D.C.C. magnet wire, or heavy Litz, etc., wound on a tube 4 inches in diameter, and tapped every two turns. It is suggested that instead of switches a better method for an experimental set would be to scrape about an inch and a half of wire bare at the tapping point and twist the bared portion into a little "tit" projecting out about a half-inch from the winding. The taps should be staggered around the coil so as not to touch, and then with the coil mounted vertically, quick connection to any tap can be made by means of flexible leads and clips.

Condenser C, is an ordinary 43-plate air condenser. A maximum of .0005 is sufficient for C₃, which may be fixed if the proper value is known but which for experimental work can more conveniently also be a variable. The value of the leak resistance R₁ will depend upon the tubes. For the VT-2, 10000 ohms is correct for one tube, 5000 for two tubes in parallel, 2500 for four tubes, etc., with a condenser of .0005 mfd. The value must be high enough to keep the grid sufficiently negative with respect to the filament, and will vary with the constants of different types of tubes. It may be determined by a little experimentation. Any non-inductive resistance, such as Ward-Leonard enameled units, may be used. L₂ consists of 500 turns of No. 22 magnet wire wound on a small wood spool 3/4 inch diameter.

The arrangement of the controlling key

is the only remaining feature. There are many places where the key may be placed, but for small sets it is entirely feasible to put it directly in the ground lead as shown. Note that this would give straight C.W. telegraphy, the current passing thru the stationary contacts of the buzzer, B, to

ground. By closing switch S₁, an inductance L₃ is shunted across the key so that compensated telegraphy is available; i.e., energy is radiated continuously and the key merely changes the wave length by short-circuiting L₃ when depressed. L₃ should be very small with a value sufficient to increase the compensating wave above the signalling wave by not over ten meters. It is very questionable, however, whether we will find compensated telegraphy at all desirable for our work. By closing switch S₂, the buzzer B is also actuated when the key is down, chopping up the emitted waves into trains and giving modulated telegraphy, which will

be audible on a non-oscillating set or crystal.

It is a very simple matter to add a little equipment to that already described and convert this set into a radio telephone. The additional apparatus is shown schematically at the right of the dotted vertical line in Figure 2. This gives us the well-known Heising modulating system, the theory of which is as follows: Another tube is connected with its plate in parallel with the oscillator, and a large inductance is inserted in the power supply, L₁. Due to its self-inductance this coil makes the power supply function as a constant current source, which is to say that a steady value of current is supplied to the two tubes and if one of them draws more or less than normal the other is supplied less or has more forced thru it, as the case may be. If then we can cause speech waves to vary the power consumed by the second tube, we will vary the output of the oscillating tube at a similar rate. The extra tube is known as the modulator, and as will be seen it is so connected that the voice fluctuations are impressed across its grid-filament circuit, thus varying the amount of power consumed by it at a similar frequency, and so absorbing or releasing energy to the oscillator tube. It does not oscillate—it is a voice-operated resistance combined with an amplifier. As an amplifier it should operate on the straight portion of its characteristic, and consequently a biasing potential on the grid is generally necessary, as shown at G. For the VT-2 this is 22 to 30 volts negative; for the Marconi II about 18 or 20 volts negative, for potentials of about

300 volts. T is a step-up speech transformer, and one of the Acme or General Radio make, with various values of impedance available, will be found very good for the purpose. The primary side is connected in series with a good microphone and a few cells of battery. In some cases the operation is improved by shunting a leak resistance across the transformer secondary, to act as a grid leak. The inductance L_1 should have a value of around $1\frac{1}{2}$ henries and be of wire of sufficient size that its d.c. resistance is not over 100 ohms, to avoid excessive potential drop and IR losses. The Heising system of modulation gives excellent speech, and is the method employed in the small Western Electric sets furnished the government during the war.

The oscillator in Figure 3 is the same as in Figure 2 except for the grid leak and the position of the power supply, which is here seen to be bridged across condenser C_2 . The connections may be traced out and it will be seen that the positive leads to the plate as heretofore, and the negative to the filament. The choice of connection is purely a matter of convenience.

Figure 3 also shows a filter for "ironing out" the commutator ripple and consists of an iron-core choke in each leg from the generator, with condensers shunted across the line on each side of the inductances. C_4 may be 2 mfd. and C_5 1 mfd.

The main feature of Figure 3 is the modulation by grid leak. The speech transformer and associated microphone circuit of Figure 2 may be bridged from grid to filament of the oscillator, in series with a resistance, and so vary its mean potential at an audio rate. This is the principle employed in the deForest sets. With some tubes, notably the VT-14, a biasing potential of about 20 volts, as shown at G in Figure 3, will be found preferable to the use of a leak resistance (which, if used, would be inserted at the same point). It is a simple matter to determine by experiment which method gives best speech on given bulbs. Modulation of the grid leak does not seem to give speech of quite the same quality as the Heising circuit, but by this system both tubes can be made to act as oscillators, in parallel, and thus the range will be considerably increased.

In experiments with this circuit it has been found that chopping for damped telegraphy can be done as successfully by modulating the grid voltage as by a chopper in the ground lead, and Figure 3 shows a switch S_1 whereby either a microphone for speech or a series key and

buzzer or motor-driven chopper B for telegraphy may be used in the grid modulator. With a key in the ground lead for C.W. telegraphy, the set will be a most versatile one. Perhaps a better place for the key would be in the grid leak circuit, shunted by a resistance just low enough to prevent entire stopping of the oscillations when the key is up.

This static feedback circuit was used in the Signal Corps SCR-67 and 68 and the Navy CW-925 and 938 sets, etc., in the deForest Oscillation sets, and is now in use in several successful amateur stations. It oscillates with remarkable steadiness, and on fairly low resistance aerials will give entirely satisfactory results when once its fairly complicated system of adjustments is mastered.

Reaching Out

9ZN has made a distance record that is the best we know of for an amateur station.

On March 9th, while lying in the harbor at Colon, Panama, the operator of the S.S. "Olockson" copied three messages which 9ZN was transmitting to 9ZL at Manitowoc, Wis., and has reported that 9ZN's signals were very QSA, wave 275 meters, no fading. This was at 12:20 a.m., Chicago time. 9ZN's log shows these three messages to have been transmitted to 9ZL on their 275-meter wave at the time given. This is nearly 2600 miles, which we claim is pretty fair for 275 meters. But that's not all. On the night of March 12th the same operator copied 9ZN 200 miles south of Balboa!

Additional interest is lent by the fact that the operator was an ex-Chicago amateur, Dutton, of pre-war 9ALM, formerly Assistant Central Division Manager. Dutton allows it was a rather exciting trip, as in the early morning of the 13th of March the "Olockson", which was carrying two million gallons of gasoline for Vladivostok, caught fire and was destroyed some 150 miles west of Balboa, all hands being saved. Dutton stuck to his post for five hours and a half while drums of gas were being hurled hundreds of feet into the air only a few feet away from him, and left his set on the run barely before the entire boat deck was blown to pieces before his eyes.

Can anyone beat this record? Ex-amateurs who are running commercial now can give us some valuable information on just how far our sparks are carrying, if they'll keep an ear out on 200 when they've nothing else to do. Some day some of us are going to be heard accidentally in the Indian Ocean that way.

Rotten Booze

By The Old Man

Our code of business ethics prevents us from making any comment on this matter. We leave it to the amateurs of the country to pass their own judgment, but everybody can enjoy the laughs that the Old Gent's indignation provides in this story.—Editor.

NOW we know who's to blame for all this punk radio weather. I haven't been able to get a single Second District station for a dog's age and after reading a certain article in a paper printed not a million miles from New York City, I began to understand the reason why. When the whole thing broke in on my alleged intellect I got so all-fired heated up that my bulbs went blue and the doggone lamps have stayed blue ever since. By the shade of the great Hertz, it's time we amateurs rose up and delivered a swift one properly addressed to the exact spot on the anatomy of the guilty party and jarred him into having a proper respect for a pure wave. In case anybody is in doubt as to what this trouble is all about let him take a slant at some of the radio amateur booze that has recently been passed up to us and note the interesting fact that we amateurs owe everything we possess and everything we expect to possess to one "Doctor Cook". And don't anybody suggest that if the old Wouff-Hong is not worn out we get her sharpened up and sent over to New York in the hands of the president of our local Radio Club—he of the strong right arm, the well-developed sense of where it hurts most, and the firm manner. He would not need to be instructed to operate promptly, as roughly as possible and without anaesthetics. He is a real A.R.R.L. man, is our president, and he knows the past, and he would see that the Wouff Hong got a fair shake.

How any one can expect to maintain the respect of the public and get messages through, when this kind of bull is being passed out passes understanding of the sort that works in this bean of mine. Two hundred meters just lays down in front of it, wriggles a few times and passes out. Only six hundred meters is able to squirm its way through such a smother. Of course we can't get our stuff into New England! How could you expect to, with the fumes arising from New York the way they do and rendering the air so thick that even an ether wave loses its way? If you were an ether wave how would you like to meet up with a thing like this? In speaking of the late fight in Washington

over the radio bill that would have put us amateurs out of business for all time, and which we organized amateurs defeated with our A.R.R.L. organization, anybody is left to believe that the amateurs themselves did nothing of any importance.

Now I ask you, how would you feel if you were an ether wave and bumped into that after being started out nice and strong from the Eighth District and well on your way to 2JU, and sailing under the colors of our A.R.R.L.? Wouldn't you fade? Do not 9ZN and 8ER understand now why traffic goes easily to the South and West but won't pass East? Can you blame it?

But, honest now, doesn't it give you a sharp, shooting pain to see a man slop over? Sort of makes you wince. You feel ashamed all through, especially when you know that he doesn't know enough to feel ashamed for himself. Just think of having the New York habit so bad as not to know any better than to claim that you did everything in the way of killing unfriendly legislation, organizing us amateurs, putting us on our feet and getting us opened up after the War. Oh Spit!

We never did anything—not a doggone thing. "Doctor Cook" did it all. We never got busy when the matter was discovered, that we were threatened with extinction; we never sent out the A.R.R.L. little Blue Card, addressed TO ANY MEMBER OF THE FAMILY OF Jack Soandso, asking him to write to his congressmen. No indeed! I was under the impression that I received one of these little cards and that I wrote our Senator and a dozen or so of our Representatives in Washington. But, no indeed, I never did anything of the kind. "Dr. Cook" did it all. And all you other old scouts of the pre-war A.R.R.L. never did a thing. No indeed. It wasn't A.R.R.L. at all who put the job across. It was the modest gent in New York, who has even made the radio weather-man quit and go home.

And those Congressmen in Washington. They must have been all doped also. They printed a big thick book of the hearings before their House Committee on Merchant Marine and Fisheries. I know, be-

cause our congressman sent me a copy. It stated that the American Radio Relay League was represented by its president and several members and their speeches were printed. Our president's was a corker. It was a peach of a plea all right and it's a pity it never was printed in QST so the amateurs could see for themselves what our leaders did in Washington. But no indeed! All bunk. All a pipe-dream of the United States House of Representatives. "Dr. Cook" did it all. He fixed it all for us amateurs beforehand. Oh, say, Boy, mustn't he have a grand and glorious feeling to pass one like that! And the gent doing the whole blame job from a swivel chair in an office in New York. Some swivel chair, eh what? Never went near the firing line once. Hollering his blame head off about how he won the war single-handed with his swivel chair, a typewriter and a few postage stamps. Oh beautiful slush!

Just take a look at the healthy side of the picture. A different kind of a man. You remember Tuska. He used to be Editor of QST. Some brave lad was Tuska. He had to guess that we amateurs were the same kind of true blue stuff that he was himself. He figured that if he acted square, told the exact truth, that the rest of us would back him up. If he succeeded it meant that the amateurs of the country would have their own organization and their own magazine. If he failed it meant that a nice little jack-pot had gone to kingdom come. But he believed in amateurs and so did Mr. Maxim. I remember they asked me what I thought. I was doubtful. Amateur radio wasn't much then. It seemed like a long chance. But they went ahead just the same. Put up their own money and we followed their lead and the thing was pulled through. It was a fine job, reflecting credit on everybody concerned. Today the A.R.R.L. is an organization with its own magazine, and we amateurs have our own leaders to thank for it. Do these gentlemen go around hollering their heads off about how they saved Amateur Radio, how they killed the Navy attempt to bottle us, how they got the lid lifted? Not so as you would notice it. They only do that sort of thing in New York I reckon. When you see a fellow bawling around trying to tell those who don't know better all the wonderful things he has done, and all free, including the button and the certificate and when it is written all over him in letters a foot high that it is all to make money for himself, it makes the insulation begin to smoke. Anyway it makes mine, probably because I had something to do with this amateur business myself, keeping you fellows to the straight and narrow by exposing all

the Rotten things that need fixing.

But the "Dr. Cook" person will get his. It always works out that way. George Washington was right. It pays, even in New York. When it is understood that a man is overworking himself trying to get away with every thing in sight, whether nailed down or not, people gradually get on to him. The Germans proved all this. They wanted it all, whether it belonged to them or not. What did they get? The swift one mentioned earlier in this yarn, and the loss of most of what they had when they started. Some kickback, what? That's what is coming to our friend, if history repeats itself, as it has a deadly way of doing. I tell you, boys, it's a blame sight better to connect onto the proper side of the meter. Then when the electric light company comes around you are right no matter if she did kick back. But if you are on the street side of the meter it is all wrong whether she kicked back or not.

Now I have an idea. First one since 1895, but you never know when one is going to break through. It must only be whispered around among us friends. Don't let it get outside. It must be strictly confidential. If all you chaps keep it dark we will get the "Doctor". It's just this: You all know how he has knocked the weather out with his fumes. Now watch for what comes next. "Dr. Cook" is going to lay low and when some of us Eighth District stations get through to the East he is going to discover that the weather has improved. Then will appear the broadside announcing that HE DID IT. He and the swivel chair and the typewriter and the one-cent postage stamps. He will tell how he went over to see his chum Tesla, and how the latter passed his hands across his noble brow, gave a grunt, and evolved a dope which if used to grease the weather three times a day just before meals will let two hundred meter stuff through amplified the equal of thirty-seven stages and without any tube noises. That'll be the lay, I'll bet a little red apple.

And when we get him with the goods, what will we do with him? There's the Wouff Hong. It has done many a job in the past. It's been one of the greatest boons to the monument business that ever was. Then there is the Rettysnitch. It has not been used so much and it's a wonder when it comes to efficient torture. Beats boiling in oil. And there is the Uggerumph. Jam the Uggerumph down a man's throat and twist it and he never speaks an untruth again, nor any other kind of a truth, for that matter. My own preference would be to stud the seat of the swivel chair with Blifskys, so when

(Concluded on page 21)

The Vacuum Tube as a Detector and Amplifier

By L. M. Clement

Part II of a paper presented before The Radio Club of America at Columbia University, January 16, 1920

Amplifiers

For the amplification of speech currents, the current in the output of the amplifier must be an accurate copy of the input signal. By the proper choice of tube and circuit constants for a given set of conditions this can be easily accomplished. If an amplifier is operated under improper conditions, so much distortion may result as to render the speech signal entirely unintelligible; but if the amplifier is to be designed for telegraph signals only, the question of distortion is not so important as it will not affect the readability of the signals.

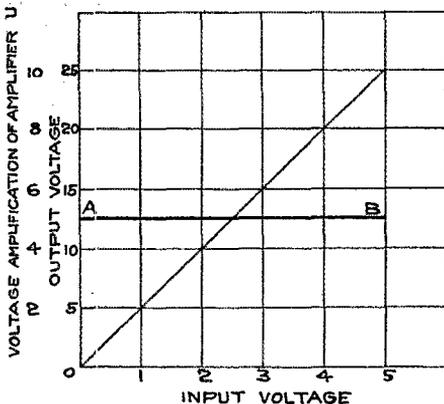
Since the speech wave is composed of a number of different frequencies of different amplitudes, it is obvious that for a distortionless amplifier the output voltage must vary directly with the input voltage and the amplification must be independent of frequency over the voice frequency range.

Fig. 13 is a curve showing the relation between the input and output of an amplifier. The line AB shows the ratio between output and input voltage and is constant over the range of input.

Amplifiers can be divided into two general classes; namely, Voltage Amplifiers

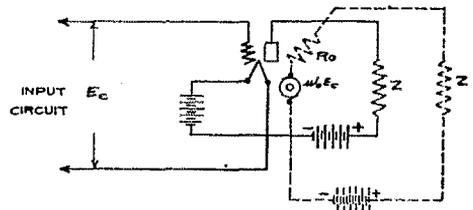
-FIG. 13-

CURVE SHOWING THE RELATION BETWEEN THE INPUT AND OUTPUT VOLTAGE OF A CORRECTLY DESIGNED AMPLIFIER



and Power Amplifiers. The voltage amplifier is used to amplify extremely small voltages of low energy content to such a point that when applied to the grid circuit of a power tube the desired current or power output is obtained.

- FIG. 14 -
OUTPUT EQUIVALENT CIRCUIT



In the case of the voltage amplifier, great care is taken so that no power is wasted in the grid-filament circuit of the tubes, and the circuit is arranged to give maximum voltage amplification. In the power amplifier, the circuit is arranged to deliver maximum power to the load.

Distortion

In speech amplifiers distortion to any great extent should not occur because of its obvious effect on the signal. The general causes of distortion may be classified as follows:

1. The alteration of the wave form of the signal by the variable absorption of power in the grid circuit. This is due to the change in the grid-to-filament resistance when the grid is allowed to assume positive values. This is shown on Fig. 17.
2. The alteration of the output current wave form by the application of the input signal to the non-linear position of the grid-voltage-plate-current characteristic of the audion. See Figures 18-19.
3. The distortion of the signal by the attached apparatus such as transformers, etc.

The resistance of the grid-filament circuit of an audion is almost infinite where the grid is charged negatively with respect to the filament. However, when it becomes positive due to the electrons which are attracted to it, the resistance falls to a

finite value and decreases with increase of grid potential. This circuit therefore acts as a variable resistance shunt on the input circuit and tends to reduce the maximum value of the positive half of each cycle of the incoming signal. This is shown clearly in Fig. 17. The curve ABCDE at the

distortionless amplification would result. While it is not possible to build audions which will give the sort of characteristic illustrated in Fig. 20, it is possible to approximate the results obtained.

It has been found that the characteristic curve is straightened by the addition of resistance and experience has shown that when the resistance is of the order of the output impedance of the tube, distortion due to the curved portion of the curve is of little importance provided the input voltage is kept within proper limits.

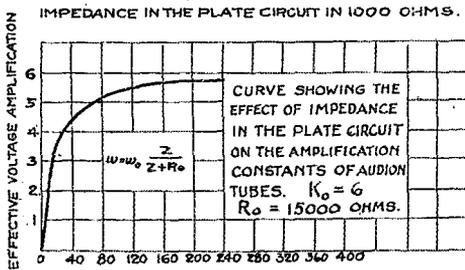
Voltage Amplification

In order properly to proportion the circuit of the amplifier the values of maximum amplification constant K and internal output impedance R_o must be known.

The ratio of the output voltage divided by the input voltage of a one tube amplifier is the effective amplification K of the device, and this is obviously less than the maximum constant of the tube K_o .

The following is an approximate method of determining the effective amplification

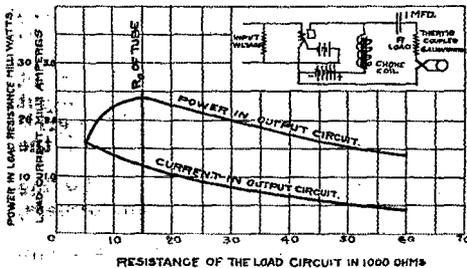
-FIG. 15-



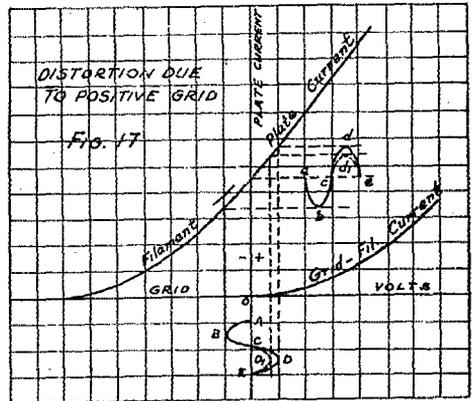
lower part of the figure shows the original form of the input voltage wave. Due to the absorption of power by the grid circuit the maximum positive value of the input voltage is reduced and looks like ABCD.E. This distorted wave impressed on the grid circuit of the tube produces the similar distorted plate current abcd.e. In order to prevent this type of distortion a negative voltage must be applied to the grid which will be greater than the input voltage. This is to insure the grid from being driven positive with respect to the filament at any time. Distortion of this sort is only serious when the energy in the signal is very small.

When the negative potential on the grid is increased the current in the plate circuit decreases until a point is reached when it is zero. This value of E_c is said to be the cut-off voltage. Obviously, then, if a potential such as ABC is applied to a tube such that BM plus MN (Figure 18) is greater than this cut-off value, the resultant current in the plate circuit will look like abcde, which shows very bad distortion. The same effect takes place, although to a much less degree, if the voltage is allowed

- FIG. 16 -



to act on the curved portion of the $E_c I_b$ curve; Fig. 19. If the $E_c I_b$ curve were a straight line and the grid of the tube were not allowed to assume a positive value,



factor K of an amplifier with resistance in its output circuit.

Fig. 14 shows a circuit which is the equivalent of the output circuit of an audion. If the input voltage on the grid of the tube is E_c , then the voltage acting in the plate circuit is KE_c . The output impedance of the tube is represented by the resistance R_o .

The current through Z will also flow through R_o and is equal to

$$I_b = \frac{K_o E_c}{R_o + Z}$$

The voltage across Z is then $I_b Z$, or

$$E_z = KE_c = K_o \frac{E_c Z}{Z + R_o}$$

Fig. 15 is a curve showing the relation between the resistance in the output circuit

and the effective voltage amplification K in a particular case in which $K_o=6$ and $R_o=15000$ ohms.

In the design of voltage amplifiers, if we are not limited in the type of tube to be used or the voltage supply, it is best to choose a tube with a high amplification factor (K_o) in order to obtain as great an amplification as is practical in a single stage. The impedance of a tube in general goes up with its amplification constant so that it will be necessary to use choke coils whose impedance is large with respect to R_o in order to obtain the high effective amplification.

By the use of tubes of low K_o and R_o and coupling transformers, approximately the same result can be obtained. The total amplification of such an amplifier is as follows:

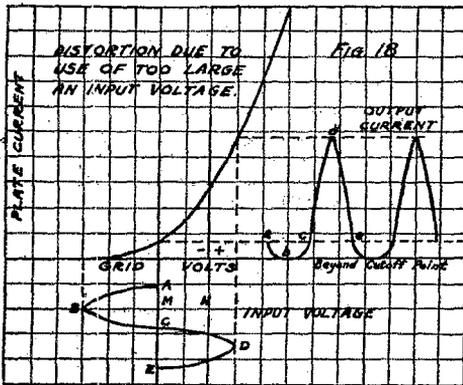
Suppose the transformer T of Figure 14 has a ratio of secondary to primary turns of e and an impedance as measured from the primary side of Z . Considering the transformer as an impedance Z , the ratio of the voltage across it to the input voltage can be calculated and is

$$K = K_o \frac{Z}{Z + R_o}$$

The voltage step-up of the transformer is practically equal to turns-ratio e so that the total voltage amplification is

$$K = K_o e \frac{Z}{Z + R_o}$$

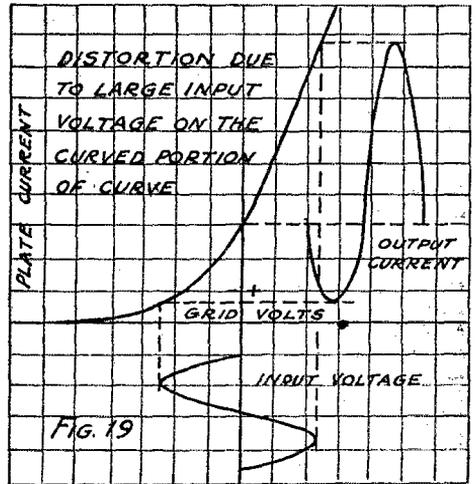
For amplification of speech signals, the transformers should be carefully designed



to transform a band of frequencies (400—2000 cycles per sec. approx.) more or less equally so that the speech signal will not be distorted to any great extent.

Increasing the ratio of an intertube transformer beyond a certain point does not increase the amplification. This is due

to the fact that the input circuit of the tube has a definite impedance due to the capacity reactance of the grid-filament

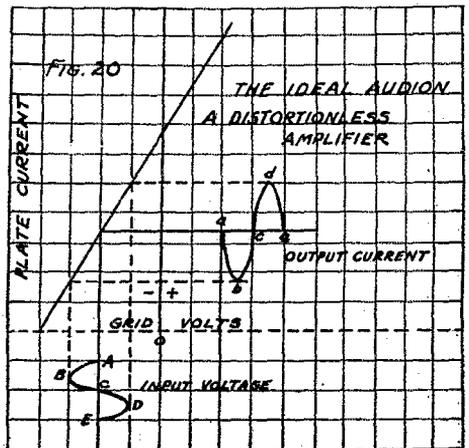


circuit of the tube which acts as a short circuit on the high side of the transformers. The capacity is not the value measured when the tube is not in operation but its effective capacity in the circuit used. This may be many times the value of the cold grid-to-filament capacity.

In practice, it is found that there is little gain in using transformers whose secondary impedance is above 750,000 ohms.

Feed Back Amplification

It is possible to obtain considerable amplification from a single tube by impressing a part of the amplified signal



voltage from the plate circuit on the grid of the tube in such a way as to tend to

sustain oscillations. See Figure 21. The arrangement of L_0 and L_1 must be used which will amplify rather than decrease the signal strength. Really what happens in the case of this hook-up is as follows: The radio frequency signal is impressed upon the input circuit of the detector and the audio frequency detected current flows in the output coil L_0 . The audio frequency current in L_0 induces a voltage in L_1 which is again amplified by the audion. In an amplifier of this sort the adjustment is apt to be rather critical and in general it is not very widely used.

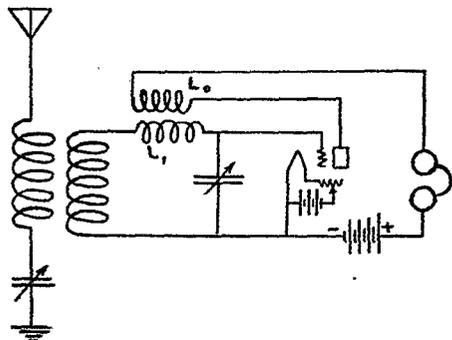
Radio Frequency Amplification

The use of loop and ground antennas with their low receiving efficiencies has necessitated the use of many stages of amplification. This has been attended with many difficulties due to amplification of extraneous noises to the same extent as that of the signals. The noises are probably due to any or all of the following causes.

1. Mechanical vibration of tubes
2. Noisy batteries or connections
3. Induction from various sources

By the use of radio frequency amplifiers which are designed so as to discriminate against the audio frequency noises, this difficulty can be partly overcome.

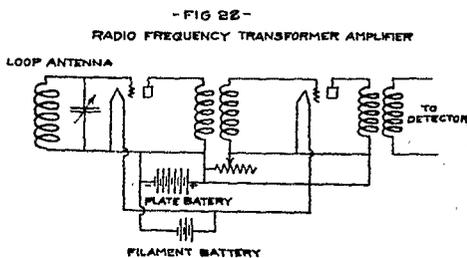
- FIG 21 -
REGENERATION AMPLIFICATION.



A resistance coupled radio frequency amplifier is shown diagrammatically in Fig. 23. The condenser C between the succeeding stages offers but a low reactance to the radio frequency currents to be amplified and a high reactance to low frequency disturbances. An amplifier so constructed will amplify the radio frequency signals and discriminate against the audio frequency noises. In actual amplifiers of this type about 90% of the radio frequency voltage is passed and only about 9% of the noise frequency gets through.

The same results can be accomplished by the radio frequency transformer coupled

amplifier illustrated in Fig. 22. Because of the low inductance of the transformers they are exceedingly inefficient in the transformation of audio frequencies and



therefore do not amplify these disturbances to any great extent.

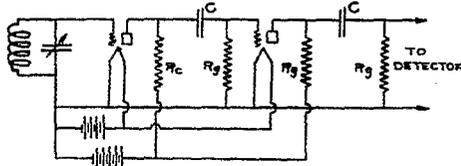
The potentiometer shown in the diagram is to present the proper positive grid potential to be applied to the amplifier so that it will not oscillate. Amplifiers of this type are designed to operate over a band of frequencies at satisfactory efficiency.

Detection

The audion, as we have seen, can be made to function as a more or less distortionless amplifier by arranging the circuit so that the input voltage is applied to the straight position of the $E_c I_b$ curve. By arranging the circuit so that distortion results, apparent rectification takes place and the tube can be used as a detector. This is accomplished by making use of the curved portion of the $E_c I_b$ curve to produce this distortion and is exactly the effect to be avoided in the design of an amplifier.

Sufficient negative grid voltage should be applied to the detector so that it will never assume positive values with respect to the filament. Operating the detector in this manner absorbs practically no power from the grid circuit and therefore does not increase the damping of the attached tuned circuit. The action of the audion can probably be best explained by considering the following example:

- FIG 23 -
RESISTANCE FEED AMPLIFIER



The characteristic curve shown in Figure 24 was taken and a constant value of E_c was applied to the grid which reduced the steady plate current to the value X' . The

signal MN is now applied to the grid and is of such a value that the grid is never driven positive.

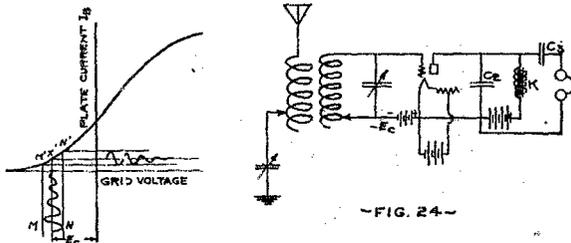
From the figure it is clearly seen that for equal positive and negative voltages on the grid the plate current is increased a greater amount than it is decreased, due to the bend in the $E_c I_b$ curve. This means that the average space current is increased by the application of the signal, and a response is obtained in the telephone.

Van der Bijl has found that maximum detection takes place when the drop across the filament of a tube is equal to the sum of the plate voltage divided by the amplification constant plus the value of grid voltage plus a small constant, epsilon (ϵ).

This is expressed by the following equation.

$$\frac{E_b}{K} + E_c + \epsilon = E_a$$

For the J or VT-1 type of tube best detection occurs when the effective plate



- FIG. 24 -

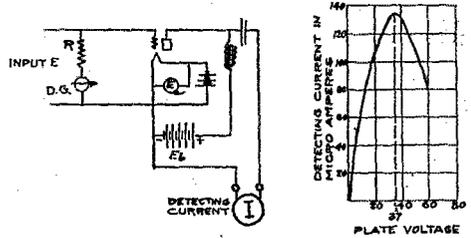
voltage is 17. The effective plate voltage is equal to E_c plus E_b .

The curve in Fig. 25 is an experimental curve which verified the above equations and shows the best plate voltage to be used for detection. The input voltage was measured by observing the current through

a resistance R by a Duddell Oscillation Galvanometer

The $E_c I_b$ characteristic curve bends at its upper as well as its lower end and obviously detection can also take place around this latter point. This upper detection point is never used, however; first, because of the high plate current, which

- FIG. 25 -



exhausts the plate batteries more rapidly than is necessary; and, second, because the grid is maintained at such a positive potential that a considerable energy loss takes place in the grid circuit. Hence most detectors confine their operations to the lower bend in the characteristic only.

A great deal has been written during the past few years upon the operation of the audion as a detector and therefore this portion of the paper has been limited to a few general considerations in which detection is distinguished from amplification. Also each type of amplifier described herein has been treated at great length from time to time; but it is hoped that the fundamentals explained in this paper which apply to amplification in general will assist the radio experimenter to obtain a clearer view of the reasons for use of any particular amplifier in various circuits.

Summer Work with Regenerative Receivers

By R. H. G. Mathews

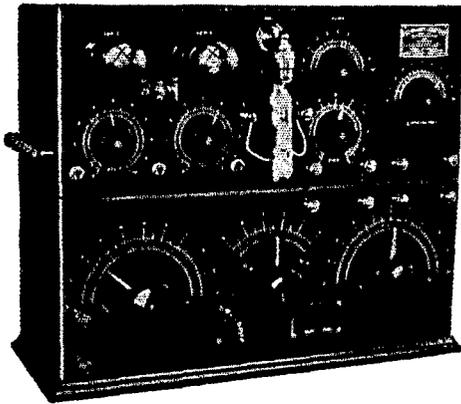
AS will be seen by a glance at the call letter list and records in QST, the past relay season has been an unusual one both for distances covered and for efficiency in traffic handling. Strong efforts are being made to continue this traffic relay work throughout the summer months. Work through this period of the year will entail the use of the most sensitive and efficient receiving apparatus which must, of necessity, in-

clude a short wave regenerative receiver. Among the foremost of the receivers of this type which have been used during the past relay season is the Chicago Radio Laboratory Paragon Short Wave Regenerative Receiver. This instrument has become so well known among long distance amateurs as to make very lengthy description unnecessary. This type of regenerative set is unique, since amplification of about 100 times is obtained with-

out loss or distortion of the natural tone of the incoming signal. It is possible to secure this amplification, retaining the normal spark frequency, for the reason that capacity of all kinds has been reduced to an absolute minimum in the circuit, the regenerative effects being secured by the use of properly designed variometers.

As will be appreciated by those who have had experience with the Navy long wave sets, the combination of a long and a short wave set is not possible when the maximum efficiency is desired on the shorter waves. At the same time, an easily variable range of from 200 to 600 meters is necessary for relay work because of the fact that many of the best relay stations are now operating on waves of 375 and 425 meters. It is also desirable to be able to tune to the 600 meter commercial wave length without the addition of external inductances or capacities. The Paragon was designed especially and solely for the reception of wave lengths between 200 and 600 meters and its efficiency is very high on all waves between these values as a result.

Aside from the antenna inductance there are no switches. Continuously variable inductances are used in both the grid and plate circuits, thus eliminating



high resistance contacts, the capacity of switch points and leads, end turn loss, and the necessity for a variable tuning capacity. The antenna and closed circuits are inductively coupled, the coupling being variable, its position being indicated by the pointer on the center 90 degree scale as shown in the illustration. The fact that all of these things are of extreme importance is being proved by the heretofore unheard of selectivity and amplification obtained by the owners of this type of instrument. Signals may be read from stations at extreme distances or through heavy static and interference with this instrument long after other receivers have

failed, and for this reason it is particularly adapted to use in summer relay work. The makers have given special attention to its mechanical construction and because it is put together to "stay put" they are able to guarantee it in every part for two years. The primary is wound on a cylindrical Bakelite tube, the leads from this coil being brought to the switch shown on the front of the panel. The grid and plate variometers are of special construction and are guaranteed to retain their shape and position under all conditions. A special method is used for holding the windings to the inside of the outer coils of the variometers. By this means the loosening of this wire is prevented and at the same time the winding does not possess the distributed capacity found in many variometers. No shellac or other medium of this kind is used on these windings and accordingly the troublesome capacity introduced by the use of such materials in holding the windings in shape is avoided. The panel used is of standard design and is made of highly polished black Bakelite Dilecto. This panel supports all the parts of the instrument, and at the same time a special "sub-mounting" is used by which no supporting screws mar the appearance of the instrument. The scales are all engraved into the Bakelite panel and by the use of large knobs with shafts revolving in bronze bearings, exceptional ease of operation is obtained.

The Paragon is of the tuned tertiary type of regenerative receiver, direct "feedback" being avoided as far as possible, since it has been found that this particular type of regenerative action is not the best for use on short waves. The tuning is accomplished by means of the primary switch and variable condenser, (if desired), and the grid variometer. These settings having been made, with the plate variometer set at zero, it is now rotated to a position just before the oscillating condition at which point maximum amplification will be secured. In this connection the operator is strongly advised to repeat the complete operation of tuning at least twice, starting with the aerial and working through to the plate circuit since each adjustment is slightly affected by the subsequent one, and in order to obtain the very best results a recheck of the settings is desirable.

As an adjunct to the Paragon the Chicago Radio Laboratory has produced their Amplifon Audion Control Cabinet. This instrument is made in two styles, one comprising a detector and one step amplifier and the other including a second step of amplification. An Amplifon of the latter type is shown together with the

(Continued on page 41)

Combination Crystal and V.T. Detectors Without Switches

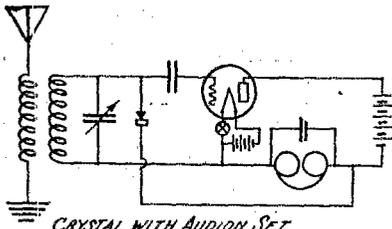
By Elliott A. White

FOR local work and receiving strong spark signals the amateur should learn to save his tubes and storage battery by changing over from the VT's to a crystal detector. The chief objection to using a crystal has been the supposed necessity of elaborate transfer switches to change the circuits and phones from tubes to crystal and back again. Many diagrams have been published using double-throw switches of from two to six poles; but anybody who has tried to work oscillating circuits with switches in them does not need to be told the inefficiency of this scheme.

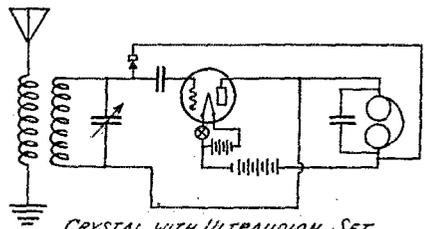
The diagrams herewith show how simply a crystal detector can be added to any VT receiving set, whether audion, ultraudion, or single or double coil regenerative, entirely without switches.

It is only necessary to remember that when the filament is cold the tube is an open circuit for both grid and plate, and that the phones must be so placed in the circuit that the plate voltage will not be sent through the crystal. One side of the crystal detector (preferably the cat-whisker side, to avoid capacity effects) is connected permanently to the lead from the tuning inductance to the grid condenser. The phones are in circuit in such a way that one side of them goes to the remaining side of the tuning inductance. The remaining sides of crystal detector and phones are then permanently connected together (the rest of the VT circuits being undisturbed), and the combination circuit is complete without switches.

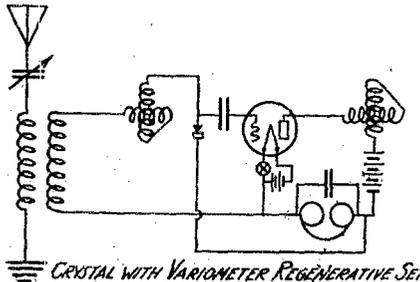
If a fixed stopping condenser is put in
(Concluded on page 25)



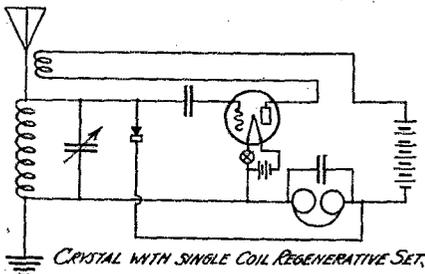
CRYSTAL WITH AUDION SET



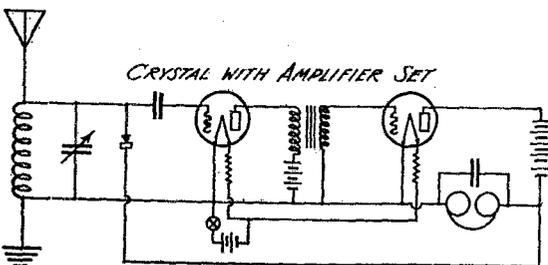
CRYSTAL WITH ULTRAUDION SET



CRYSTAL WITH VARIOMETER REGENERATIVE SET



CRYSTAL WITH SINGLE COIL REGENERATIVE SET



CRYSTAL WITH AMPLIFIER SET

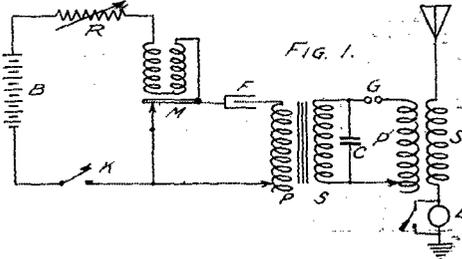
CRYSTAL
• WITH •
VT SETS

E.A. WHITE

Buzzer Transmission

LATELY some progress has been made in transmission with buzzers, and several new and interesting ideas have come out.

Figure 1 is a circuit for which credit is due Mr. L. G. Pacent, of Mesco-buzzer fame. M in the drawing is a radio buzzer or a Ford master vibrator capable of vibrating at about 500 cycles per second. F is a condenser of 6 to 10 microfarads capacity, using standard 2 M.F. paper condensers in parallel. P and S are the primary and secondary, respectively, of a 1/4 to 1 inch spark coil of ordinary design with the vibrator screwed down fast; C a capacity of 0.001 M.F.; G, a small spark gap; and P'S' an oscillation transformer which may be an ordinary receiving loose-coupler.



With the key closed the buzzer is adjusted so that the mechanical frequency of the buzzer armature is in resonance with the electrical frequency of the primary winding of the spark coil and the paper condenser in series with it. This condition will be indicated when sparking at the buzzer contacts is a minimum and the emitted note clear. The spark in the gap will be quite small, but if a small H.W.A. can be substituted for the flashlight bulb L, a surprising amount of energy will be seen to be radiated. Mr. Pacent radiated 300 milliamperes at 220 meters on a 12 ohm antenna with an input thru the buzzer of 1/2 ampere at 12 volts. A 1/4 inch spark coil was used, and the signals were report-

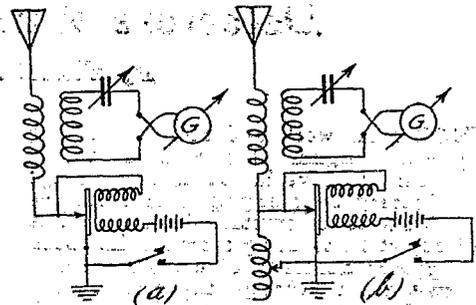
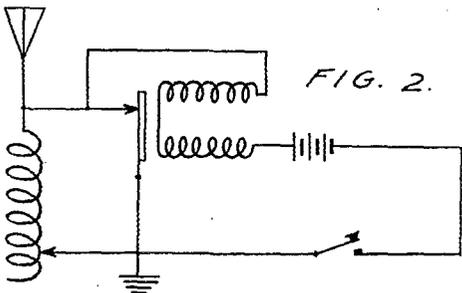
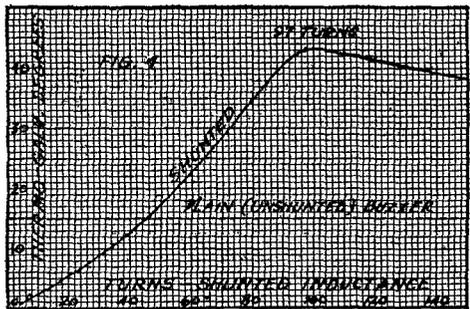


FIG. 3

ed QSA five miles distant. It was found safe to put 1 amp. thru a Mesco radio buzzer and 2 amps. thru a Ford master vibrator.

Mr. E. T. Jones, Radio Supervisor, Gulf District, U. S. Shipping Board, has discovered that by shunting a buzzer with an inductance (and of sufficient value to prevent a dead short circuit), as in Figure 2, the working range was increased fourfold. In order to get at the facts, comparative measurements were made of the respective methods, using a thermo-couple and sensitive galvanometer, as in Figure 3, where (A) shows the inductance in series in the antenna circuit and (B) shows it shunted across the buzzer. The curves of Figure 4 show the expected increase in radiation in favor of the shunted type, but more than this show a critical value of inductance for best results—in this case 97 turns.



This circuit was not wholly satisfactory and that of Figure 5 was developed as an improvement, providing a loop antenna as part of the shunt inductance and furnishing a means of tuning the aerial circuit at the same time. For 200 meter work it is important that the antenna not be too long, because inductance in the coil must be provided for. Mr. Jones' aerial con-
(Concluded on page 21)

Whither Are We Whencing ?

By Charles S. Wolfe

Mr. Wolfe needs no introduction. Everybody will remember him—the author of “Liars,” just about the funniest story ever published in QST. We’re glad to have Wolfe whencing back to QST.—Editor.

ABOUT four years ago yours truly humbly hocked his masts and spreaders, put in soak his favorite spark coil, and wished off his 'phones on some undeserving fellow amateur. I was done. Not only was I done, I was through.

Yea, verily, I thought I was.

T'other day I ran into a friend of the bygone days. One word brought on an arm load, and he invited me up to see his station, just blossoming forth from a forced retirement.

Heavings! When I last saw that set, the old boy was bobbling a chunk of spring brass wire over a portion of silicon. The gang of us had a vague idea that there was a thing they called an audion, and most of us had a sneaking suspicion that it was a hot hair pin in a bottle. Also we knew that he who would dabble with a tool of that description must separate himself from quite a little heap of iron counters. Most of us didn't possess sufficient of these bartering pieces to take cards in the game, and those of us that did looked at the collection wistfully and thought thoughts of half K.W. transforming implements.

Imagine me totally unprepared for the spectacle walking into the midst of three of these redoubtable lamps burning merrily away. Years of poker have prepared me for sudden jolts that way, so I did not betray the surprise I felt. I just backed my ears up to the preferred phones, and strained my nerves for the faint familiar whistles I used to listen to in the days of yore—that is, during the rare periods when my aerial was not grounded from some cause or other.

All that strain thing was totally unnecessary. When that signal arrived, it was plainly audible. Oh, quite so!

I had just about got myself nicely set, when something fell on the aerial.

After I was revived, friend began to explain the working of the two step amplifier. That it amplified I was quite ready to believe.

On my road home that evening I said to myself, “Son, something tells me that you are going to be considerably poorer within the next few days.” I'm some prophet.

Well, as I began to pore thru the catalogues, trying to get myself adjusted to

the new order of things, it occurred to me that four years in radio is just about equal to that period between the fall of Adam and Nero's performance with a hot fiddle. Or was it Nero's hot performance with a fiddle? Things move about as rapidly in this wireless game as an African leaving the vicinity of a grave yard at midnight.

When I bowed, and made my exit, the sharks were telling us that a slider on an inductance was an abominable thing and that any yap could readily see that the only common sense thing to do was to tap windings. This, they assured us, was the real thing and the last word in tuning methods. Today, I find, a radio engineer, when some bone-head mentions taps, throws up his hands in horror. “Taps,” he shrieks, “My God! Who wrote the text book you're using—Noah?” It simply isn't being done! There is only one thing worse than the old slider it appears, and that is the tap.

I remember sending an inquiry once to the guy who conducted one of those “Whisper Your Worries to Me” departments in one of our leading atrocities. I asked him why not wind your inductances with lamp cord, since it was fine business for connecting the tools themselves. His answer was in his very best technical vein, all replete with x's and y's and such. But when I got it translated, I found that he had simply said, “You're an ass”. Now when I mention 22 D.C.C. to the same bird he titters. Litz, you know, that's the substance.

When I used to sit in nightly, we mentioned with pride that the local naval station straggled in with such vigor that by straining our ears and imaginations we were able to hear the lad with the phones two inches from our ears.

Today I go into a station, and while talking to the owner the loud speaking telephone gives forth a plaintive shriek. The proprietor of the Hertzian factory looks annoyed, and murmurs something about the damned flies walking on his aerial wires and making his bulbs howl. I couldn't get the why of this, at first, but recently a friend explained that it was not the footsteps of the fly that caused this phenomena, but the E.M.F. set up by the friction of his feet on the wire. He accounted for the high note by the fact

that the fly is a many footed creature, and so it follows you see, that the frequency would be high.

In the good old days, we used to complain bitterly about the kid across the street with a spark coil drowning out NAA's ravings. Today you see a cuss lay down the phones with a sigh of despair. "Who can read thru Canton?" he demands, helplessly, as he toys impotently with his condenser knobs.

I found an old silicon detector stand of mine the other day that had survived my breaking-up jamboree. I had it sitting on the table wondering how I could work it in, when a friend dropped in to borrow a few honey comb coils. He spied the old stand, and picked it up with a puzzled frown. After looking it over a while, his face cleared. "I make it now," he declared, "Old mineral detector. Sending it to the Smithsonian, eh?"

Digging around among some discarded junk, I ran across an old pair of thousand ohmers. Many a night I had locked those

phones up so that no impious hand should caress them during my absence. They were on the set, when one of the local bugs dropped in. After looking the headset over critically, he blew a ring of smoke at the ceiling. "Carry their age well, don't they?" he asked, "I'll bet old Captain Kidd thought they were hum-dingers when he loaded them on his scow."

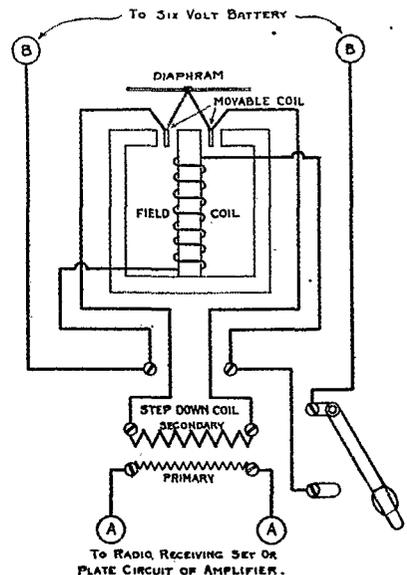
And so it goes. The old ether plow of yesterday has given way to the Plotron. The Navy used to use buzzers to test their detectors, and motor generators to transmit with. Now they transmit with the buzzers, and use the MG's for exhibits.

Which brings us to the point of this rather pointless dissertation. Whither are we whencing? Today it is the tube. Tomorrow —? Brethren, something whispers to me that the ham of tomorrow will shrug and say, "Oh, well! What can you expect of one of those old four step amplifiers. If you get Venus, you've got it all."

The Magnavox Radio Telemagaphone

THE Magnavox Radio Telemagaphone is a "loud-speaker" embodying the improvements which the Magnavox Co. have patented in the design of telephone receivers. The present-day type of receivers, in use on practically every telephone in the country, has served well as a reproducer of voice and radio vibrations, but it is a well-known fact that in converting electrical vibrations into sound vibrations it is not as efficient as it might be. In the "electro-magnetic" receiver the diaphragm producing the sound vibration is caused to move in synchronism with the electrical vibrations by the varying strength of magnetic lines of force passing through the diaphragm. These lines of force vary according to the flow of current through the fine wire, which is wound around the two pole pieces of the receiver. These pole pieces, being north and south poles of a small permanent magnet, exert a constant pull on the diaphragm when no current is flowing around the winding. As soon as a variable current flows around the coils, which are placed over the two permanent magnet poles, the magnetic lines of force from one pole to the other through the diaphragm increase and decrease and the diaphragm is caused to move closer to or away from the poles. This movement of the diaphragm sets up sound vibrations in the surrounding air and it is these vibrations that we hear. The more current flowing through the coils, the greater will

be the variation in the magnetic lines of force, and consequently the greater will be the movement of the diaphragm and the stronger will be the sound vibrations. Due to the fact that the diaphragm is always subjected to magnetic force of the permanent poles, and that the iron in these poles and the diaphragm offers a certain



amount of resistance to the varying magnetic lines of force, the movement of the diaphragm tends to lag behind the actual variation of current in the pole windings. This lag causes the reproduced sound vibrations to be distorted—that is, they do not sound as natural as the original. The diaphragm must necessarily be placed very close to the pole pieces in order to get the maximum effect of the very weak variations of the lines of force. Therefore, when a very strong variation occurs, the diaphragm will strike the pole pieces and chatter, but if the pole pieces were located any farther from the diaphragm the receiver would lose in sensitivity.

In the "electro-dynamic" receiver of the Magnavox Co. a light circular coil, rigidly attached to the center of a non-magnetic diaphragm, is suspended in the dense magnetic field existing in a small air gap between the poles of a powerful electro-magnet, as shown in the diagram. Through the coil of wire flows the variable electric currents set up by the voice or other vibrations. These currents cause magnetic lines of force around the coil, and it is these lines of force tending to adjust themselves to those in which the coil is suspended that causes the coil to move up and down—a vertical displacing movement. Since the coil is firmly attached to the diaphragm, the diaphragm will also vibrate, and sound waves are generated.

The strength of these sound waves depends upon the amount of movement of the diaphragm, and as this is not limited by pole pieces, as in the case of the electro-magnetic receiver, it will be seen that it is possible to reproduce a far greater volume of sound with the electro-dynamic receiver, and these sounds will be more natural because the diaphragm is not under direct magnetic tension but is free to move in exact synchronism with the lines of force created by the current flowing around the small coil. This type of construction not only makes a most sensitive receiver, but it also has the advantage of being able to reproduce strong electric currents into sound vibrations of great volume, and it was this feature that caused the electro-dynamic receiver to be known as "Magnavox," or "great voice."

This instrument is a current-actuated device and the small coil has a d.c. resistance of but 10 ohms. This necessitates the use of a step-down transformer as shown, the primary being of a value of impedance better fitted for operation in vacuum tube circuits and "stepping up the current" for the loud-speaker.

As illustrated elsewhere in QST, the complete Telamegafone consists of an enlarged version of the electro-dynamic

receiver equipped with a large horn, the step-down transformer, binding posts for the signal current and the magnet energizing current, and a sound-tube headset for reading faint signals. With an audio-frequency amplifier and a Telemegafone it is possible to reproduce signals to an amazing volume. Magnavox equipment of this type was used at Washington at the opening of the Victory Loan drive when an Air Service officer in a radio plane 3000 feet overhead read President Wilson's cablegram message to the American people to a great outdoor audience of 30,000 people.

ROTTEN BOOZE

(Concluded from page 10.)

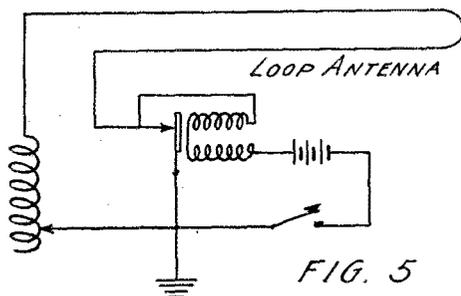
The "Doctor" sits down he will be reminded of the fact that the amateurs of the country are on to his curves and he'd better put on a new record. Let's get him to offer monthly prizes for the three best letters on the quickest cure for blisters on the seat of the pants.

Having relieved that load from my chest, I will now put on the phones, light the lamps, and see if there is any chance of getting a few East. Hope 2DA is on, and that Mrs. 8ER will hit the hay early tonight.

BUZZER TRANSMISSION

(Concluded from page 18.)

sisted of two wires 70 feet long, spaced 2 feet and connected at the far end, 30 feet high. The inductance consisted of a winding of No. 24 S.C.C. wire 6 inches in length upon a cardboard tube 5 inches in diameter, with taps every half inch.



Buzzer transmitters should be employed more generally. They are the ideal thing for local work, and their use will eliminate a lot of bothersome QRM.

NOTICE

Notice of expiration of A.R.R.L. membership are sent out in advance of expiration. Prompt renewal will insure your getting QST without any interruption, and help us too.

A Reply from Mars

Office of Radio Inspector, Mars.
Hunkadory, 210, 48, 246.

The Gang,
c/o QST,
Earth.

Dear Gang:

Your letter received today and was sure glad to hear from you. Also am glad to know that my signals are QSA at last. Don't guess I'll have to sit up so late any more. I sure kept the old key warm the last twenty-seven years but had begun to thing that you didn't want to talk to me. I knew you had been hearing me because every night that I was on and trying to get you everyone would get crabby and quit for the night. I am sorry I caused you so much trouble but I knew that that was the only way to make you listen to me. And say, that Rogers guy sure had me sweating under the collar for a while. I thought I never would get to talk to you. He found out my waves were too coarse to go thru the crust of the earth. Thought I'd have to spend another thousand Erosos in improving my set.

I'll say we get POZ up here. Who is that canary? Seems to me if he pushed the Russians as far back as he said he did, they'd be off the map by this time. Why does POZ's gang do so much pushing? We heard a rumor that Pershing did a little of it himself, altho POZ never said so. He called me one time and when I answered he told me to QRT or he'd send a flock of Zeppelins up to blow me "west"; what those thing are gets me—I haven't seen anything strange around here yet.

Well here goes for an answer to your questions. I don't know if I can answer them all or not, but will do my best. Those I can't answer Mr. Turnback can. Do you know him?

Am using one of those impulse excitation transmitters with a 250,000 K.W. input. I'm looking out for that bird Marconi. I didn't know he used "S" or would have used something else. Guess I infringed too. I've got my brass ribbon hunkus jammed tight together so as to create good strong impulses. That's what makes my wave so broad. The reason for that funny little squeak it has is not clearly known—possibly it's the make of it. It came from the E. I. Company. Oh yas, we heard about Alexanderson's Alternator, but we cool ours with pure beer instead of water. Our condenser would interest you. I use five spuds connected in series. Ever try 'em? They sure work fine on 100,000 meters.

Does Venus oscillate? Say, I caught

her shimmying one night on 425 like a nigger in a lions' den. That's the reason you never hear her. I can't get her to settle down to radio work. Wave? Marcelle. Well formed and has a beautiful curve. You might tune up on it some night—it's a perfect 3G. Her first name is Mercie and you are right, she has red hair. Met her at a planetary hop 65,000 years ago. Have quite a case on her now. (No, not Booze. Some of Billy Sunday's speeches got up here somehow and put everything on the bum except beer.) Yes, that Arlington bunch is always flirting with Venus. I'm going to send a wave down there that will put them out of commission for about 9999 years if they don't lay off t'at stuff. And, too, their wave is so broad I can't do anything until they get through. You know how they are when they get to talking with a woman.

Nothing doing here on the washing, fellows. Our wash-woman struck last week for two hours a day and three days a week and since then I have had to wash my own clothes in the sink and have worn out a half dozen kiji brushes scrubbing them. Why don't you try Annette Killerman? She has a lot of water around her most of the time and is quite apt to do things up in good shape.

Yea, Bo, Mars Radio League is affiliated with the A.R.R.L. Have several messages for Headquarters now and as soon as we get to working will unload about a hundred on the gang. We hear 2ZS all over the coop and have a sneaking suspicion he shoves nearer three KW into that old United transformer than one KW. But you ought to hear the way 3AI comes in—that guy with the Ford coil. Our meter—no, that did not come from Germany. Came from Venus. We were indeed very glad to meter. Regarding our key, yes, the dam thing does stick. It's three yards long and works like a pump. You have greatly misjudged our intelligence by trying to sell us a Marconi timed-spark discharger. We wouldn't have it with or without bearings. Sell it to the Canadian Marconi Co.—they might wanta cut bread with it. We tried every conceivable way and couldn't do anything but fry eggs on the thrust bearing.

But you got us all wrong about the aerial. What would I do with an aerial 7 miles long? I'm using a loop aerial made of Number 85 double silk covered magnet wire strung around in the attic. The ground originally was made up of copper pipes buried in Mars but after

(Concluded on page 42)



\$ % & * @ ? !

HAVE you been saying that? Don't you know if you talk like that you won't go to heaven?

Really, though, did you ever hear of such weather as we have had to fight this season? It's almost enough to make a man murder his grandmother, and we envy the fluent swearers in our midst the relief they seem to get out of cutting loose. (We never swear ourselves!) This season has been a notable one—notable for the fickleness, variety, and generally unsatisfactory character of its operating weather. All hands seem agreed that we've never had such a session, and all over the country it is making us sit up and think. And a certain evidence of our progress is the number of reported observations, theories, and deductions which reach us here at G.H.Q. It shows we are on the job just as surely as it attests that there has been something rotten about the WX. And a large number have advanced the explanation which we feel is the correct one—sun-spots. During this past season we've had awful static for weeks at a time when we ought to have had quiet air, signals have faded unmercifully and in all kind of crazy fashions without any semblance of system, many localities report dead periods of several days at a time when not a signal could be heard beyond daylight range, the aurora has visited us with a wonderful display, heavy earth currents have been existent—all of which, according to our scientists, is attributable to sun-spots—gigantic movements of almost unimaginable masses of gases on Old Sol.

We invite attention to an unusually interesting series of reports in this month's Operating Department, where quite a bit of information on observations over the country during the period of the recent wide-spread aurora will be found. The reports from all the Central states show that during two-thirds of March operation was very difficult, almost impossible over any distance, in every direction except to the south, but that from the south signals

were far above par. Does this indicate some sort of a north-and-south streak which is immune to magnetic disturbances, we wonder?

Now about that aurora. We haven't any data from the West Coast as we are writing this, but reports from most of the rest of the country are pretty generally agreed that on March 21st operation was up to the March average; the next night came the most gorgeous display of Northern Lights which has been known in our country in many years, and wire and cable communication was paralyzed. Likewise radio. We know many of us hurried to our sets that night, wondering just what that electrical business would sound like in the phones, but were disappointed. Not a peep. Everything was absolutely quiet except that every observer reports that stations inside the daylight range came through in good shape, altho in some cases even they were weaker than during the day. No strays, but some southern stations report queer whistling noises they had never heard before. The next night it wasn't so bad, altho the aurora was still faintly visible, and gradually things returned to normal and the signals commenced to come in again.

Let us hope that before long we will know a better remedy for bad radio weather than futile "cussing."

Fighting Fading

FADING is such a curious thing! Probably there's not an amateur who, as he hears a distant signal swing, has failed to wonder if it is fading the same way at every other receiving station. Indeed, we think we know it doesn't fade the same at every other place; that in some places it may not be fading at all, and that it may be fading at wholly different times at places not so far away from us. That's just the trouble. There are so many possibilities, and we know so little. And it's an amateur problem, fellows, for our own playground of 200 meters is just a little worse afflicted than most other tunes. In thinking over the

peculiar things we know and don't know about fading, the idea occurs that right here in our A.R.R.L. organization we have the facilities for collecting a vaster and more complete fund of data on swinging and fading than has ever been attempted by anyone, and so make an invaluable contribution to the art. Even while we were revolving this idea in our minds, trying to find a handle to it by which to put it into practice, you chaps in various parts of the country started to think the same thing and your letters brought the conviction that we are ready to make the attempt.

It seems to us that before the art can have a solution to the fading evil, the exact nature of the problem will have to be determined. Therefore we want as much information on fading as we can get, and not just disjointed observations, or even the careful notes of an experienced observer, but data on a given signal collected simultaneously at many points, and this kept up until a sufficient amount of data is obtained to yield results when analyzed. Imagine ten stations in a hundred mile circle around a transmitter, keeping an accurate record of his fading. It seems quite probable that he might be fading to the east while at maximum strength to the west, and possibly steady to north and south, or any other combination. We do not know what such tests would finally prove, but the general fading characteristics of a given station might be determined, the general tendencies of different localities and directions found out, and by careful comparison and analysis gradually an understanding of what is happening and what is causing it would come to light. Then it will be time to tackle the job of finding a remedy.

Now here's a scheme which we can put to use during these summer months when traffic isn't so heavy, and be really doing something of scientific benefit. If our Division Managers could arrange transmitting schedules for some of their stations, for say two nights a week, and let everybody else who is on at those times make observations of fading and report to him, and regularly change transmitters also, think what a wealth of priceless information will be obtained in a few short weeks. The transmission wouldn't have to be long—just a few minutes—and a very simple form for recording audibility from instant to instant could be got up. Those are some of the things we have been thinking about, for we want a water-tight scheme when we start. If our plans progress as we hope, full details will be announced in the next QST.

While we were thinking all these things, along came the Radio Section of the

Bureau of Standards and wanted to know if the A.R.R.L. would co-operate with them in the collection of data on transmission phenomena. Would we? Say! We went right down and talked it over with them, and as a result arrangements are now being made whereby a limited number of transmitting and receiving stations are going to make readings for A.R.R.L.—Bureau of Standards tests this summer on a scheme very similar to that mentioned before. Unfortunately the Bureau's facilities for analyzing reports are rather limited just now, so the work for them starts off on a rather small scale, altho with prospects of expanding. The request of the Bureau constitutes another governmental recognition of the value of our A.R.R.L., and we are proud and happy to be of service. Let us do our level best for them. Some very eminent scientists are going to make use of the data we gather for them, and we have a firm conviction that some very interesting conclusions will be dawn and made available thereby.

Our A.R.R.L. plan, however, is one in which every one of us can join and we will thus be able to study conditions in every part of the country on the same night and so perhaps also see what effect meteorological and magnetic conditions have on transmission. Just as soon as the final arrangements are worked out we will announce the plans in QST.

Summer Work

THOUGHTS for improvement in reception methods during the summer months are now occupying us. During the clear winter months it has been satisfactory to just hitch our receiver to our transmitting aerial and amplify everything it picked up, because it was generally just signals, and everything went merrily. But now with summer static approaching it's a different story. We can not be content with the methods of bygone summers. We must have something better if we are to succeed in carrying on business as usual. When the air is quiet it's not hard to read a weak signal, but only the strong signal is going to crowd thru amplified static, and strong signals are not so plentiful in summer.

We confess we don't know just how the problem should be approached. That's why we are putting it up to you. It seems obvious that reception on the plain antenna is not the correct thing. Underground antennae offer a chance, but we believe the loop is a better bet. Both require amplifiers, and good ones, but that's not much of a difficulty and would be necessary anyway in summer. Both have

directional qualities and so would certainly eliminate the strays coming from the sides. We have an idea that the loop, with a stray balancing-out system like those given to the world by Messrs Pickard and Proctor offers the most promise.

It's an important topic, men, and big enough to command our best efforts. Think what laurels await the amateur who can tell us just how to handle traffic through summer strays. That amateur will earn for himself an undying fame in the annals of Amateur Radio.

QSS

HERE'S a new abbreviation to add to your list. It's not international but it's being adopted by the A.R.R.L. to fill a big need. For a long time we have been saying "Your signals fade OM QTA" whereas if the cause of the trouble were anything outside of fading we could convey the information by the use of a single abbreviation such as QRM or QRN. It has therefore been suggested that it would be most convenient if we would adopt some one of the unused "Q" combinations to cover this fading business.

Let's write this down on our lists: "QSS?—Do my signals fade?" "QSS—Your signals fade."

We'll have to pull together on it, for its value depends on everyone knowing what it means, so tell your neighbor, and let us start in using it at once. It will be a big help.

H. F. Amplification

EVER stop to think that our audio-frequency amplification is all wrong in principle right from the start? Audio-amplifiers don't bring in much that isn't at least audible before, and the bad feature about them is that they amplify static and tube noises up to the point where they become distracting and so make operating harder under unfavorable conditions. We have a lop-sided ratio to start with, because the audion detector is like a crystal in that its efficiency of rectification varies as the square of the impressed voltage. This handicaps us from the beginning, as it means that strong signals are going to be made still stronger and weak signals weaker by comparison, and it's the weak ones we're after.

Radio-amplification is the answer—boost the voltage swing of the oscillations before they are impressed on the detector grid, and so get higher efficiency of detection. And with a number of stages

we will also find that certain strong signals will swing the plate current of an amplifier thru its entire saturation curve, and more than that it can not do. Then we have a "current-limiting" effect and the weak signals are amplified more than the strong ones—exactly what we want.

But radio-frequency amplification is easier to talk about than to accomplish. Major Armstrong has explained to us how the high grid-to-filament capacity of the ordinary tube makes radio-amplification at 200 meters almost impossible. If only we had a tube with very small capacity between the elements, like the British V-24, we'd be all right; we could go ahead and make an amplifier with resistance repeaters and it would be efficient on 200 meters. But we have no such tubes in America—not we amateurs. Interstage tuned circuits (radio-frequency) are out of the question for us unless some bright lad can get up a scheme whereby they'd all be tuned simultaneously, such as a number of identical variometers on a common shaft, as if we have to retune six circuits every time we change from 200 to 210 meters there won't be much traffic handled.

There's an answer, however, and it's Mr. Armstrong's heterodyne arrangement described in the February QST. Better results are had on short-wave work with this than have ever heretofore been possible. And it is not unduly complicated. An extra detector and the heterodyne tube, and only one extra adjustment—the frequency of the heterodyne. Several prominent amateurs in the east are employing this circuit now. It's the very last word in amplifiers, and with a good tuner provides all the amplification and selectivity we are likely to need for quite a while.



Combination Crystal and V.T. Detectors without Switches.

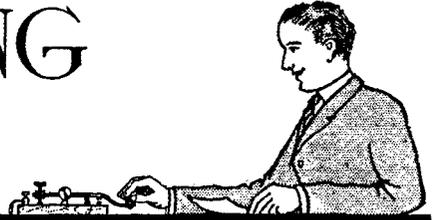
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series with the Crystal detector on the side opposite the grid lead, the phones may be put in any desired position in the circuits.

When either detector is in use it will the catwhisker should be off the crystal. To change from tube to crystal, merely shut off the tube filaments and adjust the crystal contact—simplicity itself!

THE OPERATING DEPARTMENT

J. O. SMITH
Rockville Centre, L. I.
TRAFFIC MANAGER.



THE approach of warm weather, with consequent QRN is causing a gradual shortening of distances over which traffic can be successfully handled, making more and more apparent the desirability of perfecting the short distance and more reliable method of handling traffic. The variation in strength of long distance signals is at this time also very pronounced, making it impossible to handle traffic over daylight distances.

From all over the country reports show that all amateur radio traffic was practically paralyzed on the night of March 22 by reason of a remarkably vivid display of the Aurora Borealis, with consequent nullifying effect upon all radio, wire and cable communication. The writer was able to observe conditions on the night of the 22nd at St. Louis, and it developed that it was impossible to hear or work outside of the regular daylight range of stations there. The air seemed absolutely dead. This condition was true over practically the entire country, although definite information from all points is not available at this writing.

There has been much activity among Canadian amateurs during the past winter, and parts of Canada not heretofore represented in active relay work have become closely connected with activities in the states, by means of the trunk lines of the League, which have been extended into Canada with such excellent results.

It is pretty generally true that amateur radio has progressed to a higher level than at any time in its history. This applies both to personnel and equipment. Intentional interference has practically disappeared, there is more of a tendency to work and let the other fellow work also, and the character of messages handled has changed from the "greetings" type to communications really meaning something.

The equipment in use by amateurs at the present time is a great improvement on that used before the war. This applies both to transmitting and receiving. In the case of the former, the old familiar spark coil is still with us, in some few cases, but the general tendency of all amateurs has been to use more efficient transmitting apparatus, which, in many cases, has included C. W. sets. The use of radio-audio amplifiers has increased to an enor-

mous degree the working range of amateur stations. The regenerative receiver, which before the war was a novelty, is now considered indispensable.

Detailed reports of the various division managers follow:

ATLANTIC DIVISION C. A. Service, Jr., Manager Bala, Pa.

The radio season has just about passed its high mark for the season at the writing of this report, QRN is looming on the horizon, and it won't be long till we will have to depend on short distance relays alone. Relay work is at its best and it is unfortunate that Nature won't hold up operations for awhile till all our still-incomplete Branch Lines are in shape.

Amateurs throughout this and neighboring Divisions have enjoyed the wireless phone tests of the Western Electric Company, which have been going on for the past two weeks on all waves between 450 and 1800 meters.

Following the example of the New England amateurs, those in and around Philadelphia are planning to hold a convention and banquet, at which will be represented all the individual amateurs, radio associations, schools and allied interests within a wide range. Prominent speakers from the A.R.R.L., Dept. of Commerce, Navy and others will be on hand and everybody who has not received notice as yet should make inquiries of any amateur in or around Philadelphia for final particulars. The tentative date is Saturday, May 8, and no amateur can afford to miss this. Subjects of general interest will be discussed, relay work and organization, problems of amateur interference, the relation of the Navy and Department of Commerce to the amateur, and many other non-technical matters of vital interest.

The New England Section (Northern Section) of the Division shows its usual progress, especially to the north of Boston. Some Canadian traffic has been gotten thru.

The New England crowd seem to be taking a decided interest in the law and order movement and several amateurs seem to have come under the cold calculating eye of the Radio Inspector in consequence. While

we don't wish any hard luck to our stations, nevertheless the action of the Radio Inspector in certain flagrant cases of wave length violation and willful interference is highly desirable and it is a fact that if the amateurs don't take steps to cut down in certain sections, somebody else will.

How about those Northern Lights on March 22nd? There seems to be a pretty general agreement from all parts of the Division that long distance was knocked unconscious and took about three or four days to recover. Some got peculiar kinds of QRN, hissing, sparks, etc.

The Report of the Assistant Division Manager for the Middle Section is full of interest and indicates a healthy traffic condition in the States of New York and New Jersey. This is Mr. DiBlasi's first report since assuming the duties of his position and he deserves a lot of credit for its completeness and his efforts to organize some of the new lines. During the summer months, one of the most important routes from New York City will be along the Jersey seashore, if it can be maintained, and any stations who expect to be working thru the summer should communicate with Mr. DiBlasi or Mr. Frye, 3NB, who is District Supt. for Southern New Jersey.

The New York City-Buffalo route should be in better shape, as there is good material along this line and it forms an almost sure line for Canadian traffic, without having the difficulties encountered along the New England lines to Canada in long jumps.

Conditions throughout the Southern Section of the Division are in good shape as between the larger centers with the exception of Baltimore and Washington. There are good stations in both places and it is not understood why more progress is not made. It has always been realized that geographical conditions probably have an important bearing on long distance work in a North and South direction, but there are numerous stations in Baltimore and Washington who are heard by 2, 8 and 9 stations pretty consistently, in addition to working with 3BZ, 3EN and 3GO.

The position of District Superintendent is open for the District of Columbia and any amateur who is sufficiently interested in relay work to want to handle it, should write to Mr. Stewart, the Assistant Division Manager. However, it will require a good deal of hard work and organizing effort to get things started.

The reports of the Assistant Division Managers follow:

New England Section

G. R. Entwistle, Asst. Division Manager,
18 Boylston St., Boston, Mass.

Three New England Colleges have come to the front of late to help out with the re-

laying: Tufts, Dartmouth and Boston College. The Medford station is in charge of E. W. Bearse, formerly with the General Electric Co. of Schenectady. At Hanover, N. H., they are using the call letters 1ZA temporarily until their petition for technical license is acted upon. R. S. Hayes is President; F. L. Southworth is Secretary. Tests with the Canadians are a matter of first importance. At 1ZA they report 1CM weak, but readable. Watch hours 9 to 10 p. m. and 9 to 12 Saturdays and Sundays, in effect after April 13th. There are twenty regular operators and a staff of beginners who receive regular and systematic instruction. A 1KW transmitter, together with a Grebe regenerative, forms their equipment. Mr. R. H. Sinden, instructor in Physics at the college, formerly an army radio engineer, has materially assisted in the design of the station. This station should be used for our northward route.

Father Lynch in charge of the Physics department of Boston College has a 1KW transmitter and two step amplifier in working order at Newton. Call letters 1PW. A very enthusiastic exponent of amateur radio is Fr. Lynch, his amateur days dating several years back on similar work in Philadelphia. There is some promising material for an all-college relay in New England. Has anyone heard from Worcester Polytechnic lately? Where has Rhode Island State at Kingston, (1YA), disappeared to?

Mr. Paul H. Gates of Franklin, Vt., on the Canadian border, reports little activity around his section. A station in Dunham, P. Q., that carries on tests with Farnham is about all the life that seems to exist northward. Mr. Gates, who is manager of the local telephone company, stands ready to assist in any way possible.

Portland is at last a reality with the rest of the New England States. 1EK, Robert Huston, gets most everyone here. E. G. Ham is still on the job and Castner, who is located at Cleveland's, has his hands full with the junior element. It is regretted that someone in that section ran afoul of the Radio Inspector, but law and order is one of the things Portland is noted for in the radio line. The Portland Radio Assn. has been organized with R. W. Pratt as President. 1FV has a station in Westbrook, Me. Portland clears thru 1CK, 1AE, 1HAA, 1DK.

Hardy of Beverly has arranged Monday and Wednesday for himself, Saturday and Sunday for 1RV, Tuesday and Thursday for 1ED, Hersey of Salem. The Essex County Radio Assn. has a live wire in its president, 1ED. The Assistant Division Manager had the honor of speaking to its members and wishes to thank them for their apparent effort to enforce the 10 P. M. curfew regard-

ing small talk and local stuff, giving way to the serious work of relaying and urgent radiograms.

The Lowell Radio Club held its "Dance by Wireless" on April 16th, the first of its kind around this part of the country. The club deserves great credit for the success of the affair. Everyone of those present will long remember the unique feature of dancing to wireless phone music. Music was played at the club rooms into the transmitter and received at the dance hall just as though 100 miles separated the two stations. W. J. Butterworth had charge of the technical end.

McLean reports 1ZA, 1HAA, 1SE coming in regularly at Laconia. Also hears 1AE, 1CK, 1ED regular, but not so QSA. Has route with 1IT to 1OE working, but nothing south of that yet. Young, 1AE, has caused all kinds of disturbances in the ether with that old stand-by transformer with an enviable past. He is regularly reported both at sea and ashore. Another stand-by is 1CK, Robinson of Brantree. 1AK has a regular schedule, as has 1HAA, 1DU. Our trouble at present is at Worcester and westward thru New England. All mourn the loss of 1RN, who has invaded the Ninth District where our friend 9ZN moves the electrons in his fan shaped antenna. Mr. Rawson had without doubt the finest amateur equipment in the First District with a Telefunken 500 cycle transmitter and any number of steps you happen to think of for receiving, to say nothing of the separate wireless phone set that entertained us evenings. We all wish him luck in Chicago, but are ready to wish him more luck in Boston.

Get ready fellows. The Chamber of Horrors is about to get its first representative from this district. Repeated offenses have led those interested, and that means all of us, to select the most troublesome offender as its contribution to the cause. Watch out you are not next.

Middle Section

John DiBlasi, Manager,
East Side Y. M. C. A.,
New York City.

New York State seems to be very well covered and a lot of credit is due to Mr. C. R. Runyon, 2ZS, handling over 250 messages, 100 of which were handled direct and the rest over the trunk lines. Mr. Runyon has organized a very good line to Albany as follows:

Yonkers 2ZS, 2BK, 2KN, 2AM.
Ossining 2BB.
Poughkeepsie 2DA, 2AR.
Hudson 2BM.
Albany 2FG.
Troy, 2SZ.

From there it goes to 2TF in Schenectady and so on out West. This route makes it possible to work as far as Schenectady in daylight. The amount of work passing over this line is indicated by a report from 2DA which shows a total of 166 messages relayed for the month of February.

Credit is also due to 2DA, 2BM and 2IR who have proven reliable outlets for a great portion of the traffic from this district.

Mr. Goette, District Superintendent of Brooklyn, reports that traffic has been unusually heavy for the past month. All stations are handling it promptly. 2WB has handled 89 messages.

The Radio Traffic Ass'n. of Brooklyn has been helping to break up the local interference. Also the Y. M. C. A. Radio Club has been doing its share to abolish unnecessary QRM in and around New York. At a recent meeting of this organization our president, Mr. H. P. Maxim, Mr. K. B. Warner, Secretary, and Mr. J. O. Smith addressed the amateurs in this vicinity, asking for cooperation with the A.R.R.L.

The old trunk line to New England is again in operation, through 2ZL, 2FS and 2RL. It is hoped that our difficulty in delay of traffic will be eliminated.

Mr. Julius Hornung, Chief Operator Y. M. C. A. Radio Club, has been appointed District Superintendent for Manhattan and the Bronx.

Traffic in northern New Jersey under Mr. Lester Spangenberg has progressed favorably, 2ZM having relayed over 150 messages, most of them direct with long distance stations, but QRM is so bad that Mr. Spangenberg had to resort to a continuous wave set. 2ZM will from now on be heard on C-W on 325 meters and will appreciate it if tests can be arranged with different stations.

The trunk line to Philadelphia is now working in good shape, from 2ZM to 3CV to 3CS to 3EV, Philadelphia.

Conditions in the Southern New Jersey district have improved during the past month, a great deal of traffic passing through this district. However, there still seems to be a scarcity of reliable stations in both northern and southern New Jersey, especially in Monmouth and Ocean Counties.

A branch line from Philadelphia to coast resorts has been established and is in active operation, both day and night. This branch connects with trunk lines B and D through Philadelphia.

The District Superintendent, Mr. Frye, is desirous of getting in touch with stations in the northern part of this district, especially in the vicinity of Long Branch. There are splendid openings in that section for stations desiring to become identified with the league's relay work. The bulk of the traffic in this district has been handled by the

following: 3MO handled 24 messages and 3NB 149. 3NB has been doing very satisfactory work with 2ZC and 8ER.

Southern Section

Chas. H. Stewart, Ass't Division Manager,
St. David's, Pa.

Relay conditions in the Southern Section of the Atlantic Division are gradually improving and a considerably larger number of messages are being handled than at any time since the re-opening of stations. The relay routes are being built up as stations are found to fill in the gaps.

It has, since the beginning, been the aim of the operating officers of this Section to endeavor to cut down the distances between stations to a reasonable interval, as it has been realized that the increasing number of stations would not only make this possible but absolutely necessary in the more thickly populated sections on account of the increasing interference. It has sometimes been painful to hear two stations trying to get through messages, using up energy and patience in their earnest endeavor to work through almost unsurmountable QRM and static. The same efforts expended in working a reasonable distance would afford nearly the same practice as is obtained by so-called long distance work, and give everyone a better opportunity to get messages through, because each station would take less time to clear, with the result that more time would be available to other stations in which to do their work. This condition must be recognized as a fact and not a mere theory. In some sections there still exists the need for long jumps, but the constant endeavor of everyone should be to reduce working ranges, and thus encourage others to come into the relay game. Of course, when conditions are such as to make it possible to work a station at a greater distance than normal with ease, there can be no valid objection on the part of anyone; in fact such procedure will expedite relay work rather than hinder it. Repeated attempts to work a distant station without great success should be an indication to those concerned that they are over-reaching, and they should appreciate that they are holding up others.

In planning Trunk Line B through Pennsylvania the above idea has been constantly kept in mind. From our present information it is our belief that reliable communication will shortly be had between Philadelphia and Milton, Pa. in the central part of the State. From that point until we arrive at a point within 45 or 50 miles from Pittsburgh it is likely that longer jumps will have to be the rule perhaps for some time, due to the small number of stations in the central portion of the State. There is great need for a station at Pottsville, although we be-

lieve that there is a station under way at that point. We have information that the station at State College, Pa., BXE, is again in operation, and it is our hope that they can be interested in relay work. The station of Messrs. Cawley and Walleze at Milton, Pa. (call 8BQ) is now in operating condition.

Owners of stations located in Blair, Clearfield, Cambria, Jefferson or Indiana counties are earnestly invited to communicate with the Assistant Division Manager, as over this portion of Trunk Line B the greatest need for stations exists.

Mr. Devinney, Western Pennsylvania District, reports that the station of Mr. Williams (8EN) of Pittsburg handled 95 messages in one month, and the station of Alexander Bros. (8JQ) at Washington, Pa. handled 82 messages in the month of January, and that he had counted this station as one of the best in his District.

Mr. Ferris, Dist. Supt. Eastern Penna., reports that messages are being handled with increased regularity on Trunk Line D between New York and Philadelphia, the station 3DH at Princeton University having no trouble in working a number of stations in Philadelphia and vicinity. He states that for a month or more Weber (3CC) at Abington, has not been active, and it is understood that he has retired from relay work, but that other Philadelphia district stations are coming forward and doing an increased amount of relay work. He advises that traffic on this Trunk Line is getting as far South as Wilmington, Del., without trouble, but that there is as yet no way of reaching Baltimore or points South.

Mr. Horn, Dist. Supt. for Delaware, states that he is engaged in arranging tests with Mr. Duvall, Supt. of the Eastern Maryland District, and that Gooding's station (3BE) in Wilmington will try in every way possible to connect up with stations in Baltimore. As the range of Mr. Gooding's station has been much increased by improvements which he has made, and, as he has been heard by Mr. Gravely at Danville, Va., according to Mr. Horn's statement, we have reason to be more hopeful that relay work may yet be pushed through to Baltimore within a reasonable time.

No report has been received this month from Mr. Duvall, Supt. Eastern Maryland District, and, therefore, we are without information as to what progress has been made in that territory, or as to what work the stations there have been doing.

Mr. Schaefer has resigned as Supt. for the District of Columbia, leaving a vacancy in that territory, which will be filled when someone is found who will properly represent the League in the District.

Mr. Gravely, Supt. Central Virginia District, reports that a station has been placed

in operation at Richmond, Va., by Mr. C. D. Blair (3HO) and one at Roanoke, in the same State, by Mr. J. F. Wohlford (3CA), and that he has hopes of a new station at Lynchburg in the near future. He reports that he handles some traffic at his station (3BZ); that he has worked Pope at Athens, Ga., and also 5DA, but that he has refrained from doing much long distance work over extreme ranges in order to avoid unnecessary QRM. In summing up Mr. Gravely says that he is very much encouraged over the prospects. He notes that there are several stations on the seaboard in Virginia that have been doing good work and handling a number of messages at long ranges in spite of the QRM with which they have to contend due to the jam around Norfolk.

The station of the Ass't Division Manager (3ZS) has handled quite a few messages, mostly from Princeton and with Philadelphia and other comparatively nearby stations, and a few with Ohio stations, but owing to the fact that he has been unable so far to erect an adequate antenna he has not the ranges that he had before the war.

CENTRAL DIVISION

**R. H. G. Mathews, Division Manager,
1316 Carmen Ave., Chicago, Ill.**

During the month of March, the radio weather throughout the Central Division has been very poor. There has been almost a continuous succession of storms, each bringing with it heavy static which has rendered relay work impossible, especially when coupled with the summer temperatures which have been prevalent. Nevertheless some interesting and unusual work has been done and more traffic handled than would have seemed possible. There have been several instances of interesting natural phenomena noted by various stations in the Division. Among these is the storm of March 4th which swept down from the Northwest and had a peculiar effect upon all signals from the West, North and East. It will be recalled that shortly before the war, in 1917, a trans-continental relay was planned which was an absolute failure because of the difficulty the various relay stations had in working with others East or West of them, although Southern stations were unusually loud. The storm of March 4th had exactly the same effect, rendering all East and West communication impossible, although 5th District stations were more numerous and much louder than ever before. We believe that a check of the calls heard by the various stations in this Division will substantiate this. Reports from 8ER, 9ZL, 9BT, 9DU, 9HQ, 9ZC, 9EE, 9ZQ, 9ZN and many others show this condition to be universal throughout the Division. An attempt has been made to check these results with the weather maps of the same dates,

but no intelligent result has been reached. We would appreciate reports from stations in other parts of the country as to their experience during the same period. After about a week of this sort of thing the conditions gradually returned to normal, although because of the warm weather and static mentioned before consistent work has not been possible.

On the evening of March 22nd stations from Minonk, Illinois, on North to the Canadian border were affected by the display of Northern Lights which took place on this date. Although the Aurora is sometimes visible as late in the spring as this, it is seldom seen as plainly or over as great distances as it was on this date. Reports of Chicago papers show the telegraph and telephone wires to the North have been rendered inoperative and the same may be said of radio. The static was not abnormal during the display, but it was evident that our receiving sets were being choked, since the receipt of other than local signals was not possible.

During March, preparations have been made for summer and daylight work and a number of tests have been run to find out just what was possible in various localities. Mr. C. W. Patch, 9DT, District Superintendent of Iowa, deserves great credit for handling the details of one of the best and most successful of these tests. Mr. Patch, with the co-operation of the District Superintendents of Wisconsin, Illinois and Minnesota, organized three routes of stations through these states and on Sunday, March 21st, at 8:00 A. M. started a test message along these three routes. Although the message did not get to every station in the order shown on the pre-arranged schedule, it was found that daylight work was quite easy between many Iowa stations and Chicago, and between Chicago and Lake Shore stations as far as 9ZL at Manitowoc. As a result of this test and others which have been handled by 8ER and 9CA, we believe that if the stations now operating continue to work throughout the summer, regular summer or daylight work will be possible from Western Pennsylvania to Middle Iowa and from Wisconsin to Southern Illinois. We have also found it possible to reach North Dakota by means of a rather circuitous route through Iowa. One of the best of these routes is that organized by Mr. Burhop and known as the Lake Shore route from Chicago to Manitowoc. This particular branch handles traffic regularly in an extremely snappy and efficient manner and the Division Manager wishes to express his appreciation of this work to the stations on this route.

For the benefit of those stations wishing to route traffic during the summer we wish to make the following suggestions on routing as a result of our tests:

Traffic from Wisconsin for East, South or West should be routed via 9ZL and 9ZN. Traffic from Eastern Ohio, west bound, should be handled through 8DA or 8ER and thence to 9ZN, etc. Traffic from Southern Illinois for the East or West should be routed via 9CA to either 8ER or 9ZN. North Dakota traffic for the South or East should be handled via 9EE. East bound traffic from Iowa may be handled through 9YA, 9DT or 9CS to 9CA or 9ZN. Southern Indiana traffic for the East should be handled through 9ZJ or 8ER, or from Southern Indiana to the West from 9ZJ to 9CA or 9ZV. Traffic to and from Detroit will be handled by 8ER and 8CB.

As will be seen, these suggestions take in almost the entire Division, those parts being left out to which summer work is impossible because of the lack of sufficient stations from which to build short distance routes.

The Division Manager is installing underground aeriels, together with an Armstrong Heterodyne Receiver, at 9ZN and expects to continue work throughout the summer, using the regular 2 kilowatt spark transmitter on a wave of 375 meters; a ½ kilowatt continuous wave transmitter may be added a little later.

Mr. Pray, District Superintendent of North Dakota, reports the organization of two more clubs in his District during March. He also reports the reorganization of the North Dakota Radio Assoriation, which held a convention at Fargo, N. Dak., March 12th and elected officers as follows: President, Mr. Bert Wick, A.R.R.L. City Manager of Fargo; Vice-President, Mr. J. A. Gjelhaug, District Superintendent of Northern Minnesota; Secretary-Treasurer, Mr. R. H. Pray, District Superintendent of North Dakota; Executive Committee, Doctor H. T. Irvine of Fingal, N. Dak. and B. J. Glein of Balfour, N. Dak. Mr. Pray has organized routes to the stations of all the members of the North Dakota Radio Association and expects to be able to handle a lot of local traffic through these routes. Because of summer weather conditions Mr. Pray reports that traffic is no longer being handled via radio to the Pacific coast over the Northern route. The station of Mr. Campbell at Jordan, Mont., has been closed for the summer, and the gap caused thereby is too large to be bridged at this time.

Mr. Gjelhaug, 9ZC, District Superintendent of Northern Minnesota, is organizing early morning tests in preparation for his summer work, as interference is at a minimum at that time. He reports that he has been able to work with the Winnipeg Radio Club at Winnipeg, Manitoba, Canada, very successfully of late and we believe that summer work will be possible into Canada by this route. Any traffic destined for Winnipeg or vicinity should be routed via 9ZN, 9ZL or 9ZT to 9ZC.

Mr. Burhop, 9ZL, District Superintendent of Wisconsin, has been distributing his local state traffic by daylight or in the early evening and has found this to work out very satisfactorily. Mr. Burhop is an example of the real amateur spirit. When his station, 9ZL, at Manitowoc, Wisconsin, was not equipped with an oscillation transformer or a rotary gap, he and Mr. Bridges rigged up a straight gap and helix which they managed to tune to a sharp wave by some means not known to average human beings, and proceeded to work all kinds of 2 and 3 stations consistently. After getting his rotary and oscillation transformer Burhop has been doing some remarkable work as is shown by the number of times 9ZL appears on the list of calls heard. Mr. Burhop requests that mention be made of the fact that due to an error the station of Mr. J. H. Siehr, 410 3rd St., Menasha, Wisconsin, was reported as 9RT, but has now been issued the new call letters 9UL. The assignment of the first call to Mr. Siehr was due to an error in the files of the local radio inspector.

Mr. Turner, 9DU, District Superintendent of Western Missouri, reports that in spite of the adverse weather conditions relay work in his territory has been very encouraging. The station of 9RP, whom we will all remember as old 9LO before the war, has been handling an abnormal amount of west-bound traffic and has been getting away with it in fine shape. Mr. Perkins of 9RP has been appointed Assistant District Superintendent to take care of Kansas City as a slight reward for his services in handling traffic in that vicinity. Turner has located our old standby ex-9ABD, and tells us that Corwin is now at Columbia University and hopes to put up a station there. We have missed Corwin's spark all this winter and hope that he can be persuaded to get into the game again.

We regret to announce that because of his poor health, Mr. Trump of 9BT has been forced to give his up his radio work and has temporarily moved to Phoenix, Arizona. His Assistant, Mr. W. A. Beasley of Topeka, is handling his work and has been appointed acting District Superintendent of Kansas.

In concluding this report the Division Manager wishes to impress upon all stations in the Division the necessity of continuing the operation of their stations throughout the summer. We appreciate that it is hard to stay in and operate a station with the nice weather calling, but we believe that it does not entail too much of a sacrifice to operate a station on several mornings a week for the purpose of keeping our traffic routes open. The entire organization of the League is interested in performing regular summer work, and since this has never been done before the Division Manager is naturally anxious to have the Central Division lead the

rest of the country and from the indications of our recent tests it would seem that we were going to be successful, but such success is only possible by the earnest co-operation of every station in the Division.

Mr. L. A. Benson, District Superintendent for Eastern Missouri, reports that stations in St. Louis have been doing excellent work handling traffic for all parts of the United States. Mr. Crowder, 9ZV, has handled over 200 messages. Mr. Benson, 9KV, has handled 175 and Mr. Woods, 9LC, about 160.

Queer conditions have existed there the last six weeks, making relay work impossible and tying up traffic for both coasts. Traffic going through St. Louis for the West coast has two outlets; i. e., 5ZL to 5AL to 5ZA to coast, and 9ABD to 9RP to 9BT and so forth.

Sunday morning tests are now being made with the idea of handling traffic in daylight throughout the summer months, to get away from QRN.

ROCKY MOUNTAIN DIVISION
Ira J. Kaar, Temporary Manager,
243 East 7th South Street,
Salt Lake City, Utah.

To our keen satisfaction the Rocky Mountain Division is beginning to show a few signs of life. With a little stimulating it is hoped that soon an ideal relay route may be established across this division. Working eastward the break has been for a long time at Salt Lake, but we are glad to say that the station of 6ZA has been finished and L D work started.

6ZA has no difficulty in working coastal stations direct, tho a very efficient station at Reno is a very good stand-by in case of bad conditions.

We are now ready to tackle the situation to the East. This is the worry of our life. The Eastern fellows may talk of queer conditions, but we really believe that the gap from Salt Lake to Colorado Springs is the freakiest stretch in the country. When 9JE comes in at all he nearly knocks the house down, then almost instantly he fades clear out of audibility. We suppose he notices the same things about our signals. Lately, however, we have been copying the station of the Colorado Wireless Association at Denver. We hope to have worked this station by the time this report is published. If this is accomplished the deed is done and the long desired "Straight Across the Country" route will have been established as CWA has no difficulty in working great distances to the East. Upon this gap then we are centering our attention and we mean to bridge it at any cost.

We have no difficulty in working 6GQ at Phoenix, but not much is gained by this, as

traffic goes right back on the Southern route again.

To date we have worked 5ZA once, but not very well because of insufficient amplification at our station. This has been remedied.

Salt Lake can also work the University of Oregon, and the signals are very, very QSA here. This solves the problem of traffic to the north from Salt Lake.

7CC at Moscow, Idaho, is doing splendid work. We hear him very often working 6FE.

Test messages have been received direct from 6EB and also via 6BQ.

We understand that stations exist in Southern Idaho, but haven't heard them yet. Will the owners please write us and give us information on their stations?

The Rocky Mountain Division is going to be handled a little differently in the future as we are going to endeavor to inject a little life into it. The officers of this division will please keep us posted often regarding developments. Write to either M. S. Andelin or to Ira J. Kaar, 243 East 7th South Street, Salt Lake City, Utah.

PACIFIC DIVISION
A. E. Bessey, Manager,
Sunnyvale, Calif.

Owing to my appointment coming so soon upon the time of sending in report, there will be a lack of news from the Pacific Coast Division this month, as re-organization is taking place, and the new district superintendents have not got in swing as yet. The Los Angeles district has no manager at the present time, but the Seefred Bros. report that that district is opening up with some good amateurs, that it will be able to do some very good relay work. Owing to death in the family it will be impossible for them to devote any time to the organization other than relay work, which they intend to continue. So the Los Angeles district is without a manager at the present time, but expect before next month's report that I will be able to pick up a live one in that district. Also the San Diego district has a large number of amateurs, but at the present time their receiving end is rather weak. 6AT, Mr. Garratt Arnold, one of the most progressive and efficient amateurs, has been appointed Assistant Manager of the Pacific Coast Division, and is now in a position to do very creditable work. 6CO is back on the job again after many difficulties with motor trouble, and will be from now on one of our reliable relayers. 6BQ is an old reliable, as he opens up the way to the North and South where messages cannot get through, owing to QRM, any other way.

The Northern District has been rather backward, owing to the fact that there have

been very few of them heard in this district, but of late they are coming to the front and messages are coming through direct in fine shape.

Mr. F. J. Brott of No. 10 Walk, No. 1 Madison Park Seattle, Washington, will be appointed superintendent of that district. Mr. Hertz, 7ZB, at the present time is confined to his bed, and we miss his call. Rev. Sebastian Ruth will take charge of the Washington district. Mr. Beedle, 6BQ, has been appointed for the Nevada section.

6AT, 6BR and some of the Southern amateurs have worked as far East as Salt Lake City with 6SA. 6BR has heard 6ZA working 9JE, both QSA here. So it looks as if we were going to open up a direct route through the middle section of the Pacific Coast Division to the East, and from good authority I understand that a great many of the boys are putting in larger amplifying sets which will meet the long-felt want of the West Coast. 6CC of Point Richmond is doing very creditable relay work, and he is one of the best for relaying to the Valley by 6EJ. 6AM of San Francisco seems to stand first in audibility through the terrible QRM of San Francisco amateurs, and in all probability will handle the San Francisco relay work. 6AH of Oakland has just completed his set and is doing very creditable work. We anticipate him being one of our prominent relayers.

The reports from the North are not in as yet, owing to the re-organization as stated before. 6AE of Stanford University, the old district manager, reports that there is a station in Stockton now so that messages will be accepted for that city, routed via 6EJ; also that 7CC is picking up in the relay work and messages for the North can be routed direct to him when possible or through 6BQ. 6JK of Palo Alto is a new station and promises to do very creditable work. His distance work is very good for the short time he has been on the air. He has a 1KW station and a one step amplifier. 6AE has been out of commission recently, due to a break of hoisting rope on the aerial system, but this will be remedied soon. He has been doing direct work with 6JM and it has been possible for him to read 6JM through the Bay amateurs' QRM.

There are some very live relayers coming to the front in the Portland and Seattle district, and expect by next month's QST to give a great deal of data on their work. All the sets are getting better and should in a very short time be in condition to handle relay work in a very efficient manner.

All messages for long distance relay should be given to those relayers that can work distance before ten o'clock, so that the distance relayers may be able to clear their files for distant work before too late. If they cannot get messages to the stations

that handle distant work before ten o'clock they should be kept over until the next day, as it only interferes with the work done by the distant relayers. Local work should be cut down when it is close to a powerful station relaying distant messages after ten o'clock, as it interferes greatly with their sending and receiving. It has been the habit of local stations around the Bay district that have messages for Reno to try and get these messages through themselves until about 11 o'clock, and when failing to do so they try to give the message to one of the stations that can work Reno easily, thus seriously interfering with relay work.

5ZA of Roswell, New Mexico, is heard in the Bay section, but at the present time has not been able to get messages through direct in a satisfactory manner. Usually they have to be relayed through Los Angeles.

Reports from all the districts will be in for next month's QST in a complete form, and the names of all the district managers and superintendents will be given at that time, and I trust that the new organization will prove efficient. Data from all the stations that are doing good work will be appreciated and wish that they would send a report of their work to me so that they can be given due credit.

ST. LAWRENCE DIVISION

A. J. Lorimer, Manager,
Montreal, Quebec.

Navigation re-opens shortly, which will cut down our activities to some extent. However, it is hoped that good co-operation, such as we had last summer, will reduce interference to a minimum. Most of the fellows are already sharpening up on the 200 meter wave and we hope the good work continues.

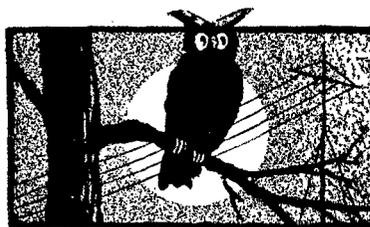
Mr. Millette (2AI) reports constant communication possible with 2BJ, Three Rivers, but has so far been unable to link up with 9AC at Ste. Croix. 2BJ hears 9AC but has failed to get any answer to his calls.

2AI will close down during the summer months. 2AK, 2AW, 2AM, 2BC, will no doubt be able to handle any summer work thru this city if conditions permit. As nearly all our "jumps" are less than 100 miles some midsummer work should be possible even with our ½ kw power limit.

Mr. C. Buzzell, (2AS) Cowansville, Que., has been appointed superintendent of the Eastern Townships District, succeeding Mr. Barnes (2AX), of Stanbridge East, who was unable to accept the post. Several prospective stations now developing thru-out this district promise to be "live ones".

Mr. Farmer, (3Z) Farnham, Que., expects to re-open his station at the end of

(Concluded on page 38)



WHO'S WHO IN AMATEUR WIRELESS



A. E. Bessey.

We're pleased to meet you on this page, Mr. Bessey, and to welcome you as the new manager of our Pacific Division.

Mr. Bessey was born at St. Catharine's, Ontario, in 1879, removing to the states at the age of six. He attended Southern California College, and at nineteen went into business with his father at Sunnyvale, Calif., where they have a fine factory manufacturing incubators and brooders. An early interest in Morse finally developed into a wireless set in 1909—a 5 kw. affair with a helix and straight gap and gawd nose what wave length; used to figure the bigger the spark the further it would go, so kept it 1½-inch and shot a spark that would make a hand-grenade look sick; pulled the lights so that anybody in town a mile away who could read continental could copy him. But he knows better now, and his post-war station, 6BR, is about the finest on the west
(Concluded on page 42)



K. A. Duerk.

Mr. Duerk known on the air as the operator of 8ZY, formerly 8AA, which was described in the last QST. We're glad now to see what he himself looks like.

K. A. was born in Auburn, Indiana, on May 3, 1899, with a spark coil in his left hand, but he didn't manage to get into operation until 1916, and reached the transformer stage of the game in time to do four months of DX work before the close-down. He says constant studying of QST and text-books has enabled him to make his post-war station successful from the beginning, but it's also true that he is blessed with a geographical location so favorable that there's not much a chap could do to a station that would keep it from being heard.

Mr. Duerk, by the way, is the efficient superintendent of the District of Western Ohio under Mr. Mathews, and is now located at Defiance, Ohio.

QST'S DIRECTORY OF CALLS

In continuance of the policy announced last month, QST presents another two pages of calls, which may be cut out and kept with the January supplement if desired.

FIRST DISTRICT

Frederick P. Kent	Loomis Institute, Windsor, Conn.	1PW
Elbert C. Brown	11 Harrison, Melrose Highlands, Mass.	1PX
Lester E. Gavitt	48 Beach St., Westerly, R. I.	1PY
Frank Lindergren	21 Aberdeen St., Boston, Mass.	1QE
Kenneth E. Hiorns	36 Central Ave., Seekonk, Mass.	1QF
Charles J. Keenan	15 Bordell Place, New London, Conn.	1QH
Connant Manning	Phillips-Andover Academy, Andover, Mass.	1QI
John L. Renartz	371 Hartford Road, So. Manchester, Conn.	1QP
Donald J. Ramsey	5 Ringfield Road, Winchester, Mass.	1QR
Edward S. Poster	15 Grove St., Winchester, Mass.	1QS
Everett C. Atwell	41 Woodford St., Dorchester, Mass.	1RB
Gifford L. Weston	56 Brook St., Pawtucket, R. I.	1RQ
Wallace Warren	1089 Beacon St., Brookline, Mass.	1RR
L. Milton Knight	331 Cabot St., Newtonville, Mass.	1RS
Arthur W. Summers, Jr.	36 St. Botolph St., Boston, Mass.	1SA
Harry Henson	34 Thayer St., East Braintree, Mass.	1SD
Robert Fox	124 Williams St., Chelsea, Mass.	1SG
Leon T. Hutchins	16 Mt. Vernon St., Somerville, Mass.	1SH
Harold C. Clark	13 Summer St., Hyde Park, Mass.	1SI
M. Gardner Clemmons	2 Dell Ave., Wakefield, Mass.	1SM

SECOND DISTRICT

Chas. Mulligan	Washington Ave., Bergenfield, N. J.	2BC
Elmer G. Baier	253 9th St., Brooklyn	2BD
Geo. S. Yerbury	331 Lafayette Ave., Passaic, N. J.	2BE
Byron H. Mills	U. S. Gen. Hospital No. 41, Fox Hills, S. I., N. Y.	2BF
Geo. F. Gaede	Pompton Rd., Paterson, N. J.	2BG
James Wood	1420 Putnam Ave., Brooklyn	2BI
Reed Cline	Main St., Millerton, N. Y.	2BL
John Pollock	230 W. 99th St., New York	2BP
Baldwin Guild	636 Mt. Prospect Ave., Newark, N. J.	2BQ
Leroy S. Callan	1032 New York Ave., Brooklyn 2BR	2BR
Fredk. E. Garlick	23 Occident Ave., Tompkinsville, N. Y.	2BS
Earl F. Adams	1043 Julia St., Elizabeth, N. J.	2BT
Harold F. Sniffen	730 E. 178th St., New York	2BU
R. ginald K. Woodward	34 Amherst St., East Orange, N. J.	2BV
Erwin Oeller	511 Mumford St., Schenectady, N. Y.	2BY
Will T. Weatherbe	609 W. 186th St., New York	2BZ
Harry G. Lichtschein	1245 Madison Ave., New York	2CA
John D. Schram	233 East 32d St., Brooklyn	2CB
Clarence Collignon	Montvale, N. J.	2CC
Roger D. Prosser	Chestnut St., Englewood, N. J.	2CD
Arthur E. Prince	30 So. Eldert Ave., Rockaway Beach, N. Y.	2CF
Frederic K. Shield	Coxsackie, N. Y.	2CG

THIRD DISTRICT

H. W. Morley	5042 Ogden St., Philadelphia, Pa.	3ET
C. E. Kaeber	2826 Tloga St., Philadelphia, Pa.	3EU
E. A. Taylor	Buck Lane, Haverford, Pa.	3EW
A. H. Morley	1003 McKean St., Philadelphia, Pa.	3EX
R. G. MacKendrick	307 Amosland Road, Holmes, Del. Co., Pa.	3EY
I. I. Blanford	922 North St., Portsmouth, Va.	3EZ
F. Atlee	2039 Pine St., Philadelphia, Pa.	3FA
W. Jordan, 3d	126 Atlantic Ave., Atlantic City, N. J.	3FB
W. H. Davis	627 Mount St., Baltimore, Md.	3FE
A. Hook	827 Penn St., Camden, N. J.	3FF
I. C. Herndon	115 Middle St., Portsmouth, Va.	3FG
F. H. Nichols	303 Penn St., Camden, N. J.	3FH
C. T. Majer	1705 Broad St., Philadelphia, Pa.	3FI
P. D. Mohr	126 S. 6th St., Emaus, Lehigh Co., Pa.	3FJ
J. M. Gillen	2134 28th St., Philadelphia, Pa.	3FK
E. G. Griffith	1422 Blavis St., Philadelphia, Pa.	3FL
J. F. Rau	2085 E. Kingston St., Philadelphia, Pa.	3FM
G. H. Wise	234 Broadway, Bangor, Pa.	3FN
C. J. Wenzinger	3135 Front St., Philadelphia, Pa.	3FO

FIFTH DISTRICT

L. Peine	1506 Rosalie Ave., Houston, Tex.	5AE
Davis Elliott	303 So. Copper Ave., Deming, New Mex.	5AM
Wm. Meyer	110 Park Row, New Orleans	5AX
Urban D. Worner	1052 City Park Ave., New Orleans	5BC
Cecil S. Westmoreland	1616 Herring Ave., Waco, Tex.	5BG
T. C. House	Box 75, Comanche, Tex.	5BI
Frank M. Eives	1401 So. Congress Ave., Austin, Tex.	5BO
Burie R. Jones	302 Lawrence St., Muskogee, Okla.	5BR
Harold Schonwald	443 E. Padon Ave., Blackwell, Okla.	5BT
Chas. M. Woodman	600 Rockwood St., Dallas, Tex.	5BV
Jack Grosse	1915 McGowen Ave., Houston, Tex.	5BZ
W. C. Hutcheson	Wind Rock, Tenn.	5DA

SIXTH DISTRICT

J. Toles	2723 Benvenue Ave., Berkeley, Cal.	6CF
W. C. Skilling	2910 Linden Ave., Berkeley, Cal.	6CG
H. C. Brown	843 Hayes St., San Francisco, Cal.	6CH
A. E. Johnson	1030 Delaware St., Berkeley	6CI
L. S. Barnes	827 Green Ave., Los Angeles	6CJ
C. V. Bascom	1020 E 27th St., Los Angeles, Cal.	6CK
H. T. Burkey	2017 Lincoln St., Berkeley, Cal.	6CL
D. M. Campbell	Highland Ave., North Glendale, Cal.	6CM
V. J. Campo	207 Gaven St., San Francisco, Cal.	6CN
P. U. Clarks	898 S. 8th St., San Jose, Cal.	6CO
F. L. Deetkin	1535 6th St., Alameda, Cal.	6CP
H. A. Greene	313 Lighthouse Ave., Monterey, Cal.	6CQ
G. H. Dennis	1227 Greshaw Blvd., Los Angeles	6CR
R. C. Denny	1516 McKenzie Ave., Fresno, Cal.	6CS
R. F. Downs	3988 1/2 S. Grand Ave., Los Angeles	6CT

SEVENTH DISTRICT

Donald Woodward	369 14th St., Portland, Ore.	7AI
K. A. House	130 Polk St., Moscow, Idaho	7AL
A. R. Tingstead	2507 1st St., Tacoma, Wash.	7AM
C. E. Williams	8326 13th Ave., N. W., Seattle, Wash.	7AN
L. G. Haw	14th St., So. and Bayview, Seattle, Wash.	7AO
T. T. Smith	1306 E. 75th St., Seattle, Wash.	7AP
R. Bostwick, Jr.	2906 West Eaton, Seattle, Wash.	7AR
F. Eastman	1506 28th Ave., W., Seattle, Wash.	7AS
E. LaPine	2301 E. Madison, Seattle, Wash.	7AT
L. F. Mahoney	461 Schyler St., Portland, Ore.	7AV

EIGHTH DISTRICT

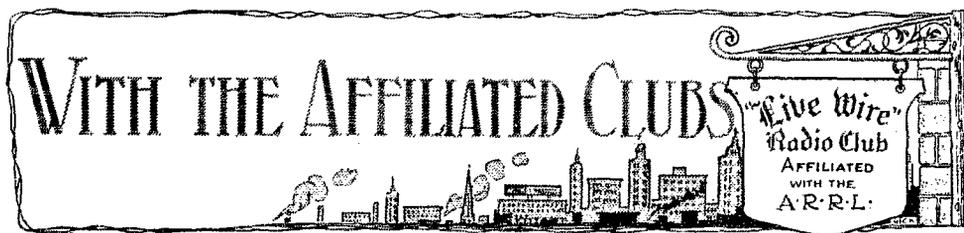
Russell F. Loomis	27 Villa Beach, Cleveland, O., (Correction)	8AA
Gregory Armstrong	1905 E. 90th St., Cleveland, O., (Correction)	8AE
Edwin H. Koehn	989 Meldrum Ave., Detroit, Mich.	8BA
Norman P. Badina	85 Brinkerhoff St., Plattsburgh, N. Y.	8BB
Melvin M. Burtes	906 N. Alvord St., Syracuse, N. Y.	8BC
Benj. S. Carpenter	14234 Detroit Ave., Lakewood, Ohio	8BD
Jessie J. Francis	5230 Superior St., Cleveland, Ohio	8BE
Geo. Wedemeyer	511 E. Kingsley St., Ann Arbor, Mich.	8BF
John F. Griffin	1783 Cort Road, E. Cleveland, Ohio	8BG
Archie G. Peoples	1592 E. 86th St., Cleveland, Ohio	8BI
Roy F. Herschelmann	325 Cleveland Ave., Detroit, Mich.	8BJ
Albert P. Tyler	14001 Ardenall Ave., E. Cleveland, Ohio	8BK
Malcolm F. Jackson	148 W. College St., Oberlin, Ohio	8BL
Orrin E. Dunlap, Jr.	1029 Cleveland Ave., Niagara Falls, N. Y.	8BM
Harold Morarity	1919 Lawrence Ave., Toledo, Ohio	8BN
Earl Ensign	923 W. Bancroft St., Toledo, Ohio	8BO
Clarence R. Partridge, Jr.	521 Nimons St., Saginaw, Mich.	8BP
Norman D. MacConnell	14006 St. Clair St., Cleveland, Ohio	8BS
F. B. Falknor	519 Coal St., Wilkensburg, Pa.	8BT
Jas. L. Russell	1941 E. 88rd St., Cleveland, Ohio	8BU
Geo. Schmidt	750 Ross Ave., Hamilton, Ohio	8BX
Floyd A. Knoll	93 Chapin Pkw., Buffalo, N. Y.	8BY
Garrold E. Flower	65 Hooker Ave., Detroit, Mich.	8BZ

NINTH DISTRICT

Verner Bolin	3212 Macy St., Omaha, Neb., (Correction)	9BR
James Schultz	9th & Cedar Streets, St. Paul, Minn.	9DH
A. A. Johnson	3rd & Grand Ave., Superior, Wis.	9DI
George H. Kenyon	4313 Ellis Ave., Chicago, Ill.	9DJ
Smith, William Noble	1243 First St., Louisville, Ky.	9DK
Elmer I. Stein	4237 N. Lincoln St., Chicago, Ill.	9DL
Andrew Fischer, Jr.	811 Cass St., Chicago, Ill.	9DM
Harold Chester Sever	105 Lincoln St., Valparaiso, Indiana	9DN
James K. Douglas	85 Mason Street, Milwaukee, Wis.	9DO
Eugene H. Hartnell	Salem, Wisconsin	9DP
William Leland Birren	412 E. Arcadia, Peoria, Ill.	9DQ
Donald Clare Wallace	823 Snelling St., St. Paul, Minn.	9DR
Raymond E. Breunig	2252 Roscoe St., Chicago, Ill.	9DS
Clifford Warren Patch	No. 5 Villa St., Dubuque, Iowa.	9DT
George Spencer Turner	124 S. Pearl Street., Independence, Mo.	9DU
Homer U. Bishop	310 Forest Ave., Neenah, Wis.	9DV
Robert W. C. Carter	597 Ann St., Blue Island, Ill.	9DW
Jay F. Carpenter	1473 Van Buren St., St. Paul, Minn.	9DX
Boyd William Nestlerode	17th & Jackson St., Sioux City, Ia.	9DY
G. L. LaPlant	Saint Anthony, Iowa	9DZ
William D. Wagner	123 West Fourth St., Duluth, Minn.	9EA
Richard R. Roby	215 E. Kiowa St., Colorado Springs, Colo.	9EB
B. E. McDowell	R.R. No. 7, Kokomo, Indiana	9EC
Wesley T. Myers	1275 Cramer St., Shorewood, Wis.	9ED

CANADIAN

H. Wilder	680 Roslyn Ave., Montreal, Que.	2AK
A. Rowland	684 Cuvillier St., Hochelaya, Montreal	2AM
J. McShane	71 First Ave., Verdun, Montreal	2AO
C. Buzzell	Cowansville, Que.	2AS
Dr. Ricard	Grandemere, Que.	2AT
W. H. Sutton	4400 St. Catherine St., W. Montreal	2AW



THE A.R.R.L. announces the affiliation of the following additional societies:

- | | |
|---|------------------|
| Detroit Radio Assn., | Detroit, Mich. |
| LaCrosse Radio Club, | LaCrosse, Wis. |
| Lowell Radio Club, | Lowell, Mass. |
| Mass. Inst. of Techny. Radio Soc., | |
| M. I. T., Cambridge, Mass. | |
| Minnesota Wireless Assn., | |
| Minneapolis, Minn. | |
| Nola Radio Club, | New Orleans, La. |
| Radio Club of Hartford, | Hartford, Conn. |
| Rockville Center Radio Club, | |
| Rockville Center, N. Y. | |
| South Jersey Radio Assn., | |
| Merchantsville, N. J. | |
| South Side Radio Assn, | Chicago |
| Y. M. C. A. Radio Club, | |
| 153 E. 86th St., New York. | |
| Y.M.C.A. Radio Club, Sioux Falls, S. Dak. | |

The applications of some thirty more clubs are now pending and the Secretary would like to explain the procedure followed in answer to queries as to why affiliation can not be accomplished "instantly". It is not simply a case of writing up a charter and mailing it—it's a real affiliation when it finally arrives—a till-death-do-us-part business, so we want no mistakes. Applications are referred to the Operating Department and thru the personnel of that organization an investigation and recommendation is made, and if favorable the matter then comes up at the next meeting of the League's Board of Direction and the clubs are formally declared affiliated. We are happy to say that there have been no blackballs—because it is the right kind of clubs who desire affiliation with the A.R.R.L.

Secretaries of affiliated clubs, a word with you. How the dickens are we going to print club news on this page when it's not sent in? Please.

RADIO CLUB OF HARTFORD

The regular monthly meeting of the Radio Club of Hartford was held on Tuesday evening, April sixth. The speaker of the evening was Mr. W. F. Coleman, a local radio enthusiast and formerly radio operator in Uncle Sam's Navy. His sub-

ject was "Elements of Electricity and Magnetism as Applied to Wireless," and he spoke about the theories of magnetism and electric waves, a subject which is usually neglected by the amateur. The average amateur knows more or less about how to operate his radio station, but is apt to be ignorant of the theory of radio and is unable to explain why it works as it does. Mr. Coleman also told of the radio work aboard a battleship, describing especially the remote-control systems which enable the operators to work the set from various parts of the ship. Mr. C. D. Tuska, of the C. D. Tuska Company, also spoke to the Club. He told the latest theory of the "fading signals." Mr. Tuska was also asked to tell about his radio telephone set which has entertained many local amateurs recently, with phonograph records, and readings from scientific papers.

Club meetings are held on the first Tuesday of each month. Every other Tuesday evening practice meetings are held, at which code practice and instructions are given to beginners in radio. All amateurs in Hartford and vicinity are urged to join the Club. Beginners should take advantage of the opportunity of obtaining code practice at practically no expense, as well as attending the regular monthly meetings at which interesting and instructive talks are given. The Radio Club of Hartford is the place where you will get acquainted with your fellow-amateurs. Address all communications to the secretary, Maitland Steele, 378 Park Road, Hartford, Conn., or call 11W by radio.

LOWELL RADIO CLUB

On April 6th the Lowell Radio Club, of Lowell, Mass., engineered a most successful radio dance at which "a large time was had by all". The music was transmitted from the club room by a radio-telephone built up of apparatus loaned by Boston radio firms and received on an aerial strung overhead in the dance hall. Western Electric "loud-speakers" were used and the music was sufficient in volume to fill the hall. Over a thousand persons attended, including a large delegation from Boston.

The mayor of Lowell also talked to the gathering by the same means, and the speech transmission was reported exceptionally clear.

The Lowell Radio Club is to congratulate on their successful affair. This is an idea which other clubs may follow in arousing public interest in amateur wireless, and it will build up a club too. The Lowell club had out an interesting circular in announcement and recounting amateur activities, with a note that any member of the club would be pleased to give further information on the work of the amateurs to interested parties.

QST de P. A. R. A.

A convention of amateurs of the Third District will be held under the auspices of the Philadelphia Amateur Radio Association on Saturday, May 8, 1920, 7:30 p. m., at Mosebach's, 1239 Girard Ave., Philadelphia. All amateurs, amateur organizations or individuals connected with radio work in the Third District are cordially invited to attend. Subjects of general interest to amateurs will be discussed, including problems of wave length, interference, the relation of the Navy and Department of Commerce to the amateur, relay traffic of the American Radio Relay League and other non-technical matters, and prominent speakers representing the Navy, Department of Commerce, American Radio Relay League and local radio organizations will be present.

The convention will be preceded by a get-together banquet and it is urged that radio organizations attend in a body if possible, or if unable, send a delegate. Tickets may be secured from P. A. Holt, 1902 N. 11th St., Philadelphia, price \$2 each.

NORTH DAKOTA RADIO ASSN.

The North Dakota Radio Association held a reorganization meeting at Fargo, March 12—a banquet followed by the business meeting. A good turn-out was present and the association has a good chance for some effective work.

Officers were elected as follows: President, Bert Wick, A. R. R. L., City Manager, Fargo. Vice-president, J. A. Gjehaug, 9ZC, A. R. R. L. District Superintendent for Northern Minnesota, Baudette, Secretary-Treasurer, R. H. Pray, 9EE, District Superintendent for North Dakota, Valley City. Additional members of the Executive Committee: B. J. Glein, Balfour, N. D., and Dr. H. T. Irvine, Fingal, N. D.

The membership includes radio men in Minnesota and South Dakota, so it has been decided to change the name of the organization to one more suitable, and a committee has been appointed to handle this matter and present it at the annual convention to be held in Grand Forks next fall.

PHILA. A. R. ASSN.

To the Amateurs near Philadelphia:

Must we lose faith in our fellow amateur? The writer has visited nearly fifty stations of the members of the Philadelphia Amateur Radio Assn. for the purpose of obtaining first-hand knowledge of the work they are doing in receiving. Very few hear long distance amateurs—even those using amplifiers—but a fair majority have very little difficulty in receiving NBA, POZ, and numerous exceptionally distant commercials.

This I believe is due to the fact that we build 200 meter regenerative sets and expect our western and down-east friends to adhere to the law. In the few stations visited that hear DX amateurs I found that those heard were up from 275 to 410 meters. If, fellow men, I see your call listed in some fellow's receiving list printed in these pages, and I sit in for a week or two with a good set and tune around 200 or even go to 250 meters, night after night, and I stray away from these tunes to copy a ship and find you—you, the fellow I have spent hours down on 200 trying to pick up—on a 400 meter wave, why shouldn't I feel sore and lose faith in you for infringing the law? I trust some of you will wise up, save yourselves some unpleasant criticisms, and learn to appreciate that our laws are in the "ace" class when compared with our sister country, Canada.

To those living in or near Philadelphia, the Philadelphia Amateur Radio Assn. will send a man to tune your set to 200 meters if only you will request it. There is no charge for this service, although paying a man's carfare helps to keep up the good work. You are welcome to join us. We are affiliated with the A.R.R.L. Our dues are \$3.00 a year, which may be paid in monthly installments by the younger set. We preach the law; we knock QRM; give technical instruction; practical demonstrations; promote good fellowship, and endeavor to live up to the law.

Publicity Committee, P.A.R.A.,
By W. F. Wunder, Chairman.

OPERATING DEPARTMENT

(Continued from page 33.)

the month, which will again give us a reliable connection east of Montreal within 25 miles of the Vermont border.

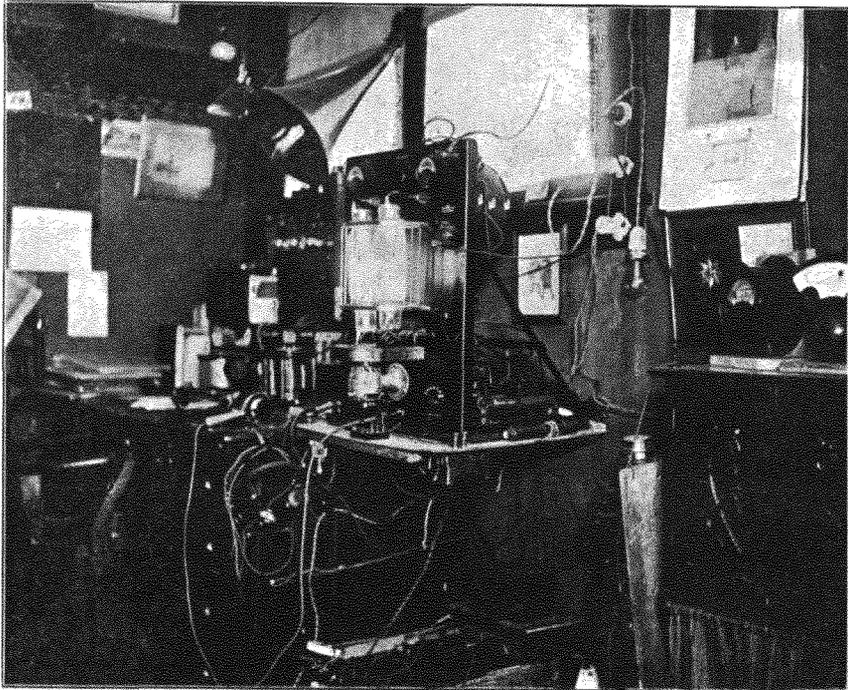
No report received from Mr. Jarest, (2AB), Levis, Que., but as his sigs have been reported here in daylight we believe there is "something" brewing in his vicinity.

We would like to have the A.R.R.L. man at Houlton, Maine, make an attempt to work this station, (2AB), as it is quite within his working range.

(Continued on page 42)



2XX, OSSINING, N. Y.

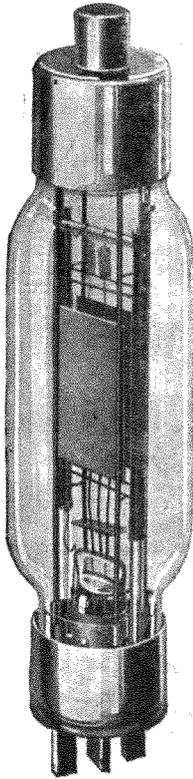


2XX is the station of Mr. Robert F. Gowen at Ossining, N. Y. Mr. Gowen is Chief Engineer for the DeForest Company, and 2XX was established to give the DeForest sets thorough tests under practical conditions and determine their range and reliability. It is therefore not in any sense an amateur station and properly does not belong in this department, but because it has been doing good work with amateur stations and on amateur wave lengths it has attracted attention and many inquiries have been received concerning it, in answer to which Mr. Gowen has favored us with the following description.

Our views show the antenna, the oper-

ating room, the motor generator, and a "close-up of the tube. A 170-foot four wire aerial on 12½-foot spreader is supported at one end by a 60-foot mast, on the other end by a pole on the house, with an average height of 55 feet, and has a capacity of 700 micro-mfds and a fundamental wave length of 355 meters.

The motor-generator is the source of high voltage for the plate circuit, and is operated from the 110 volt a.c. supply. Note the chopper on the shaft between the two machines. It was found necessary to move the machine some 30 feet from the instruments to prevent inductive noises—and from that time on the chopper

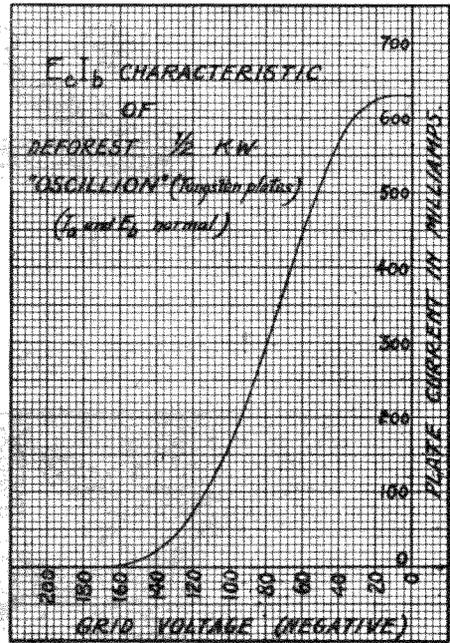


was abandoned in favor of buzzer modulation in the talking circuit.

The transmitter itself is one of the new 1 K.W. DeForest Type OT-200 Oscillon Panels, using 1/2 K.W. Oscillon bulbs oscillating in parallel. The circuit used is very similar to the transmitting circuit appearing elsewhere in this issue but employs an improved system of modulation developed by Mr. C. V. Logwood. No details are made public at this time but it is said that plate current as well as grid potential is directly modulated by the new method. Back of the panel is the tuning helix and condenser, remote-control relay, choke coils, filters, resistance, etc. The separate view of the panel shows the arrangement of the switches and meters. On the left is a wave-change switch and at the top of the panel is the plate coupling switch. The functioning of the circuit

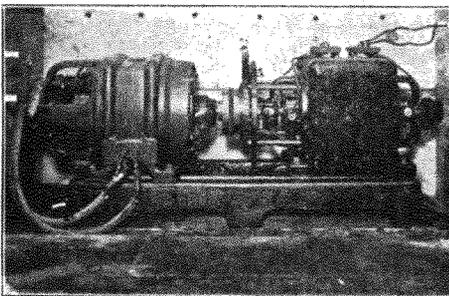
will be gathered by reading the before mentioned articles in this QST, and study of the DeForest panel in turn will give the amateur constructor some good practical ideas.

The fan below the tubes was for cooling, the set originally using nickel plate tubes requiring external cooling. Since then the tubes have been improved and now are "self-cooling", so that the fan motor is idle. The Oscillions have characteristics similar to most power bulbs, the E.I. curve being shown herewith.



Note that the center of the straight portion occurs at about 80 volts negative grid.

The radiation is only in the neighborhood of 3 amperes, yet this station has covered some remarkable distances, having been reported from Little Rock, Valley City, N. D., Baudette, Minn., Topeka, West Palm Beach, Fla., Chicago, etc., with an input of 300 watts and a wave length of 330 meters—just a splendid tribute to the



carrying powers of a little bit of C.W. energy. Transmission is by voice or undamped or modulated telegraphy at will, all being accomplished by modulating the grid leak. The damped telegraph signals have been reported QSA very at 1000 miles, and no doubt a great number of QST readers have heard the speech, music, and signals of this station.

2QR, KEYPORT, N.J.

2QR is the station of Messrs. Harold and Hugh Robinson at 13 Walnut Street, Keyport, N. J. Our readers will agree with us that it is a neat well-arranged outfit.

The receiving set is composed of 15 DeForest unit panels, and honeycomb coils are used for the tuning. Marconi bulbs are used thruout, Class I as detector and Class II, with Acme interstage trans-

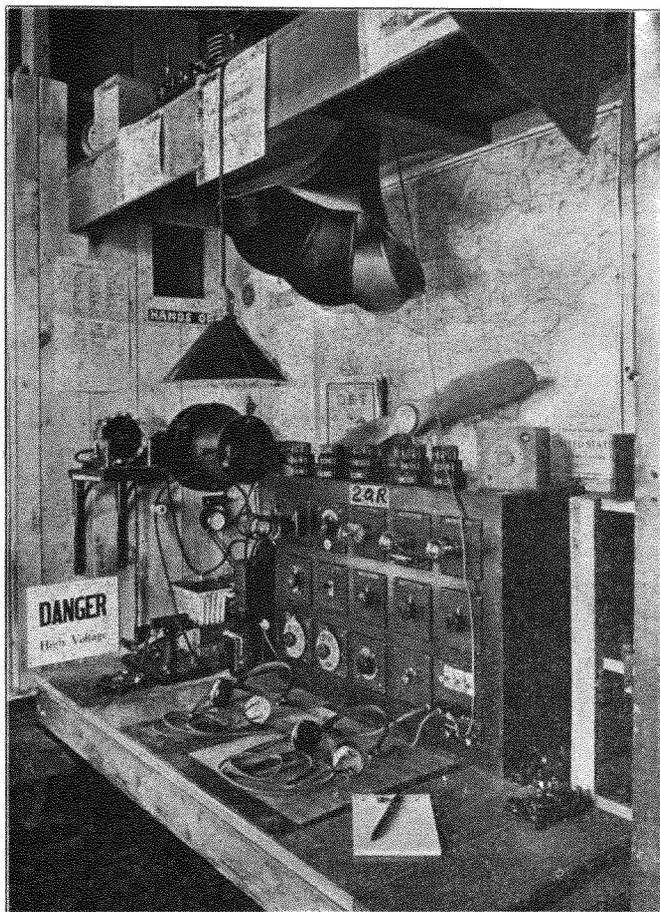
formers, for the two steps of amplification. Note the crystal also, for emergency work. 2QR has a full set of DeForest honeycombs and copies everything from 150 to 25000 meters. For amateurs up to 250 meters they report best results with L-35 on the secondary, and L-25 for primary and tickler. In addition to Brandes Superior Phones a DeForest loud-speaker is used for loud signals.

The transmitting side has a 25,000 volt 1 K.W. Thordarson connected to Dubilier mica condensers in series, each unit being rated at .007 mfd., 14,000 volts. The oscillation transformer is the new design of the International Radio Tel. Co. and the rotary is a Standard with 12 points, direct-driven from a variable speed motor—note the rheostat in front of the change-over switch. A four foot ground lead earths the set on steam pipes, driven pipes, and buried metal. Heavy leads are used in the connections, and the installation is pleasing to the eye and looks A1.

2QR has two aerials, 50 feet high and at right angles to one another. The receiving antenna is three 160-foot wires spaced 3 feet, and the one for transmitting has six wires, 80 feet long, spaced 2 feet.

The Messrs. Robinson are to be congratulated on a most business-like installation.

On top of the cabinet are two valuable adjuncts to any amateur station—one a wavemeter (in this case an Amrad), and the other—QST!



SUMMER WORK

(Continued from page 16.)

C.R.L. Paragon in the accompanying illustration. The Amplifon is produced as a separate unit in order to facilitate its use in connection with other apparatus which the owner may have, such as a long wave set. At the same time its use with the Paragon is provided for in such a way

as to make the two practically one set when in operation, the only connections necessary being four small bridges at the right hand end of either cabinet. The mechanical construction of the Amplifon Cabinet is similar to that of the Paragon and other standard apparatus of this firm.

As will be appreciated by those who have done relay work, a set in which the

filament circuit must be broken when transmitting is almost useless for effective message work, since a certain time must elapse after the set is returned to receiving position before the tubes regain their operating temperature. In order to avoid this condition the makers have incorporated in the Amplifigon Cabinet a special three position switch. In normal receiving position, this switch, of course, throws on both filament and plate batteries. When in the center position this switch disconnects the plate battery, thus allowing transmission, the filament battery being allowed to remain connected. When the transmission is finished and the switch returned to receiving position an immediate "come-back" of the tubes is noted. A readjustment of the receiver is therefore unnecessary, and as a result none of the incoming message is lost. In the third or "off" position of the switch both filament and high voltage batteries are disconnected and in addition the high voltage batteries are also disconnected from the potentiometers.

A number of these combined instruments have been in use during the past relay season in many of the more prominent relay stations and their effect is beginning to appear in the daylight traffic work of the stations in certain parts of the country. It is believed that their effect will be still more strongly shown by the possibility of continuous summer work.

A REPLY FROM MARS

(Concluded from page 22.)

hearing of that wash-boiler stunt I decided to try it. Guess that Smith fellow was shooting a lot of bunk to you guys about that being a poor ground so he could use it and get big credit for long distance work. Meter jumped up to 15860 amps after I cut out those pipes and used the boiler. Have Gawler bring Smith up with him when he comes—I'd like to see what he looks like. What I want to know is how on Earth did Gawler get a car?

Say, tell Mrs. 8ER to call me some time. Would like to talk to her. She seems to be the most popular ham on Earth. Well, guess I'd better close now and get some sleep, so I can have my set working good by the time hot weather sets in down there. I'll be on most of the time then. Be a good scout now, ole top, and write again soon—anything at all from a half cycle to a few thousand ohms will be appreciated—anything so we can get across—even a Wheatstone Bridge. Tra-la.

Yours truly,

I. M. Static,

Chief Radio Inspector, Mars.

P.S.: Stella and Luna send best 73's.

A. E. BESSEY

(Concluded from page 34.)
coast—the best that money can buy.

Mr. Bessey liked the Old Man's "Rotten Hours" with one exception; he doesn't let anyone "sit him out"—says his stomach is iron-clad and can stand tobacco smoke and all that goes with it—so that if his hook isn't clear when he turns in it's because there's no one else on when he quits.

Like many business men, Mr. Bessey finds the diverting element in amateur radio most benefitting—it takes his mind off of business affairs and he's fresher next day for it.

His ambition is to work the East Coast and he's tinkering with amplifiers, prepared to go twenty stages if necessary. So far he uses seven and reads 92N, which is promising.

Mr. Bessey wants us all to know that there is surely a lively bunch of amateurs in his Division, and assures the other D.M.'s. that they will have to look to their laurels when he gets his bunch pulling in line. Here's luck Mr. B.—we know you have the hearty support of the boys!

OPERATING DEPARTMENT

(Continued from page 38.)

ONTARIO (CANADA) DIVISION.

A. H. R. Russell, Manager,
353 Markham St.,
Toronto, Ontario, Canada.

Things are at last looking up in this division, and relay traffic is now being handled between Canada and the United States via two distinct lines.

The Southwest Ontario District, under the leadership of our energetic new district superintendent, Mr. W. J. Carter of Windsor, 3DH, is being very efficiently and well organized, and Mr. Carter reports that he hopes in the very near future to have high power amateur stations ready for relay work in Windsor, Wheatley, Chatham, Guelph and London. Messages have already been exchanged via 3DH with many Ohio and Michigan stations.

In the Central Ontario District, both Mr. Rogers, 3BF, and the manager's station have established reliable communication with 8MZ at Lancaster, New York, and the manager advises that all relay traffic for the Central Ontario District should be forwarded via 8MZ and 3BP.

Towards the east, unfortunately, things at present do not look very promising as the eastern part of Ontario seems to be still very undeveloped in the radio line. However, the situation may improve later in this district and we have not yet given up hope of working through to Montreal.

(Concluded on page 52)

STRAYS

We are sorry to learn that Trump of 9BT Topeka, has had to leave the game for a while and is now in Phoenix, Ariz., for his health. He certainly had a splendid station this season and we hope he can be back with us strong next winter.

We've lost 1RN too. Rawson is now located in Chicago making steel fishing poles (awful thing for a radio man to be doing), and has been obliged to close up the station at Belmont. He too expects to be on the job again in the fall.

Cheer up, we're trying to dope out something on an A. R. R. L. emblem. Too busy printing QST to come to a decision yet. We'll have some news on it soon.

That lightning switch you didn't have time to put in in the mad scramble to get in the air last Fall—better do it now, as you can ground your wave-strainer during the electrical storms this summer.

Everyone should have a copy of the "Radio Communication Laws of the United States," which may be obtained for 15 cents (not in stamps) from the Superintendent of Documents, Government Printing Office, Washington. The international abbreviations, etc., are included in this publication.

See that picture of Mary Whosit in a phonograph advertisement in all the magazines—scene from "Oberon," beautiful lady beside the sea, and all that? Sort of a "Study in Wave Forms," as it were, eh?

Got all the Christmas Greetings stuff off your hook yet?

We saw an interesting indoor aerial recently. Thru the door between two rooms an X-shaped antenna was erected with the wires going to the far corners of the rooms and lead-off taken from the crossing point, An idea.

Recently our girl asked us what "fading signals" were, and we explained at length in our w. k. non-technical style. She replies: "You said the strength of signals goes up and down, but you forgot to say WHAT it goes up and down. Or is that the secret?" Hellup!

Part II. of Stanley's "Textbook on Wireless Telegraphy," entitled "Valves and Valve Apparatus," as mentioned on page 45 of March QST, postpaid from QST Book Department for \$5.00.

Commercial and amateur operators will regret to learn that Lawrence B. Robinson, of Gorham, Maine, operator on the S. S. Macona, lost his life on Jan. 18th when his ship went on the rocks off the Swedish Coast near Gothenberg, broke in two and sank, with the loss of all hands except the second officer.

A typical amateur, young Robinson entered the Marconi employ, running coast-



Lawrence B. Robinson

wise at the age of eighteen; entered Harvard Radio School in April, 1917, in the Coast Defense Reserve, and volunteered for active duty in the war zone the same month. He was promoted to Chief Radio Electrician in July, 1918, and released from service a year later. He was a clean-cut American boy with many friends, who extend their sympathies to his parents.

The French warsloop "Aldebaran," detailed by the French Government for wireless research work in the Antipodes, has

been making tests in the South Pacific near New Zealand where are located the antipodal points for the big French stations. At a point just southeast of Awarua the "Aldobaran" located a spot where reception from YN was as strong as in the Mediterranean a thousand miles from Lyons, and apparently confirmed the possibility of exceptional reception in antipodal positions.

Friend of ours rushed in wild-eyed the other day and announced he had had a 100-watt bulb given him. Visions of helping him rig up a set for it rose before our eyes and we congratulated him; then asked what kind it was. "Mazda", he replied. (He got the trap-door!)

Seems somebody at least saw that last "Stray" in November QST, didn't they?

Two more of the boys have launched in business for themselves: Mr. John DiBlasi and Mr. Joe Stantley, well-known in the Mesco stores, are opening up at 6 Warren St., New York, under the name of Continental Radio & Electric Corp'n. Their initial QST advertisement appears elsewhere in this number. Both have hosts of friends who join us in wishing them every success. They promise free room in their new store for Mister Cronkhite's Free Lunch-Hour Class in Ultra Theory, and the gang is invited to drop around and chew the rag.

WOULDN'T IT BE WONDERFUL:

If 2AB got some new phonograph records!

If someone invented a hookup that would do away with "B" batteries?

If audions sold for 89 cents?

If all the long distance records we hear were true?

If every ham read QST?

If we all had money instead of brains?

If we could tell a naval station to QRT once in a while?

If there were no arc lights to bother us?

If the radio inspector never came around?

If our mineral detectors never got out of adjustment?

If the entire Third District would attend the Phila. A. R. A. Convention?

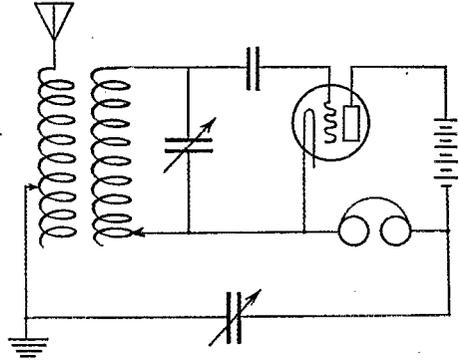
If all the navy radio experts were experts on radio?

If somebody would invent a circuit-breaker (or a jaw-breaker) for the control of QRM?

Mention has been made in QST of the Holland Radiotelegraphy Society, a Netherlands amateur organization. Thru the courtesy of their secretary we are now receiving their official organ "Radio-

Nieuws," a very nicely gotten up monthly magazine about the size of QST. Transmitting is forbidden in Holland, so that the articles treat largely of receiving. We were interested in noting that Murdock condensers and phones and DeForest honey-combs are as popular there as here.

This hookup is sent us by Mr. Albert P. McDowell, Jr., of Mt. Airy, Philadelphia, who claims it entirely eliminates 60-cycle



induction hums from house currents and other nearby wiring. The connection to earth thru the extra variable is the only variation from the standard hookup. Try it.

The District Naval Communication Superintendent at San Francisco has sent out blanks to sixth district amateurs similar to those recently sent out in the New York district, preparatory to an amateur code and press schedule like that started last fall at NAJ and NAH. The decoded messages are to be graded, scores kept and published, and the best worker determined.

Anybody know the decrement of NPG? Not only do Frisco amateurs report bad QRM on 200 meters, but the same is true from San Jose, fifty miles away. NAH all over! Here's the answer: Get up a delegation and go see the Commandant and explain the situation. It's inexcusable and no doubt will be corrected when brought to attention. If it's as bad as it seems we know Mr. Dillon, the R.I., will be glad to help.

New book received: "Electric Oscillations and Electric Waves", by Geo. W. Pierce, Ph. D., Professor of Physics at Harvard University. Published by McGraw-Hill. An elaborate mathematical treatment of some of the fundamentals of the theory of electric oscillations and waves. Of little value to the average amateur but an authoritative work for the research engineer and student. QST Book Department has it—\$5.00 postpaid.

Radio Communications by the Amateurs



THE PUBLISHERS OF QST ASSUME NO RESPONSIBILITY FOR THE STATEMENTS MADE HEREIN BY CORRESPONDENTS

TELEPHONE EXPERIMENTS

78 S. Hamilton St.,
Poughkeepsie, N. Y.
April 12, 1920.

Editor, QST:

Just a few words regarding some dope which undoubtedly will prove of interest.

About a month ago 2DA, whose station is about one half mile from the writer's was listening in and unconsciously tapped the grid post of his V.T. calling 2AR. I happened to be receiving on the same wave and his sigs were very QSA. I answered at once on the spark and asked what he was using. He was very much surprised and told me what he had done. I immediately tried it with the same success.

The receiving tubes having ample power to more than cover the distance the next step was why not use a transmitter in the circuit and have a fone?

We both immediately got hold of old transmitters and the following night hooked them up and tried it out.

Considerable trouble was experienced at first which has now been eliminated and communication has been easily accomplished over two miles using a single tube. This system is in continuous operation between 2DA and 2AR each hearing the other several feet from the phones. The modulation is exceptionally good, much clearer than with a power bulb phone as there is no generator hum or other cause for interference.

The general system is as follows: At 2DA the Paragon, two variometer hook-up is used with two steps of audio-frequency amplification. A high resistance transmitter is connected in series with the ground lead. The circuit is caused to oscillate by variometer adjustment and then modulated by the transmitter. A plate voltage somewhat higher than that used for receiving was found to give better results. Considerable difficulty with howling and C.W. interference was noticed with this connection as the writer found it necessary to use heterodyne reception, the voice being inaudible when operating below the oscillating point of the receiving tube. This was overcome by 2DA shunting his transmitter with two dry cells, the

transmitter evidently being of too high resistance for successful modulation. A variable condenser across the transmitter or across both transmitter and battery had no effect. Reception is now possible with the receiving tube well below the oscillating point.

At 2AR a different combination is used. Here I have a single tube and use the Armstrong regenerative circuit with a single variometer. A LOW resistance transmitter directly in the ground lead is used. The circuit is caused to oscillate by variometer adjustment and then modulated the same as at 2DA. A plate voltage of 40 is used that being the highest available at present. The system here will not operate as a transmitter below 30 volts. No trouble has occurred here at all. A shunted capacity has no effect and a 3 or 1½ volt battery shunted across the transmitter caused the system to become inoperative.

Both sets are of the short wave type, 2DA tuning up to 600 meters and 2AR up to 300. Marconi V.Ts. are used by 2DA while an Audiotron is used here. Tight coupling at 2DA and loose coupling here seems to give the best results.

When the circuit is operating properly everything spoken into the transmitter will be clearly heard in the receivers at the transmitting station.

The many advantages of this system are at once apparent. The only switching done is that of reducing the plate voltage to receive. Both stations operate at exactly the same wave so no tuning is necessary. The transmitting station can immediately hear any bad QRM on that wave and either stop talking until it ceases or change to some other wave in case the receiving station misses any part he may immediately break in, the transmitting operator stopping at once. Shunting the transmitter with a key, provided no shunt battery is required, gives a low power C.W. set which may be used thru QRM strong enough to cause the fone to be too weak.

I have never heard of any phone set being as simple as this, the only additional piece of apparatus needed being an ordinary telephone transmitter, preferably of low resistance.

I would be glad to hear of any one trying this as to results obtained, etc. It certainly works beautifully here.

Hoping this will prove of interest to readers of QST, I am

Sincerely yours,
G. H. Underhill.
2AR.

Editor's Note: Now somebody tell how to take advantage of the audio-amplifiers as power amplifiers, so that the output may conveniently be radiated without complicating the set as a receiver.

CONSTRUCTIVE CRITICISM.

Buffalo, N. Y., March 19, 1920.

Q S T Publishing Co.,
Hartford, Conn.

Gentlemen:

I have not received my March copy of QST. Please send one to my home address which is my subscription address and given below. By the way, if you will remember, just before the U. S. entered the war, the Radio Ass'n of Western New York, of which I am president, wrote in a suggestion that all of the wireless clubs be organized in a National Organization of clubs. The next copy of QST contained an editorial on the subject, with no mention made of the matter being suggested to the editor, he leaving the reader to believe it original with him. If you want your magazine to take on the aspect of a money making scheme, keep on doing these things. Let's have an amateur paper be one in reality. If you would devote some of the valuable space which is now allotted to traffic news and give the clubs throughout the country a chance to say something you would be taking a long step in that direction.

Don't rate me as a kicker, but honestly now, take the last copy of Q S T (mine was a borrowed one), and see the large number of phrases such as, "nothing definite to report," "we expect to open up soon," etc. I would trim all this out and rather play up accounts of such things as the New England banquet. The banquet idea in itself is a valuable one to be spread out on your pages to unite the boys with a fraternal spirit. Every encouragement should be given to clubs to aid their organization. You will find that the ones who cause most of the QRM are non-members of local clubs. Every encouragement should be given to small clubs with a large field to expand. If you expect to do any efficient relay work, the non-members must be rounded up. "The little boy with the spark coil" before the war, has become the "smart overgrown boy with the transformer," but thank goodness, in a much better position to be taught. We of the Buffalo club have lined up our members and are going after these fellows with a fine mesh net. We will get them all.

So after all, my good friend, you see we need encouragement and not discredit. The best interest of the AMATEUR should be our motto.

Very truly yours,
John G. Rieger,

15 Fairview Pl.

[Editor's Note. Mr. Rieger's letter concerns a failure on Q S T's part to mention a name as the originator of an idea (which perhaps many of us shared) which was presented before the war, and possibly overlooked inadvertently by the present editor's predecessor. We're sorry, but do feel that it should be seen to be a subject on which many of us had been thinking hard for a long time, even then.

The editor is grateful for this letter, as it opens up important topics for discussion. He respectfully represents that as your secretary "the best interest of the amateur" IS his motto, and the constant guidance of all of us here at Headquarters. The gentleman does not seem fully to have imbibed the realization that Q S T is not merely a "magazine" which has been successful in appealing to the amateur, but is a magazine which is operated BY those amateurs who comprise the A. R. R. L., Mr. Rieger included. Your Editor is no professional journalist—he's a radio amateur, and his constant effort is to make Q S T truly representative of the amateurs.

Of course we don't always succeed, for the money that prints our Q S T is limited and we can not in every issue present a whole lot of matter on every topic that interests us amateurs. Some of us like one thing and some another, and we must have variety to suit all hands. We cannot have all club news and no traffic news nor all traffic and no club—we must have both. We want information about the affiliated clubs, but the clubs must send it in to have it printed. If they will do this we shall have both.

Comment is invited.

—K. B. W.]

DAYLIGHT RECEPTION.

Brooke, Va.,
April 4, 1920.

Editor, Q S T:

I have been making daylight tests at 2 p. m. daily with 3BZ, 170 miles distant, Mar. 29th to April 2d, inclusive, 220 meters, 550 watts input. I have read him every day nicely with a single VT.

Here's a few others I heard to-day on a single tube between 2-2:15 p. m. and 3-3:30 p. m.: 3AD, 3BI, 3DF, 3DW, 3EN, 3EI, 3GB, 3GZ, 3IB, 3MA, 3ND, 3XF. The following doubtful account heavy static: 2MZ,

2RB, 3EM, 3HB, 3MS, 3OU, 4BT.

How's that?

Yours truly,
A. L. Groves.

EARTH CURRENTS AND FADING.

2BF, 243 Mackay St.,
Montreal, Canada.
Mar. 29, 1920.

Editor, QST:

Have been making some very interesting observations up here. Please look over the enclosed sheet of comparisons between my radio and wire logs during the past week. I am employed at a large Central Telegraph Office and have some accurate data on weather, etc., at my disposal.

As far as I can ascertain, earth currents and aurora have a great deal to do with the phenomenon of fading, etc. Have noticed

Time.	Sigs.
Mar. 22 1-2 a.m.	Amateur 1, 2, 3, 8, 9th dists.
Mar. 23 12-3 a.m.	Amateur nil Com'l nil
Mar. 24 12-1 a.m.	Amateur nil Com'l nil
Mar. 25 12-2 a.m.	Amateur nil Hrd NAF, NAH, at 1:30 but they fade out, 1:40 nil.
Mar. 26 12-1 a.m.	Amateur nil Hrd. NSD but fades out.
Mar. 27 12-3 a.m.	Amateur few, com'l few, all fading badly.
Mar. 28 12-3 a.m.	Amateur QSA, com'l QSA, but swinging.

many articles in radio journals stating that aurora has no effect on radio, but undoubtedly observations were made at sea and not on land. If we work on Tesla's theory that wireless waves pass thru the earth, there is every reason to believe that earth currents are the cause of all the trouble. The currents might even distort the radiation from a radio station, concentrating its sigs in one direction with a corresponding decrease in the opposite direction.

A very peculiar thing I notice is that water blocks the paths of these earth currents. I have made no attempt to study up on this subject, so can offer no other than the observations I have taken. I shall continue to make notes on this work and will advise you from time to time. Meanwhile I would like to hear the views of yourself and others who have made any notes on the subject.

Sincerely,
Albert J. Lorimer.

Weather and Currents.

Clear and cool.

Clear and cold. Very heavy aurora east and west. 20-100 mils, varying. Clear and mild. Aurora still very heavy. Mostly west.

Clear and mild. Considerable aurora west but clear east.

Clear and warm. 20 mils earth current steady, flowing west. Nothing east.

Warm—rain. 10 mils earth current west.

Clear—mild. Earth currents not noticeable.

HOW DO WE REALLY FEEL ABOUT IT?

Middlebury, Ind.,
March 22, 1920.

Dear Eddy:

Think it's time for me to write a few lines and tell you what we think of our magazine in this "neck of the woods."

It is certainly the only wireless magazine for all those who are interested in the subject. We get quite a few different ones out here and yet QST beats them all.

I have noticed with pride and satisfaction its growth since those few sheets of a few months after we were re-opened until the last few copies. I believe that it is now up to standard and that in a few months it will be far above standard. Even better than before the war, and believe you me, we thought it some paper then.

There are a few things, however, that I don't like to see, or rather, "hear" is more appropriate, I suppose. It seems to me as if amateur wireless telegraphy is being put

too much on a business basis. It seems as if the fellows who do not have messages to get thru are out of the game.

If I answer a station the first thing he asks is QRU. If I say NIL, then it's "73" for me. If I don't know who he is I don't even get a chance to say QRA? to him.

Where is the fellow who calls his pal in another state and says "How is the weather"? or "How does the world treat you"? There are very few of those fellows around here. I am sorry to say this, but nevertheless, it is true. If you would say a few words to your friends via radio you must put a number to them and tag them as SVC. Just a little too much business and not enough pastime.

Now a few more lines to tell you about the traffic handling in Northern Indiana. This territory has a very poor representation. Most of the traffic is carried over our heads from Ohio to Illinois. I am afraid that as soon as summer static gets bad there will be trouble in getting traffic over such long distances.

We in this district are on no regular relay route and so the messages get thru "hit or miss." However, this will be remedied in the near future with the re-organization of the Northern Indiana Radio Association which has already been affiliated with the A.R.R.L.

Have been using a Packard half kilowatt transformer and must say that I have rolled up quite a range with it—about thirteen hundred miles. Pretty good, eh?

Thru the kindness of 9CB (ex-9ANO) I have installed his one kilowatt Thordarson. Altho I have used it but a few days have worked regularly a distance of one hundred and fifty miles.

Well Eddy, OM, guess I will have to QRT now in order to give someone else a chance to file their grievances with you.

For the continued success of A.R.R.L., I am,

Very truly yours,
Maxwell W. Hutchinson,
Radio Stn. 9HR.

[Editor's Note. This letter expresses sentiments in line with several others we have heard. Not all of us CAN be relayers, and we hear it pointed out that if we ever do get a perfect-working traffic network everyone's interest would straightway die on account of the absolute monotony of the thing. Now just exactly what is our aim and our future? The Editor requests communications on the subject, but let them be constructive criticisms like this—this letter is worth its weight in gold, while mere destructive knocks simply handicap efforts to progress.]

SAVED BY A "FORM-LETTER" !

Chicago, March 30, 1920.

Editor, QST:

Hr, nr1 fm Chgo pse. Your two cards could not be read thru financial QRN, but your letter vy QSA hr. Am sending two dollars (see enclosed slip) for renewal of subscription. QST is really indispensable in an up-to-date amateur radio station, and I am glad to be again QSO. Wl c u l, o m, 73.

de 9BJ.

PATENT IT.

Radio 9ZL, Manitowoc, Wis.,
March 13, 1920.

Editor QST,
Hartford, Conn.
Dear Editor:

I note in the March issue of QST, page 14, that our sigs were picked up 500 miles east of New York, by the S. S. "Curlew." It might be of interest to state that at the time these signals were picked up we were using a fixed (series of 4) gap, and a four turn helix, in connection with a 1KW Thordarson transformer and an oil immersed

plate glass condenser. We were awaiting our HYRAD rotary and Thordarson OT, and used the makeshifts for temporary duty. Also succeeded in working 2ZS and 2BM with the same makeshifts. What next?

Fraternally,

H. J. Burhop,
District Superintendent,
Wisconsin District, A.R.R.L.

NEITHER ARE OUR LITTLE NEIGHBORS.

8CB, Detroit, Mich.
March 12, 1920.

Editor QST:

Sometimes there happens a moment in the experience of radio operation that repays for all the nerve trying, joy killing perils that beset the operator trying to receive a LD message thru offending local QRM; for instance: Not long ago I was receiving some LD traffic along about midnight thru a couple of local spark coils grunting off so-called signals in very hoarse, file-edged voices. After working hard for half an hour to get the message one of these tender offenders with an unsteady timid, 3-a-minute fist with a code which might or might not have been continental, asked me if I was a Commercial Station. Upon replying "No" he came back beautifully courageous and remarked, "Neither am I."

Howzat, Eddy?

73-CUL,

Clyde E. Darr.

P. S.—Honest Engine this is true.

FAREWELL de 9AJ.

9AJ, Peoria, Ill.

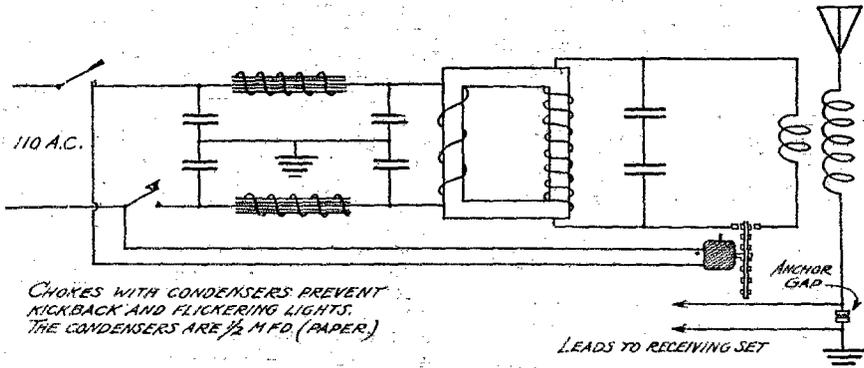
Dear Mr. Warner and QST staff:

Just a few lines and it's QRT for urs truly. Going to join the ranks of the Has-Wuzzes for the time being. It's not good-by; just farewell until next fall. Expect to be sewed up building my home very shortly now and will have to put forth all my efforts toward that end. Let me whisper, I am laying a new keel for a new 9AJ too, b'gosh. It's gotta be 500 cycle synchronous. I've had the high-frequency bug now for quite a spell. Sure will miss the old familiar sparks—1AW, 2ZS, 3BZ, 8ER, and the good old stand-by 8CB. Old 8CB was good for QSR east any time. I sure hate to lose out on the opening of our Canadian cousins but can't always expect things to break right.

There are a few certain neighbors who will have a regular shindig when they hear I've holed up for a while. One night a few months ago the kingpin next door came to my front door about 1 P. X. I was right in the middle of a msg to 5ZA. The mercury was standing about where the needle on your HWA hangs when some son of a

gun has swiped a coupla feet outa your ground lead, and the wind about where they make everything snug on a howling nor'easter. This bird was in his pajamas and slippers. I saw he was darn near frozen so I asked him in. I had a sneaking notion what was up so I beat him to it. I said "Now listen, Oscar, you have that boy of yours take down that light service and put it up the way I told you and you won't have any fire-works, savvy?" I kinda took the wind out of his sails. We had a coupla fingers of chain lightning (How do they get that way?—Ed.) so he went home. He had strung a light service from his attic to his garage, same length as my antenna and about 15 feet lower. You can imagine how it would load up when I got to punching the key. I bought some resistance rods and bridged his service and drained the static. But he sure was some scared Indian—says he went to turn on a switch and got a hulluva jolt—claims fire was jumping from

I would like to clear up a few points in regards to the break-in system, used by myself and others in St. Louis. I have used it for the last five years, but few have had success with this proposition. My receiving station is on the first floor and the transmitter in the basement. I use a distant or remote control. The key I use is one built by myself, but any other key will do. Only one single pole single throw switch is needed. This switch controls the whole transmitting set. When closed it starts the gap motor and supplies current to the key. The key is dead unless the switch is down and the motor running. In the ground lead is an anchor gap. Leads from both sides are taken to the receiving set. So far so good, and that is as far as most of the fellows get. They turn on the V.T., press the key, get a bat in the ear, and out goes break-in. "N.D.—give me the old aerial switch." If it don't give them a crack in the ear it chokes the bulb so it



his gas stove to the kitchen sink. I know for a fact, tho, he had a Fourth of July over there one night, and I couldn't laugh as I'd have had him to go to the mat with right then.

Well, it's quite a while after taps and the wife is liable to make bunk-check any time now, so will have to QRT and do some bunk fatigue. I'll keep in touch with you and keep a line on what's doing thru QST. Best of luck, success to the A.R.R.L., and regards to the boys.

Sincerely yours,
Mackley.

MAKING A BREAK-IN SYSTEM.

5740 Bartmer Ave.,
St. Louis, Mo.

Editor, QST:

As a member of the A.R.R.L and a radio bug I have a few ideas that I submit so other members of the League may benefit by my experiments. A member who has good ideas in radio construction and keeps them to himself is of no benefit to the League.

takes 15 to 30 seconds for it to come back.

Here is a simple way to get rid of this trouble and still not decrease the strength of incoming signals. The leads coming from the anchor gap to receiving set should either be in lead-covered duplex No. 14 double-covered wire or twisted lamp cord. The former is far better but more expensive. This reduces induction to the minimum and clears up some of the trouble.

Very few men using V.T.'s know the reception of signals depends upon the grid leak. A V.T. will work or not, depending upon the grid leak. All V.T.'s differ in regard to detector action by the use of variable grid leaks. One bulb will work fine with one leak and another N. D. Each one of my tubes has a different value of leak: On the base of the tube between the prongs I use a pencil mark running between the "Grid" and the "Fil" opposite. If the leak is not heavy enough I use more pencil. If too much, I erase part of it, thereby getting the most out of the tube. Now, getting back to the break-in, I increase this leak until I can't choke the tube while I am send-

ing. This is very simple and, once tried, surprising results will be found. I never throw a switch to send or receive after once starting up. Even in long distance work I keep the motor in operation. No noise, no bother at all. I built every bit of both receiving and sending sets, even to the key.

Well, OM, I will pipe down now and give you a rest.

Your friend,
D. H. C. O'Neil, 9GO.

WE'RE FOR YOU, BUDDY.

19 Royal St.,
Boston, 34.

Editor, QST:

Many of us around Boston have been interested in the efforts to control QRM. Among others I am one who hopes that the way is soon found.

Reading the QST I find that the little fellow with the spark coil is blamed for the QRM.

Being one of those operating the coils, I think that we too should have a word in the matter as well as the big fellows. It is said that the little fellows cause the greatest part of the interference. I believe that since all men are created equal we should have a little right of the air.

I see the idea of the local amateurs closing at 10 P.M. and I think it a good idea but we must have a little freedom.

I come home afternoons to talk with a few fellows and am completely drowned by some 1K.W. They think this O.K. but also think we should close at ten o'clock.

The big fellow has got to play fair or he can't expect it.

I see no reason why we should not use the air at all. Why can't the big fellow lay off in the afternoon and very early in the evening? If he did this I know it would be easy to get the others to quit at ten o'clock.

Also there are some fellows operating 1 K.W. that can read about a word a minute.

Yours truly,
W. J. Flanders.

THERE WERE TWO 5AY'S

P. O. Box 807,
Bogalusa, La.,
February 21st, 1920.

Editor, QST:

Due to a misunderstanding between the Radio Inspectors at New Orleans and Galveston, Texas, my call letters (5AY) have been changed to another party in Texas, whose name I am unable to learn.

I have written the Radio Inspector at New Orleans who issued my license last October, and he will straighten this matter out.

My call letters were published in QST

several months ago, and since that time I have received a number of complaints on the wave lengths used by 5AY and also interference, all of which has been caused by the other party using this call and not by myself.

I therefore should like it understood that the party using 5AY and causing the above trouble is not myself but some station in Texas, as my transmitter is still out of commission. His call letters, however, will shortly be changed by the Radio Inspector in his district, who is the one at fault. Kindly give this due publication in the next issue of QST, and greatly oblige.

Very truly yours, Walter C. Leahy.

A TIP

Newark, N. J.

Fellow light blinkers:

This little article is intended for the transformer stations in the crowded districts. Most of us read the stuff in our QST abt cutting power when we want to talk to the fellow on the next block and give it serious thought—but—if we have an O.T. that is not readily accessible and that we spent a week adjusting or perhaps our transformer is not tapped or is Thor-darson that we consumed a lotta valuable time locating the rite leakage adjustment—then we almost feel that it is too much of a hardship to think of other stations.

Here is a little stunt that I tried a few nites ago. It enables u to cut ur power without bothering ur adjustments or building an overgrown choke coil. I had a step down transformer, one of the husky variety that looks like a starter box and gave fm 10 to 80 volts by moving the handle. I connected the secondary of this to the transformer and broke the circuit with an extra key. Note the sec. circuit is broken; this prevents the small transformer bothering ur regular key circuit. A small knife switch was used to break pri of the toy transformer and by adjusting the amount of voltage the lowest power upon which the set wud wk was quickly found and then the step down was put out of sight in the most convenient place. If u desire to use still less power it will be necessary to use a straight gap. In most cases this is not necessary. I have wked several miles on an input of ten volts (this of course was without the rotary since the spark is very small on this input) Simple stuff—take ur hand off ur big key push the switch and go on with ur little key. Any toy transformer will do but u will need at least 30 volts to use ur rotary. Try it—an ur pals will thank u for not knocking their bulbs alla tha time. No construction wk—jus dig out the step down (there's one in every garret).

2LT

CALLS HEARD

On account of the vast quantity of calls reported we must ask your co-operation in the following or calls can not be published.

(1) List the calls on a separate sheet of paper—do not embody them in a letter.

(2) Arrange by districts from 1 to 9, and alphabetically thru each district; and run them across the page, not down a column.

(3) Put parentheses around calls of stations also worked.

(4) Omit initial or other unauthorized calls.

8ER, ST. MARY'S, OHIO.

1AT, 1AW, 1AZ, 1DL, (1RN), 1PY, 2BB, (2BM), 2CG, 2CS, (2DA), 2FG, 2GR, 2IH, ex-2IL, (2IR), (2JE), (JU), 2KM, (2KN), 2PL, 2SH, 2SZ, 2WB, (2XG), 2YC, (2ZM), (2ZS), 2ZV, 3AK, 3BH, (3BZ), 3CK, 3CV, (3DH), (3DZ), 3EH, 3EQ, 3EV, 3EZ, 3FG, 3GB, 3GH, 3IB, 3IC, 3IN, 3KA, 3KN, (3NB), 3ST, (3ZS), (3ZW), (4AE), (4AG), 4AI, 4AK, 4AN, 4AZ, 4BQ, 4EJ, 5AB, (5AC), 5AL, 5AS, 5BB, 5BG, 5BO, 5BT, 5BZ, (5DA), (5DO), 5ED, 5GO, 5XA, 5YA, (5ZC), 5ZG, 5ZL, 5ZU, (8AI), ex-8AKY, 8AL, ex-8ALD, 8AM, 8AU, 8AV, ex-8AVD, 8AW, 8AY, (8BO), (8BP), 8BQ, 8BV, (8CB), 8CC, 8CH, 8CM, (8DA), (8DI), 8DJ, 8DV, 8DW, (8EC), 8FA, 8FC, 8FD, (8FH), 8FI, 8FR, 8FS, 8GE, 8GI, 8GN, 8GR, (8HA), 8HB, (8HG), (8HH), 8HP, 8HT, 8IB, 8IE, (ex-8IB), 8IH, (8IK), 8IN, 8JA, 8JJ, (8JK), 8KH, 8KK, 8KN, (8KV), (8LA), 8LF, 8LJ, 8LO, 8LV, 8MA, 8MB, 8MQ, 8NR, 8OM, 8OQ, 8PJ, 8PU, 8PX, 8RP, (8RR), 8RQ, 8RS, 8US, 8WS, 8XA, 8XK, (8XU), 8ZF, (ex-8ZW), 9AD, ex-9AES, (ex-9AII), 9AJ, 9AK, ex-9ANC, (9AU), (9BR), 9B*, 9CA, 9CN, 9CS, 9CW, 9DF, (9DH), 9DR, (9DU), 9DV, 9DX, (9EE), 9EL, 9EQ, (9ER), 9ET, 9FB, (9FZ), 9GC, 9GK, 9GO, 9GS, 9GX, (9HA), (9HN), 9HT, 9HW, 9HY, (9IF), (9IT), (9IX), 9JA, 9JB, (9KF), 9KM, 9KO, (9KV), (9LO), 9LH, 9LQ, 9LU, (9MK), 9NQ, 9OI, 9PC, 9PD, 9PY, 9PZ, 9QC, 9QM, 9RK, (9RP), 9RX, 9UC, (9ZC), 9ZH, (9ZJ), (9ZL), (9ZN), 9ZT, 9ZU, 9ZV.

5EJ, AUSTIN, TEX.

5AF, 5AB, (5AL), 5DO, 5BS, 5YA, 5ZA, 5ZC, 5ZG, 5ZO, 6GQ, 8ER, 8IK, 9LA, 9AES, 9AJ, 9BR, 9BT, (9CA), 9DR, 9EL, 9ET, 9FB, 9FN, 9HB, 9HI, 9HN, 9HT, 9IF, 9IR, 9IT, 9IX, 9KF, (9JF), (9KV), 9KM, 9NQ, 9NX, (9LC), 9LO, 9PS, 9RP, 9SZ, 9VN, 9YA, 9YN, 9ZC, 9ZJ, 9ZL, 9ZN, 9ZU, 9ZV.

9AK, EUREKA, ILLS.

1WG, 2CS, 2ZC, 3NC, 3KM, 4AE, 5AF, 5AL, 5BB, 5BF, 5BT, 5DO, 5ZA, 5ZC, 5ZG, 5ZP, 8AA, 8CB, 8DA, 8DV, 8EN, 8ER, 8EZ, 8FA, 8FH, 8FII, 8GQ, 8HG, 8IB, 8IF, 8IK, 8JG, 8JJ, 8JK, 8LA, 8NF, 8NZ, 8ZB, 9AU, 9BT, 9CN, 9CR, 9DV, 9EL, 9ER, 9EV, 9EX, 9EY, 9FA, 9FB, 9FJ, 9GV, 9HI, 9HT, 9HW, 9IC, 9IF, 9JB, 9JT, 9JV, 9KF, 9KO, 9KV, 9LC, 9LQ, 9NX, 9OI, 9PI, 9ZC, 9ZJ, 9ZL, 9ZN, 9ZU.

9DG, SHEBOYGAN, WIS.

1AJ, 1AW, 1DA, 1RN, 2DS, 2JU, 2WV, 2ZL, 2ZM, 2ZJ, 3NB, 3XG, 3ZG, 3ZW, 4AB, 5AJ, 5BA, 5CC, 5OD, 5DO, 5LA, 5ZG, 5ZL, 8AA, 8CB, 8DA, 8DW, 8ER, 8EW, 8FH, 8IB, 8IH, 8JJ, 8JK, 8KR, 9AJ, 9AL, 9AU, 9BR, 9CN, 9CQ, 9CW, 9EE, 9EL, 9EY, 9FC, 9FZ, 9GS, 9HD, 9HN, 9HQ, 9HT, 9HZ, 9KM, 9KO, 9KV, 9LC, 9LQ, 9QE, 9QM, 9QR, 9WB, 9VD, 9VL, 9ZC.

MINNEAPOLIS (MINN.) Y.M.C.A. RADIO CLUB.
1AW, 2II, 2XG, 2XS, 2ZS, 3DH, 3NB, 4EA, 5AD, 5AF, 5AH, 5AL, 5BB, 5BZ, 5DO, 6EB, 5YA, 6ZA, 5ZG, 5ZL, 5ZO, 7AY, 8AA, 8BP, 8CB, 8DA, 8ER, 8FB, 8FF, 8FG, 8FH, 8GQ, 8HG, 8HR, 8IH, 8IV, 8JJ, 8LH, 8NF, 8NZ, 8RS, 8XA, 9AA, 9AB, 9AJ, 9AQ, 9AU, 9AW, 9BR, 9BS, 9BT, 9CA, 9CD, 9CN, 9CO, 9CR, 9CS, 9CU, 9CV, 9DI, 9DV, 9EE, 9EG, 9EI, 9EL, 9EX, 9EY, 9FH, 9FS, 9FZ, 9GC, 9GR, 9HA, 9HN, 9HR, 9HS, 9HT, 9HW, 9HY, 9IF, 9IJ, 9IT, 9IU, 9IX, 9JE, 9JL, 9KF, 9KO, 9KV, 9LC, 9LH, 9LP, 9LU, 9NE, 9NQ, 9OB, 9PI, 9PQ, 9PS, 9PZ, 9RP, 9RR, 9RV, 9SM, 9TW, 9UG, 9VY, 9WU, 9XE, 9XM, 9YA, 9YB, 9YN, 9ZC, 9ZF, 9ZJ, 9ZL, 9ZN, 9ZO, 9ZU, 9ZV.

3CE, NORWOOD, PA.

1AK, 1AN, 1AS, 1AW, 1AZ, 1CM, 1DE, 1ED, 1IY, 1PY, 1RU, 1RN, 1ZA, 1ZS, 2BB, 2BG, 2BM, 2CS, (2DA), 2EV, 2FG, 2GO, 2IR, 2JU, 2JE, 2LP, 2MK, 2MQ, 2QU, 2WB, 2XG, 2ZM, 2ZS, 2ZU, 3AN, (3BZ), 3FG, 3GO, 3AT, 4BC, 5AF, 8AA, 8AE, 8CB, 8CC, 8CD, 8CH, 8DA, 8DF, 8DR, 8DV, 8DW, 8EC, 8EF, 8EN, 8ER, 8EV, 8EZ, 8FD, 8FF, 8FH, 8FI, 8FO, 8FP, 8FR, 8FS, 8GB, 8HF, 8HG, 8HH, 8IK, 8JJ, 8JK, 8JZ, 8LA, 8MB, 8NF, 8NN, 9AJ, 9EG, 9EQ, 9ER, 9FK, 9GS, 9HD, 9IX, 9LQ, 9VY, 9ZJ, 9ZL, 9ZN.

7AY, BEAR CREEK, MONT.

5DO, 5ZA, 6AV, 6CS, 6BQ, 6FL, 6QZ, 6ZA, (7CC), 7CH, 9AJ, 9CN, 9CO, 9BR, 9BT, 9EE, 9EX, 9FA, 9FL, 9FZ, 9GK, 9HN, 9HT, 9IF, 9JB, 9JE, 9OT, 9PI, 9PQ, 9YO, 9ZC, 9ZN, 9ZL, 9ZU.

5XA, AUBURN, ALA.

1AW, 1DA, 1LJ, 2CB, 2CS, 2DA, 2FG, 2GL, 3BZ, 3EN, 3GO, 3NN, 3ZS, 8ZW, 4AE, 4AG, 4AI, 4AK, (4AL), 4AN, 4AO, 4AT, 4BK, 4BQ, 4YA, 5AB, (5AG), (5AL), (5AU), (5BC), (5BG), 5BJ, 5BK, 5BL, 5BM, (5BO), 5BS, 5BZ, 5CD, 5CY, (5DA), 5EA, (5EB), 5YA, 5ZO, (ZP), 5ZG, (8ER), 8DJ, 8DR, 8EN, 8FH, 8GB, 8HG, 8HH, 8IK, 8JJ, 8JK, 8LA, 8LQ, 8XA, 9ALE, 9BG, (9CA), 9CV, 9ET, 9EY, (9FU), 9HD, 9HN, 9HW, 9HY, 9II, 9IT, 9IX, 9JT, 9KO, 9LQ, 9MJ, 9NQ, 9PY, 9QM, 9SS, 9VC, 9YA, 9ZJ, 9ZQ, 9ZL.

6AT, SAN JOSE, CALIF.

(6AE), (6AG), (6AH), 6AI, 6AJ, (6AK), (6AM), 6AN, (6AR), 6AS, 6AV, (6AY), 6BG, 6BM, (6BN), (6BQ), (6BR), (6BS), (6BU), (6BX), 6BY, 6CC, 6CH, 6CI, (6CM), (6CO), (6CQ), (6CS), 6DP, 6DR, (6DY), (EA), (6EB), 6EF, (6EJ), 6ER, 6EW, 6EX, 6FC, 6FD, (6FN), 6FX, ..GC, (6GJ), 6GO, (6GQ), 6GD, (6HG), (6HZ), 6IB, 6JC, 6JD, 6JE, 6JI, (6JK), 6JL, 6JM, 6JR, 6KB, (6KL), 6LE, 6LP, 6NE, 6NS, 6TQ, (7CC), 7CW, (7DK), 7DS, (7YS), (7ZB).

2WB, BROOKLYN, N. Y.

1ABS, 1AS, 1AE, 1AW, 1CR, 1DL, 2SZ, 2MB, 2DA, 3DA, 3EN, (3NZ), (3DH), 4BG, 8ALE, 8AL (8CB), (8ZY), (8HD), (8KP), 8DO, 8IB, 8DE, 8HG, 8DW, 8DA, (8ER), 8DH, 8GB, 8IK, (ex-8DR), 8HH, 8FH, 8HD, 8JQ, 8LA, 8XU, 8CH, 8FR, 8DI, 9GS, 9ZL, 9CW, 9HW, 9LQ, 9ZD, 9ZL, 9KF.

5CI, FROST, TEXAS.

4AE, 5BZ, 5AS, 5ZC, 5AL, 5YA, 5BA, 5ZA, 5ZC, 5ZO, 5DO, 5ED, 5EA, 5ES, 5DW, 5BL, 5BZ, 8FU, 8ER, 8LA, 8KA, 8ZD, 9ZL, 9ST, 9AJ, 9KH, 9ZN, 9HT, 9BT, 9CN, 9CW, 9DT, 9KF, 9ET, 9HY, 9LO, 9QM, 9HI, 9HA, 9IF, 9OE, 9JW, 9ZU.

3FG, PORTSMOUTH, VA.

1AK, 1BAR, 1EP, 1RN, 2BB, 2BK, (2CB), (2DA), 2GL, 2KN, 2PM, 2Q, 2QR, 2QZ, 2RB, 2ZA, 2ZC, (2ZL), 2ZV, 3CA, 3CS, 3DV, 3GX, 3ZC, (4AB), 4AN, 4AO, 4AT, 4BQ, 4TT, (5DA), 8AD, 8AK, 8AL, 8AS, 8AIA, 8AKY, 8BK, 8BP, (8BQ), 8BV,

8DW, 8DO, 8EM, 8EN, 8EX, 8FC, 8FI, 8FO, 8FP, 8GA, 8GB, 8GC, 8GI, 8HG, 8HH, 8HR, 8HU, 8HX, 8HY, 8IF, 8IH, 8IK, 8JJ, 8JV, 8LA, 8LG, 8NI, 8PM, 8QD, 8ZY, 9AA, 9AU, 9BG, 9BM, 9CS, 9DQ, 9ET, 9FP, 9GC, 9HW, 9IJ, 9IK, 9IT, 9JT, 9KO, 9LU, 9LW, 9MT), 9PN, 9TE, 9WQ, 9ZC, 9ZL.

4AZ, ATLANTA, GA.

1AW, 2BM, 2DA, 2FG, 2JE, 2JU, 2ZM, 2ZS, 3BZ, 3DH, 3GO, 3IN, 3KM, 3NB, 3NC, 3ZV, 4AE, 4AG, 4AL, 4AN, 4AQ, 4AT, 5AA, 5AQ, 5DA, 5AB, 8AI, 8CB, 8CH, 8CP, 8DA, 8DZ, 8EN, 8ER, 8EV, 8FH, 8FI, 8FP, 8GB, 8GR, 8HA, 8HG, 8HH, 8IA, 8IB, 8IF, 8IK, 8JJ, 8JQ, 8ME, 8PH, 8QI, 8RI, 8WQ, 8WW, 8ZJ, 9AJ, 9AP, 9AU, 9BR, 9BT, 9CA, 9CW, 9DV, 9ER, 9FU, 9GS, 9GX, 9IX, 9LF, 9NQ, 9SS, 9YA, 9ZJ, 9ZL, 9ZN.

9DF, ANGOLO, IND.

1AW, 1EP, 2EV, 2JU, 2ZM, 2SZ, 2BM, 2IR, 2DP, 2FG, 2ZH, 2CS, 2ZS, 2XG(cw), 2XX(cw), 2ZL(cw), 2ZV(cw), 2PL, 2DA, 3GO, 3NB, 3BL, 3ZC, 3WB, NSF(cw), 4AN, 4AE, 4AL, 4AG, 4EB, 5ZA, 5ZC, 5ZL, 8AA, 8ZY, 8FI, 8BO, 8XU, 8ER, 8GB, 8BK, 8DZ, 8DV, 8AZ, 8DA, 8MF, 8DI, 8BQ, 8MR, 8JQ, 8JJ, 8HN, ex-8ZW, 8DJ, 9GC, 9ZU, 9CS, 9LQ, 9HN, 9ZC, 9AU, 9AK, 9FU, 9AJ, 9RP, 9LC, 9QM, 9HD, 9MS, 9ZJ, 9ZL, 9BR, 9BT, 9HN, 9ZN, 9GS, 9IT, 9FE, 9DE, 9PC.

9FM, COLLEGEVILLE, MINN.

5AL, 5BC, 5BT, 5DO, 5ZA, 5ZC, 5ZG, 8AM, 8BJ, 8BP, 8ER, 8FH, 8FI, 8II, 8IK, 8KM, 8LA, 8XA, 8XK, 9AJ, 9AP, 9AU, 9BA, 9BG, 9BM, 9BR, 9BT, 9CA, 9CK, 9CN, 9CS, 9CV, 9DF, 9DO, 9DR, 9DV, 9DX, 9EE, 9EO, 9EQ, 9ER, 9EZ, 9FL, 9FR, 9FT, 9FW, 9FE, 9GC, 9GK, 9GT, 9GV, 9HA, 9HK, 9HT, 9HW, 9IF, 9IJ, 9IP, 9IX, 9JA, 9KI, 9KM, 9KO, 9KV, 9LA, 9LC, 9LF, 9LJ, 9LK, 9LI, 9MF, 9MH, 9MX, 9NQ, 9OB, 9PA, 9PL, 9PN, 9PS, 9PY, 9PZ, 9QJ, 9QM, 9RP, 9RX, 9TB, 9UG, 9UM, 9YB, 9YO, 9ZC, 9ZJ, 9ZL, 9ZQ, 9ZN, 9ZS, 9ZT, 9ZU.

1AW, HARTFORD, CONN.

during March (1AK), (1AS), (1AY), (1CK), (1CM), (1CR), (1DL), (1FQ), 1GJ, (1HAA), 1JAT, 1QP, (1SZ), (1TS), (1ZA), 2AQY, (2AR), (2BM), (2BO), (2BB), (2DA), 2FG, (2IR), 2JE, (2JN), (2JU), (2KM), 2NP, (2QC), 2QR, 2RB, (2RL), 2UK, 2WB, 2XX, (2ZC), (2ZL), (NSF), 3BZ, (3DH), (3EV), 3HJ, (3NB), (3NV), 3ZG, 3ZV, 4AT, (5CB), 5DA, 5EC, (5ER), 5FF, 5GB, 5HG, 5IB, 5EF, 8LA, 5ME, 8PQ, (8VK), (8XU), 8ZW, (9AU), 9AJ, 9DF, 9EX, 9ZJ, (9ZL).

3NB, M. FRYE, VINELAND, N. J.

Feb. 15th to Mar. 25th: (1AE), (1AS), (1AW), (1BL), (1CK), (1CM), 1CV, (1IZ), (1RN), (1ZA), 1ZF, (2AR), 2BB, 2BK, (2BM), 2CB, 2CV, (2DA), 2DD, (2FG), 2II, 2IR, daylight, (2JE), (2JU), (2KN), 2FS, 2SZ, 2VA, (2WB), 2XG, phone and cw set, (2ZC), 2ZL, (2ZM), (2ZS), (3AK), 3AN, 3AR, 3AS, 3BG, (3BT), 3CB, 3CE, (3CL), 3CS, (3CV), (3DH), 3DZ, (3EH), (3EN), (3EV), (3EZ), (3FB), (3FD), 3FN, 3GX, (3MU), (ex 3NG), (3NN), (NSF, phone and cw), (3NV), (3ST), 3WU, (3XC), (3ZA), 3ZL, (3ZW), 4AE, 4AL, 4AO, (4AT), 5AL, 5BB, 8BK, (8BP), (8BQ), 8BV, 8BY, 8CB, (8CC), (8DA), 8DV, 8DY, 8DR, (8ER), 8FC, 8FF, 8FO, 8FT, (8GN), 8GQ, 8GR, (8HD), (8HG), (8HP), 8HR, (8IK), 8IN, JC, (8JQ), 8KP, (8LA), (8LF), (8LI), 8MN, 8MZ, (8NF), (8NI), 8NQ, 8WS, (8XA), (8XK), 8XU, (8ZW) dilite, (8ZY), 9AJ, (9AS), (9BG), 9BR, (9CA), 9CV, (9HJ), (9KF), 9KV, 9LQ, 9YA, 9ZC, (DX), (9ZJ), (9ZL), (9ZN), 9ZV, 9ZW.

7CU, VANCOUVER, WASH., ON CRYSTAL

6AE, (6AK), 6AM, 6AT, 6BQ, 6BR, 6CO, 6CQ, 6CS, 6DK, 6EA, 6EJ, 6FE, 6JK, 6JM, 7AD, 7CC, 7CH, 7CW, 7YS.

7DG, PORTLAND, ORE., Mar. 20th

6AK, 6BQ, 6BR, 6CI, 6CS, 6DP, 6EA, 6EJ, 6FE, 6HO, 6ZA, 7AK, 7CC, 7CW.

2VU, NEWARK, N. J.

1AW, 1CD, 1BT, 1AK, 1CK, 1BA, 1AE, 1DL, 3CV, 3CS, 3BC, 3BH, 3CK, 3DH, 3NB, 3CC, 3JQ, 3IK,

8DG, 8GB, 8IF, 8WK, 8DF, 8CB, 8BJ, 8LA, 8EV, 8LI, 8FR, 8QK, 8ER, 8EG, 8ZW, 9ZL, 9ZJ, 9LQ, 9DZ, 9KF, 9ZN.

6FE, ANDERSON, CAL., Jan. 22d to Mar. 22d

6AT, 6AS, 6AK, 6AE, 6AI, 6AN, 6AH, 6AP, 6AC, 6AF, 6AY, 6BR, 6BG, 6BQ, 6BS, 6BJ, 6BA, 6BZ, 6BK, 6CQ, 6CV, 6CU, 6CS, 6CK, 6CO, 6CR, 6CT, 6DK, 6DR, 6DY, 6EO, 6EW, 6EK, 6ER, 6ET, 6EA, 6EB, 6ED, 6FU, 6FQ, 6FK, 6FN, 6FG, 6FD, 6FT, 6GY, 6GE, 6HQ, 6HI, 6HZ, 6IM, 6JM, 6JD, 6LJ, 6JJ, 6RK, 6RT, 6RR, 6AK, 6VS, 6XA, 6YS, 6ZA, 7AD, 7CC, 7CR, 7CH, 7AN, 7HS, 7EA, 7FD, 7AY, 7DF, 7CW, 7ZB, 7YS, 7DU, 7BR, 7FT, 7AR, 7CK, 7LQ, 7AH, 7AP, 7CU, 9HI, 9YB, 5ZA, 5AF, 5AH, 4ZA.

5ZA, ROSWELL, N. MEX.

(5AA), (5AB), (5AC), 5AD, 5AE, (5AF), (5AG), (5AL), (5AM), 5AO, 5AP, (5AS), (5BC), (5BG), (5BJ), 5BK, 5BL, (5BO), (5BS), (5BT), 5BV, 5BZ, 5CP, (5CW), (5CX), (5DO), 5EJ, 5FA, (5ZC), (5ZL), (5ZN), (5ZO), (5ZP), 5ZU, 5ZV (5ZW), 6AC, 6AE, (6AK), (6AL), 6AT, 6AV, 6AY, (6BJ), (6CS), 6CT, 6DB, 6DR, (6EA), (6EB), 6EF, (6EJ), 6EN, 6FE, 6FU, (6GE), 6GH, (6GQ), 6HH, (6HZ), 6ID, 6IF, 6IY, (6JD), 6JK, 6QJ, 6RN, 6SD, (6TX), (6AZ), 6BQ, (9ABD), (9AJ), 9AP, 9AU, 9AW, (9BR), (9BT), (9CA), (9CN), 9CS, 9DC, (9EE), (9ET), (9EY), (9FB), 9FI, (9FL), (9FU), (9FZ), 9GC, (9HI), (9HN), 9HS, (9HT), (9IF), (9JA), (9JB), (9JE), 9JO, 9JR, 9KO, (9KV), (9LF), 9LH, (9LP), (9LR), (9MK), (9NE), (9NX), (9NZ), 9OE, 9QP, 9PQ, (9RP), (9VP), (9WH), (9WI), 9WU, 9XR, 9YA, 9YE, (9YO), 9ZD, (9ZN), (9ZU), (9ZV), (9PI).

9CA, MINONK, ILL., Feb. 22d to Mar. 22d.

1AW, 1ZG, 2BM, 2JU, 3OM, (3HD), (3EN), 3KM, 3NB, 3ZS, (NSF), 4AE, 4BZ, 4YA, 5AB, 5AL, 5AS, (5BS), 5BT, 5DA, 5DO, 5ED, (5EJ), 5YA, 5YE, 5ZA, (5ZG), 5ZJ, 5ZL, (5ZO), (5ZU), 5ZK, (5CB), 8DA, 8DP, (8ER), 8FA, 8FF, 8FH, (8FI), 8HG, (8HH), 8IB, (8IK), (8IV), 8IN, 8JQ, (8LA), (8NZ), 8RR, (8XR), 8ZW, (9AD), 9AL, (9AU), 9BG, 9BK, (9CE), 9CK, 9CN, (9CS), 9DF, 9DH, (9DR), (9DU), (9EE), (9EL), 9EO, 9FB, (9GI), 9GM, 9HI, (9HJ), 9HN, (9HT), 9HW, (9IF), 9IR, (9IT), 9JN, (9KF), 9KO, (9KV), (9KX), (9LC), 9MC, 9MH, 9OV, 9PY, (9RP), 9RV, 9RY, 9TV, (9UG), 9YA, 9YO, 9ZC, 9ZJ, (9ZL), (9ZN), (9ZT).

6EJ AND 6AK, WALNUT GROVE, CALIF.

(5ZA), (6AY), (6BQ), (6CM), 6CS, 6CT, (6DA), (6DH), (6DK), 6DT, 6DX, (6EA), (6EB), (6EF), 6EI, (6EK), 6EL, (6EN), (6ER), 6FE, 6FU, 6GC, (6GI), 6GQ, (6HG), 6HH, (6HZ), 6IQ, (6IU), (6JD), 6JG, 6JI, (6JJ), (6JM), 6ZA, 7AD, (7BP), 7BR, (7CC), 7CE, (7CH), (7CR), (7CU), (7CW), 7DA, 7DK, (7EC), 7FB, (7JU), 7YA, (7ZB). Heard following: 9HA twice, 9HI once, 9JE twice.

8LF, PITTSBURGH, Mar. 1-21st.

1AK, 1AS, 1AW, 1RN, 1VN, 2BM, 2DH, 2DA, 2JU, 2LO, 2RB, 2UK, 2WB, 2WX, 2ZC, 2ZL, 2ZS, (3AN), 3AD, 3BE, 3BM, 3BZ, 3DH, 3DG, 3DS, 3ED, 3EA, 3EN, 3EV, 3EY, 3FG, 3FW, 3GC, 3GX, 3HJ, 3IB, 3IR, (3NB), 3ND, 3NV, 3YA, 3ZC, 3ZS, 4AE, 4AL, 4AO, 4AT, 4CR, 4DE, 4PA, 4ZL, 5BT, 5DA, 5BR, (8DA), 8DY, 8EC, (8ER), (8FD), (8FI), 8FG, 8GC, 8GB, 8GA, 8HG, 8HH, 8HP, 8HY, 8IF, 8IV, 8IK, 8IE, 8JJ, (8JO), 8KE, 8LA, 8LW, 8MT, (8NZ), 8NQ, 8NV, 8RW, 8RS, 8NI, 8RR, 8SH, 8UP, 8VE, 8VK, 8VG, 8WD, 8XA, 8XU, 8ZY, 9AU, 9AX, 9BT, 9GO, 9GX, 9HD, 9HK, 9HV, 9HR, 9IT, 9IF, 9KV, 9LF, 9LQ, 9NQ, 9RP, 9WQ, 9ZL, 9ZN, 9ZQ, 9ZJ.

(Concluded from page 42.)

ALASKAN DIVISION.

Mr. Theodore A. Stocking, Ketchikan, Alaska, has been appointed manager of the Alaskan Division. All amateurs in the "Land of the Midnight Sun" are requested to communicate with Mr. Stocking in connection with relay traffic and routes.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of QST published monthly at Hartford, Conn. for April 1, 1920, State of Connecticut, County of Hartford.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared K. B. Warner, who, having been duly sworn according to law, deposes and says that he is the business manager of QST and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 448, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The American Radio Relay League, Inc., Hartford, Conn.; Editor, Kenneth B. Warner, Hartford, Conn.; Managing Editor, (none); Business Manager, Kenneth B. Warner, Hartford, Conn.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its names and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.) The American Radio Relay League, Inc., an association without capital stock, incorporated under the laws of the State of Connecticut.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) Hiram Percy Maxim, Hartford, Conn.; John S. Dunham, Brooklyn, N. Y.; C. D. Tuska, Hartford, Conn.; W. S. Browne, Brooklyn, N. Y.; C. R. Runyon, Jr., Yonkers, N. Y.; Nicholas Roper,

Youngstown, Ohio; Chas. C. Godfrey, Bridgeport, Conn.; Frank Conrad, Pittsburgh, Pa.; F. M. Bookwalter, Springfield, Ohio; Chas. A. Service, Jr., Bala, Pa.; Miller Reese Hutchison, New York City; George M. Woodcock, Buffalo, N. Y.; C. Tefft Hewitt, Swissvale, Pa.; Leonard D. Fisk, West Hartford, Conn.; H. E. Rawson, Cambridge, Mass.; Emma Candler, St. Mary's, Ohio; Chapman Printing Co., Hartford, Conn.; Robert F. Gowen, New York City; E. C. Wilcox, Meriden, Conn.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceeding the date shown above is..... (This information is required from daily publications only.)

K. B. Warner Sworn to and subscribed before me this 19th day of March, 1920.

F. R. Lawrence, Notary Public (My commission expires February 1, 1924.)

"DX" Relay Men Know Baldwin 'Phones are Best

We have just received a letter from an Ex-Sergeant of the 117th Field Signal Battalion, Rainbow Division, which shows the worth of Baldwins.

John Firth & Co., New York Gentlemen:

4022 Wayne Ave., Kansas City, Mo.

Reading your advertisement of Baldwin phones in the January QST and having used several different pairs of these phones in the Signal Corps; I desire very greatly to obtain a pair.

I have tested Baldwin phones against almost every phone made, including several French, British, and even German-made receivers, and have found nothing to equal them. I used "a pair of Baldies" while on the U.S.-Mexican border, in conjunction with a Signal Corps mule-carried pack set, and can say they stood up under the severest jars and jolts a stubborn mule could give them. I also had a pair with me at the Aisne-Marne defensive, the Chateau Thierry offensive, St. Mihiel, The Argonne, and on our hike to Germany. The type phone I had I don't know and cared less—all I knew was that they had the others beat in a walk.

Awaiting your circular, I remain,

Respectfully,

B. F. Riggins

Any A.R.R.L. long-distance relayer will tell you there are no other phones as sensitive as Baldwins. The enormous increase in sensitivity over ordinary receivers is secured by the famous Baldwin construction—a mica diaphragm, removed from the constant pull of a permanent magnet, and a separate light iron armature. Write for interesting illustrated bulletin explaining the construction of these phones, and why they are BETTER.

BALDWINS MEET THE EXACTING REQUIREMENTS OF LONG DISTANCE AMATEUR WORK FOUR MODELS—FOUR PRICES

JOHN FIRTH & COMPANY

81 NEW STREET,

Sole Distributors

NEW YORK

Tresco Tuners Deliver the Goods

A TESTIMONIAL

Point Pleasant, N. J.

TRESCO,
Davenport, Iowa,
Gentlemen:—



Some time back you will remember that I bought a 20,000 meter coupler from you and now I wish to tell you of the wonderful results that I have had from it. I was very timid about buying this coupler, as I got stuck with a set of honeycombs, but now I am glad I got that coupler as I would not part with it for anything.

I could get results with it just as you show the hook-up but with a little altering I got it to-work-ing so that I have heard NPL, BZR, NAR, NFF, NDD, NSS, POZ, OUI, IDO, FL, YN, LCM, and many others that I do not call to mind just at this writing. This is no bull, either; all straight stuff. I am using one bulb—a VT, 3 variables, Baldwin phones, and your Tresco coupler.

Anybody that contemplates buying one of these couplers should not hesitate, as they are the greatest thing out, take it from me. Hoping you are selling lots of these couplers and thanking you for such a wonderful instrument, I am

Yours very truly,

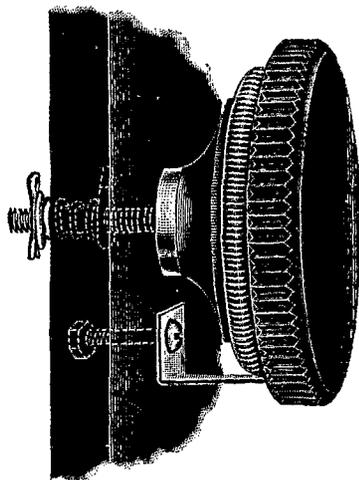
R. VAN CAMP,

Radio Station 2VC.

PARKIN RHEOSTAT now \$1.00

Why Pay More?

When this is the easiest mounted, smooth running, best on the market.



(Actual Size)

No. 35 PARKIN PANEL TYPE RHEOSTAT (Pat. March 30, 1920) has easily renewed resistance mounted on back of MOULDED BAKELITE KNOB. Shaft is moulded into knob, cannot come loose. "OFF" position provided. 360 degree rotation assures fine adjustment.

Write for descriptive circular of audion panel switches, binding posts, contacts, etc.

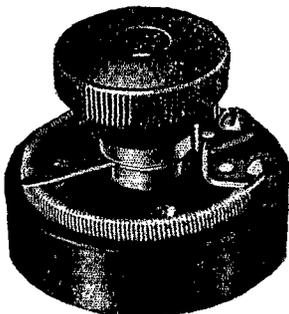
Dealers: Write for proposition.

PARKIN MFG. CO., San Rafael, Cal.

6 OHMS PARAGON RHEOSTAT

\$1.75 POSTPAID \$1.75

For either panel or table mounting



IMMEDIATE SHIPMENT
Descriptive Circular Free

Description: The base is of moulded densite. All metal parts are heavily nickel plated. Money back if not satisfied guarantee. Address Dept. Q.S.T.

THE RADIO APPARATUS
SERVICE
UNION SAVINGS BANK BLDG., WASHINGTON, D.C.
A SUPPLY COMPANY FOR THE RADIO AMATEUR

Stromberg

Carlson

RADIO HEAD SET

A set that combines your ideas of extreme sensitivity with strength, durable construction that stands the gauntlet of continuous service ashore or aboard ship.



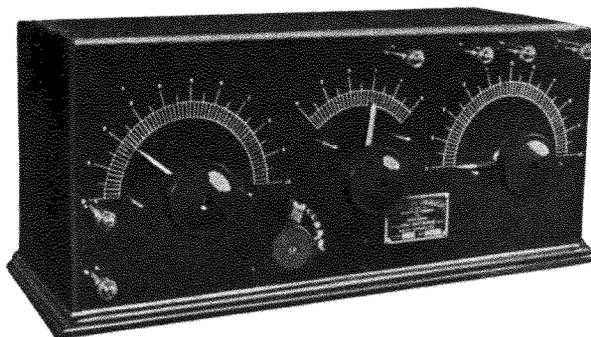
All operating parts housed in dust-proof aluminum cases. The diaphragm is mounted metal-to-metal in such a way that temperature variation will not disturb the air gap adjustments. Non-conducting spool head and slotted pole tips eliminate 90 per cent of the eddy current losses that are found in other head sets.

Each set is wound to a resistance of 2,000 ohm with pure copper wire and furnished complete with 6-foot moisture-proof cord attached. Tested for matched diaphragm tuning an operating qualities in actual service before shipment.

Send \$12.00 for sample set for trial in your own station—satisfaction guaranteed or your money refunded upon return of set. Write for Bulletin 1106 giving full particulars.

Stromberg-Carlson Telephone Mfg. Co.
Rochester, N. Y. Chicago, Ill. Kansas City, Mo. Toronto Ont.

Caught Up At Last!



C.R.L. Paragon Regenerative Receiver.

We are now able to make **IMMEDIATE DELIVERIES** of the famous C.R.L. Paragon Short Wave Regenerative Receiver. The demand for this instrument has been so great that our production has heretofore not been able to keep pace with it, but we have finally caught up with our orders and can now give you the kind of service we like to give.

This improved 200—600 meter Regenerative Receiver gives 100 times amplification (guaranteed) and operates with equal efficiency on all waves within its range. It will enable you to **CONTINUE YOUR LONG DISTANCE WORK THROUGHOUT THE SUMMER.**

For description send for our new Bulletin J-20, just out.

Place your orders now while quick deliveries are possible.

This instrument licensed under the DeForest patents.

Price, complete, F.O.B. Chicago.....\$55.00

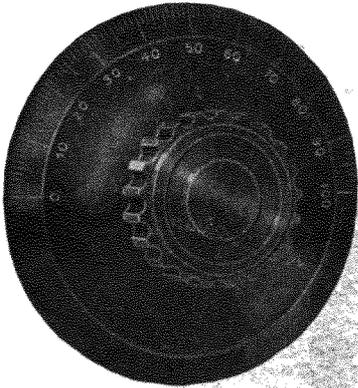
Chicago Radio Laboratory

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U. S. A.



Indicating Dials

Make your radio apparatus up to date. Indicating Dials now available at a reasonable price.

Made of fine black polished composition with radial lines and figures accurately engraved and filled with brilliant white. Diameter of dial is 3 inches and they are 1/8 inch thick. Have Bevelled edge. We can furnish dial alone or with fine Bakelite Knob mounted. This knob has a set screw to clamp shaft of instrument to which dial is to be applied.

3 inch Dial only 75 cents
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3 inch Dial with Knob mounted, \$1.30
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If your dealer cannot supply you send us his name with your order. Immediate deliveries.

OUR NEW CATALOG, now ready for distribution. Contains 24 pages of real live, up to the minute illustrations, news and descriptions of all standard Radio parts, including the above Indicating Dial.

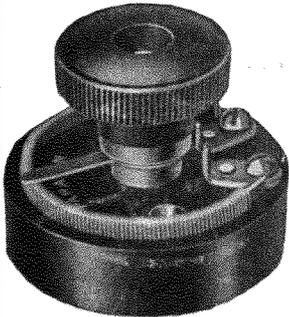
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FOR SALE AT ALL RADISCO AGENCIES AND BY

A. H. Corwin & Co.

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OUR NEW FILAMENT RHEOSTAT

For Back or Front of Panel Mounting.
\$1.75 Postpaid

6 ohm resistance, fine adjustment on 4 or 6 volts.
2 1/8" Diameter.
Smooth action
IMMEDIATE SHIPMENT!

Send self-addressed, stamped envelope for bulletin 1920-24—containing new and important amplifier information, and prices and data on our most popular specialties.

Immediate shipment—postpaid for \$5.00
On General Radio \$10.00 type 127-A ammeters.

Genuine rectifier VT's for radiophone plate voltage supply, \$7.00 each plus one lb. postage.

Standard VT socket—positive contacts \$1.00

Remember that we have in stock
THE ORIGINAL AUDIOTRON ADAPTER
Permits the use of your 'tron in a VT socket.
\$1.75 postpaid—described in bulletin 24
Made of good material and really practical.

RADIO EQUIPMENT CO.

630 WASHINGTON ST., BOSTON, 11, MASS.

BURGESS "B" BATTERIES

SEVERAL SIZES FOR SPECIAL WORK



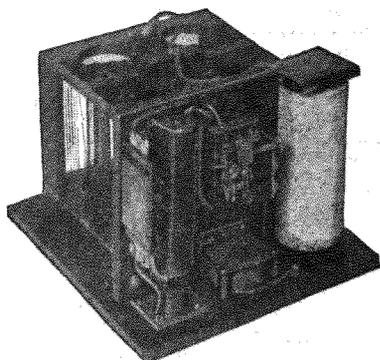
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A POST-WAR OPPORTUNITY

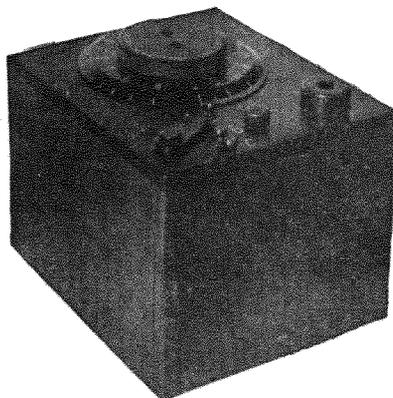
THIS STANDARD WAVE METER

No other instrument anywhere near its price has the same high standard of Design---Workmanship---Material



Size
5" x 5 1/2"
Height 4 1/2"

Weight
2 1/4 lbs.



This instrument was originally designed and manufactured to meet the exacting requirements of military use. Owing to the closing of the war a limited number is available, for amateurs, AT A PRICE BELOW THE ORIGINAL COST OF CONSTRUCTION

Each is complete for measuring the wave length of transmitter and receiver—a real standard, guaranteed to be accurately calibrated and to hold its calibration.

No internal sliding contacts. Bakelite construction thruout in substantial wood case.

A self contained buzzer, battery, and current indicating lamp, which can be readily removed for replacement. The ordinary use of a lamp as a current indicating device for showing when the Wave Meter is in tune with a transmitter requires considerable power and a very close coupling to make the lamp burn

bright enough to be visible. This instrument includes a special arrangement whereby the voltage of the battery is applied to the lamp through a choke coil, and a variable rheostat that can be adjusted so that the lamp is ALMOST lighted by the battery. Then the slightest additional impulse from the coils makes the lamp burn brightly, and the sensitiveness of the instrument is therefore enormously increased.

There is no other instrument any where near this size containing all these features.

Price each, F. O. B. Washington

\$15

We fully guarantee every instrument, and that each cannot be duplicated except at a much higher price today. Other ranges than 150 to 300 meters furnished at slightly additional price.

National Electrical Supply Co.
1328-30 N. Y. Ave., N. W. WASHINGTON, D. C.

CLASSIFIED ADVERTISEMENTS

Five cents per word per insertion, in advance. Name and address must be counted. Copy must be received by the 10th of month for succeeding month's issue.

BARGAIN: Amateurs attention Grebe CR4 regenerative for only \$50. Wireless Specialty Triode two stage amplifier only \$50. These are new instruments, not a mark of any kind on them. They were turned in to us for credit so we can dispose of them cheap. TeCo Radio Co., P. O. Box 3362, Boston, Mass.

KODAK FINISHING: Any 6 exposure roll developed and finished, 20c. Frain, Eureka, Ill.

BUGS—BUGS, must sell, DeForest Unit Panel Receiving Set. Units, Honeycomb coils, audion bulbs, switches, "B" batteries, phones. Hurry get my list. It's free. Write. Atlee Maurek, c/o Box 157 Austin, Minn.

FOR SALE: Complete receiving and transmitting set including two step amplifier and audion with Bakelite panel and quartered oak cabinet. Also Acme 1/2 K.W. transformer and a lot more things. Prices reasonable. Box 34, Melrose, Mass.

FOR SALE: 1 rotary spark gap universal motor, \$15; 1/2 K.W. Thordarson transformer, \$10; 1 oscillation transformer, \$5; 1 Murdock aerial switch, \$3; 1 oil condenser, \$3; 1 variable condenser, \$3; 1 Murdock condenser 50 cents; 1 receiving transformer, 3500 meters, \$10; Murdock receivers, 1000 ohm, \$1.50. Willard Ashley, 415 Emerald Ave., Willard, Ohio.

FOR SALE at a bargain: Two high iron masts and antenna, \$25.00. Can be seen here. C. A. W., 654 Sixth St. East, Salt Lake City, Utah.

WANTED: 1/2 K.W. transformer (Thordarson preferred) and spark gap. Robert Hawkey, 29 Virginia Ave., Poughkeepsie, N. Y.

AMATEURS—We will sell your radio apparatus for you on commission basis, or purchase outright. All good sent us will be placed on exhibition in the used instrument department of our Boston retail store, where it will be seen by many customers. Send full description. Radio Equipment Co., 630 Washington, St. Boston, Mass.

FOR SALE—Complete new DeForest unit set minus batteries and bulbs. Mounted on panel, \$80.00. Special multi-wave receiver, detector and two step amplifier, \$65.00. Prescott Smith, 542 Broadway, Paterson, New Jersey.

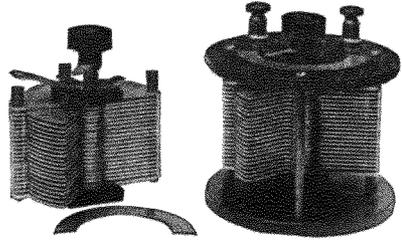
FOR SALE: Complete equipment modern radio station; electrical apparatus, consisting of motors, generators, measuring instruments; engines, three gasoline marine, one steam. Send stamp for complete list. Leon G. Swenson, Oak St., Shrewsbury, Mass.

FOR SALE: First \$20 M.O. takes brand-new 6-80 storage batter. J. A. Swank, R.F.D. No. 16, Dayton, Ohio.

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Copies of QST for AUGUST, 1919. An extension of subscription for three months, or fifteen cents in cash, for each copy returned in good condition to

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THE "ILLINOIS" VARIABLE CONDENSER

Hard Rolled Aluminum Plates

Three Styles, No. 1. Panel, No. 2. Open Type as shown, No. 3. Fully Encased, Anti Profitteer. Less than pre-war prices. Fully assembled and tested.

Sent Prepaid on Receipt of Price.

Style	No. 1	No. 2	No. 3	Money back if not satisfied. Just return condenser within 10 days by insured P. P. In Canada 25c additional.
43 Plates,	\$3.00	\$4.00	\$4.25	
28 "	2.50	3.50	3.75	
18 "	2.25	3.25	3.50	

These condensers are made by a watch mechanic schooled in accurate workmanship. Personally we will need no introduction to Amateurs who have "listened in" for "time" and "weather" from 9ZS.

Postscript.

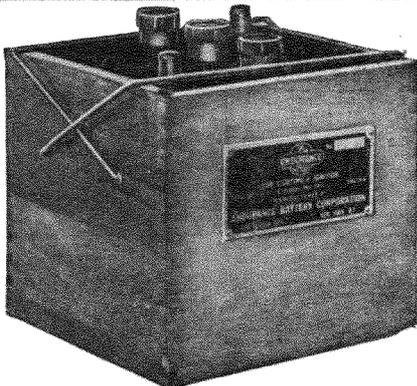
The above "Ad" certainly put "ILLINOIS" "on the map" in the Condenser Industry. Not only on the map, but scattered it all over the map, from Alaska to the Gulf, and from the Penobscot to the Golden Gate. The "money back" proposition seems to have been superfluous. Instead of having any instruments returned for credit, they ask for more. And, most satisfactory of all to us, our customers write to express their appreciation. All these, we take this occasion to thank heartily.

You will notice a slight increase in our price list, on the "mounted" styles only. This will be effective from May first. The fact is we could not quite "get by" with our first prices.

The "Star Spring" feature of our design meets with great favor. We shall make this the subject of application for Patent as we think it marks a step forward in the construction of Variables. It has two important functions. It keeps the plates accurately and permanently centered, without "end-shake"; and provides sufficient friction to hold the "rotor" at any setting without liability of its dropping from its position by the unbalanced weight. It makes the Condenser in this respect as reliable as the much more expensive "balanced" type.

Kindly note: We issue no Catalog, and make no "trade discounts". We set our prices at the lowest limit, and leave the "middle man" out for the sole benefit of the "consumer".

G. F. JOHNSON, 625 Black Ave., Springfield, Ill.



Length 6 13/16 in. Width 6 3/4 in. Height 7 1/4 in. Weight 26 1/4 lbs. Price \$20

ENDURANCE Storage Battery

6 Volts, 60 Amp Hours

Just what you need for your "A" battery.

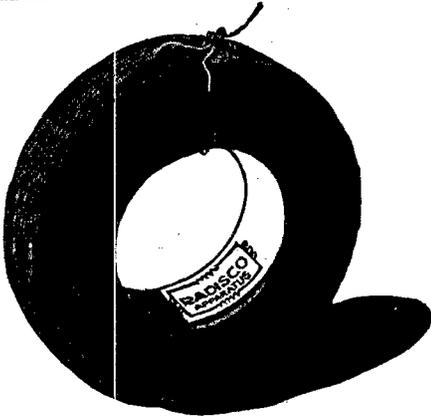
2 YEARS GUARANTEE

Price \$20.00

James W. Poole, Inc.

64 Kingston St., Boston, Mass.

Est. 1887



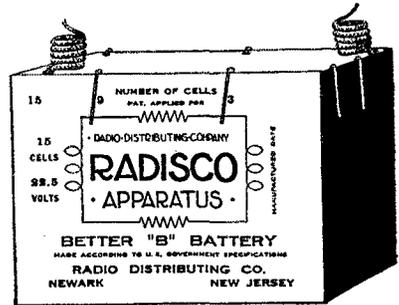
Two Famous Radisco Specialties

RADISCO COILS

conceded by several well known Radio Men to be far superior to any similar type of Inductances: Made in seventeen sizes, tapped and plain, Wave length range from 200 to 20,000 meters. Priced from 70c to \$4.85. Plentiful supply in stock at all Radisco Agencies.

RADISCO BETTER "B" BATTERY

is made, according to Government specifications in two (2) sizes; $3\frac{1}{4} \times 2 \times 2\frac{1}{2}$ " and $6\frac{1}{2} \times 4 \times 3$ ". A first class 15 cell, 5 group battery. VARIABLE VOLTAGE (Pat. App. For) is a special feature of this battery which enables you to provide critical voltage regulation for your Vacuum tube by means of a switch connection with cells, taps of which have been taken off. Very economical and convenient. If one cell goes bad just test each group of 3 cells and short circuit the bad one. Price Small size \$1.40. Large size \$2.40 at any agency—or if ordered by mail include postage for 2 pounds on small size and 5 pounds on large size. RADISCO AGENTS carry only apparatus of proven merit. Look for the Radisco trade mark on all parts you buy and be sure of getting efficient apparatus. Below are listed a few of the reliable firms who carry the RADISCO COILS, Better "B" Batteries, and are our Agents for all other standard apparatus of merit.



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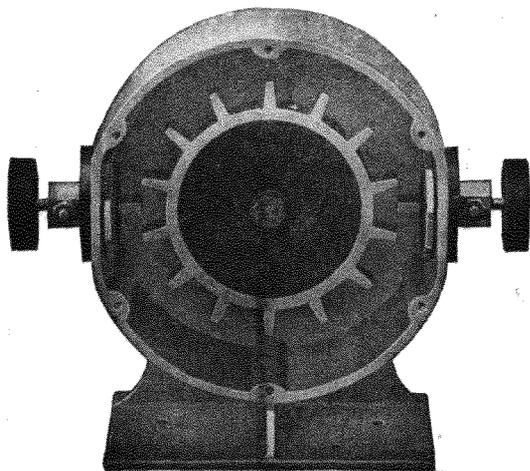
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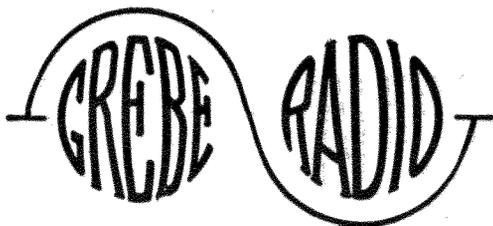
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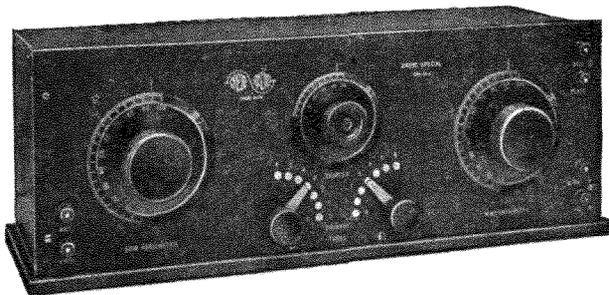
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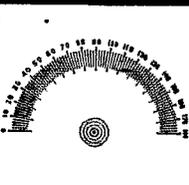
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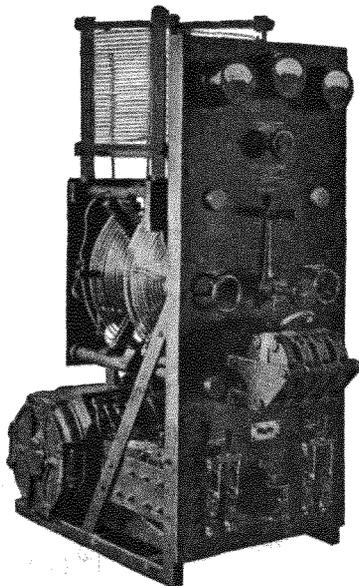


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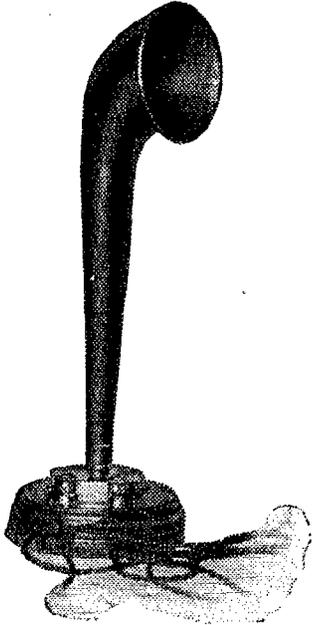
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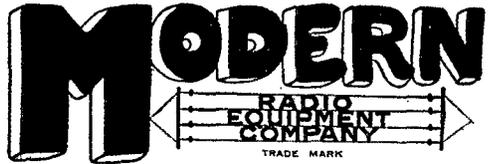
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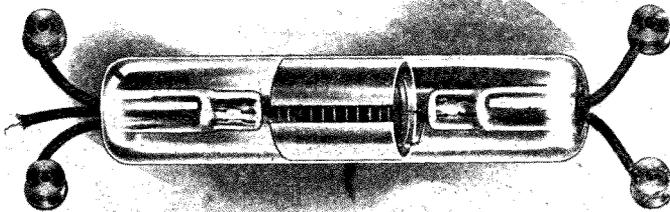
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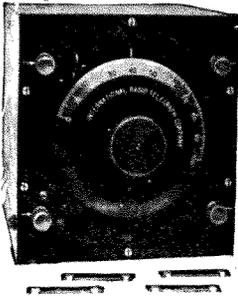
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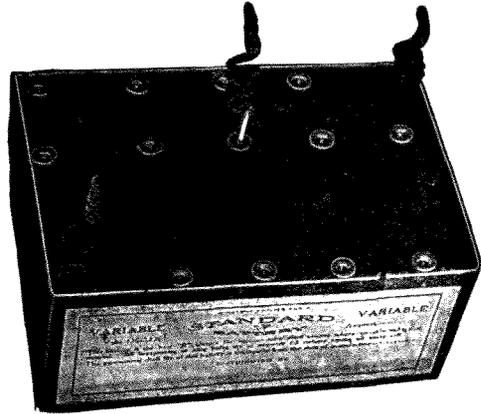
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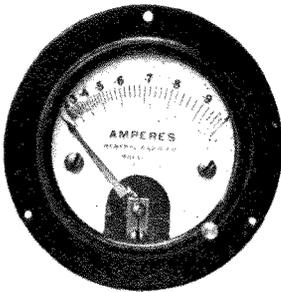
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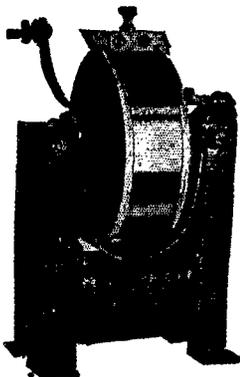
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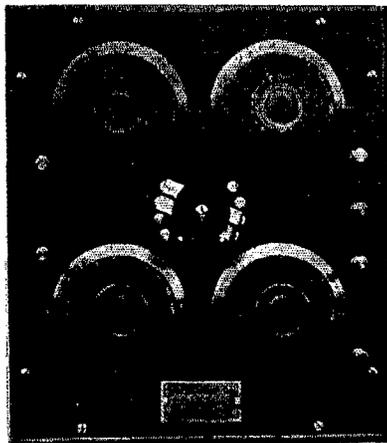
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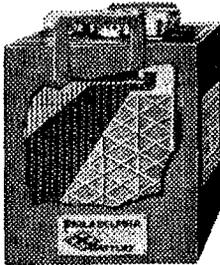


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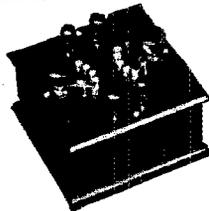
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WIRELESS TELEPHONE INDUSTRY PRESENTS TREMENDOUS FIELD OF OPPORTUNITY TO AMBITIOUS AMERICANS

E. R. Haas, Director of the National Radio Institute, tells how the development of the Wireless Telephone has opened a fertile and uncrowded field of opportunity to American men and women: When Alexander Graham Bell announced his invention of the telephone to the skeptical world he was hooted, laughed at and told that his device was simply a scientific toy. But the men and women who backed the Bell Telephone with their money and their energies have reaped rewards far beyond their rosiest dreams.



are thousands of people and millions of dollars involved in carrying on the industry and a permanent demand exists for more men and women, trained in Wireless than can possibly be supplied. Salaries in the wireless field have advanced steadily and today range from approximately \$225 a month to \$15,000 a year.



stations located on land. The Wireless Telephone annihilates space and in doing so overcomes many of the serious objections to older methods of telephonic communication. So great has been the development in this line that Congressman Steenerson of Minnesota recently stated that all telegraph and telephone wires would soon be scrapped owing to the perfection of Wireless.

Men and Women are needed and will be needed in ever increasing numbers to carry on the work made necessary by the advent of the Wireless Telephone. Those who realize this fact and who prepare now to successfully fill positions in this great field, will be the first to profit—as in the case of the pioneers in the telephone, automobile, talking machine and flying machine industries.



America has always been at a disadvantage because of the inadequacy of her oceanic cable system. This is one of the many important obstacles to greater world commerce which the Wireless Telephone will effectively remove. In fact the Wireless Telephone puts the world at America's front door and elevates her from a minor to a major position in world communication. The permanent success of Wireless Telephony in America is definitely assured because of the recent formation of the Radio Corporation of America (controlled by the General Electric Company) which has taken over the basic Alexanderson patents covering radio intercommunication and will virtually control this important industry in America and as a further sign of progress American apparatus is now standard throughout the world.



Due to its low cost of operation, installation and maintenance, the wireless telephone is steadily supplanting the long distance telephone for practical business purposes. Branch factories located in different cities may now enjoy the advantages of frequent telephonic intercourse by means of their individually controlled wireless stations; the wireless telephone makes possible telephonic communication between moving trains, ships and other carriers, something heretofore impossible of accomplishment and it will soon be as simple a matter to talk by wireless phone with people across the ocean as it now is to phone across the street.

The Wireless Telephone is bound to do more toward unifying the commercial, political and social interests of the world than any other single factor. The day of wireless, while still at its dawn, is here to stay and the field of opportunity which it has opened to ambitious men and women is second to none.



Each new step forward in the development of wireless creates a still further demand for men and women who are trained in this modern method of communication and it was in order to help meet this ever increasing demand that the National Radio Institute was founded in the Nation's Capital, in 1914 by James E. Smith, E. E. The National Radio Institute was one of the first schools of Wireless Telegraphy in America and was the first to teach this science by mail. Thousands of students have completed their practical courses in this fascinating study. Hundreds of them are still holding important positions in the wireless field and a permanent demand now exists for graduates of the National Radio Institute. It is only natural that the National Radio Institute should also be first in the field to teach Wireless Telephony by mail to the hundreds of progressive Americans who realize that this modern method of communication in all its various branches presents a broad field of commercial opportunity in which to exercise their abilities and make their fortunes.



You, who have read this far will find in Wireless Telephony the opportunity for growth and successful accomplishment for which you have long been seeking. By taking up the study of Wireless Telephony now, as taught by the National Radio Institute you will advance rapidly as its universal use increases and you will be carried along on the crest of the wave to success in what is fast becoming one of the foremost industries in the world. Text-book and Advanced Lesson on Approval.

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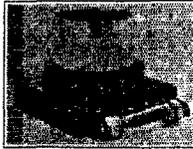
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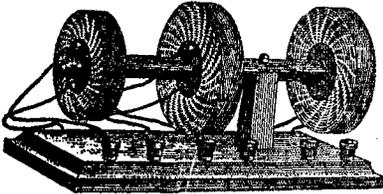
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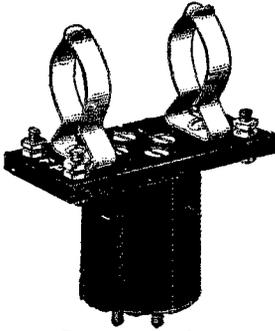
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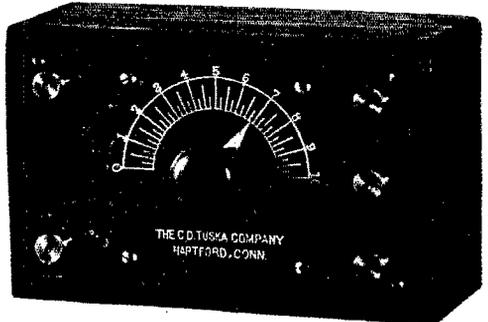
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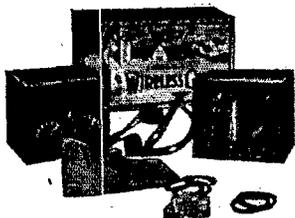


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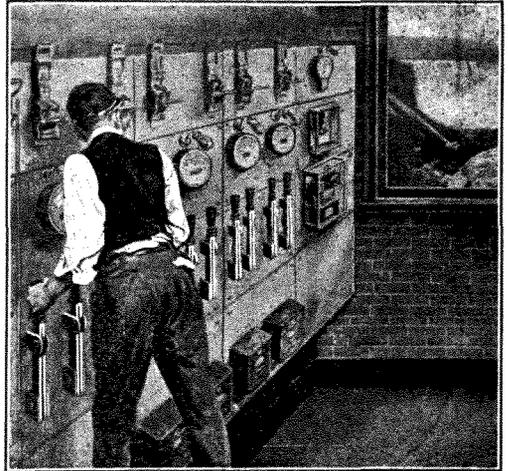
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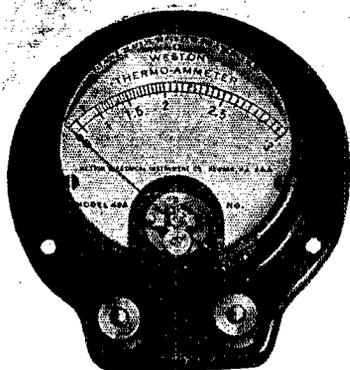
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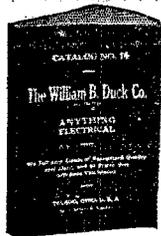
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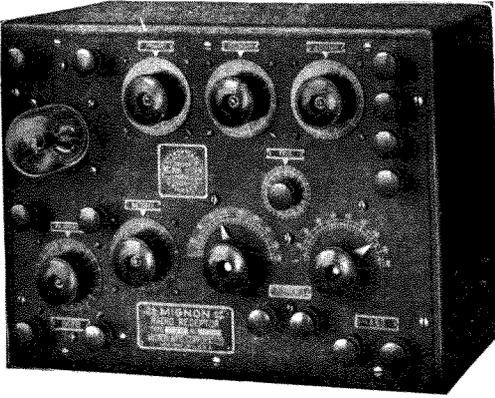
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The Mignon System Apparatus "RW1," "RW2," "RW3" and "RBD8" are no longer manufactured and are superseded by the improved "RW4," "UW1" and "BD1." These apparatus are manufactured exclusively by the MIGNON MFG. CORP., sole owners of the Mignon System Patents. (See U. S. Letters Patent No. 1329672.)

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HIGH SPARK FREQUENCIES

ALLOW

TRANSMISSION THROUGH STATIC

ACME TRANSFORMERS

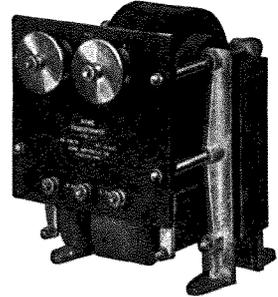
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QST

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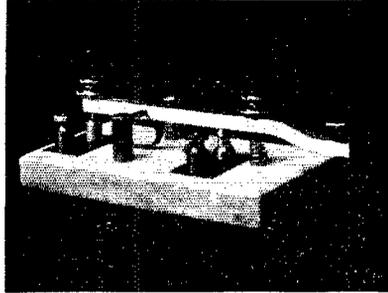


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Standard BA-2 TYPE The same type of a battery as used by the U. S. ARMY AND NAVY SIGNAL CORPS. Fully guaranteed on a money back basis. Once you use these batteries you will use no other. Meraco Perfect "B" Batteries are made in three sizes and should be ordered by Catalog No.

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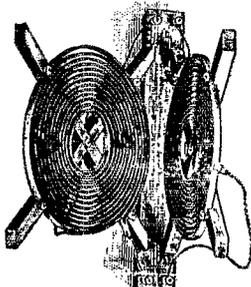
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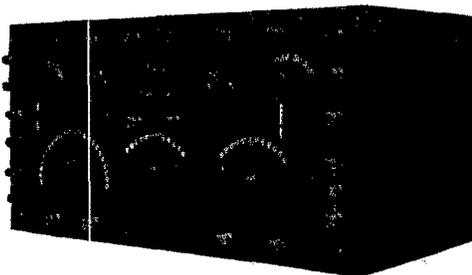
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For DAMPED or UNDAMPED Wave Reception

A carefully wound Receiving Transformer with an approximate Wave Length of from 200 to 8000 Meters Equipped with Variable and Fixed Condensers Rheostat and Grid Leak. Fitted to take the latest MARCONI Vacuum Tube. Bakelite Panel, Silver Plated Switches and Contacts, Mission Oak Cabinet. Entire Apparatus built within Metal frame to permit easy removal. Model "D", as illustrated, **SIXTY DOLLARS, Net.** Model "E" fitted with Modern "DEAD END" Switch and High Grade Hot Wire Ammeter, Eighty-Five Dollars net.

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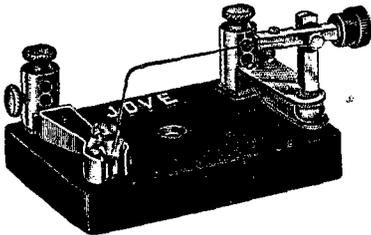
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25.....\$0.40	150.....\$0.60	400.....\$0.80
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Group price \$2.00	Group price \$3.00	Group price \$8.50

Complete set 17 coils (unmounted) \$12.00. Mounted, \$15.00. Coil mounting, sliding type, \$1.00. Panel or Rotary type, \$3.50.

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It is the earnest aim of this enterprise to furnish all manner and kind of Radio and Electrical apparatus and supplies necessary to the highly technical experimenter as well as to the novice. A special endeavor will be made to please all customers, both in the vicinity of New York and distant points throughout the country. If you live nearby, drop in and see us; if far away, drop us a line and try us out.

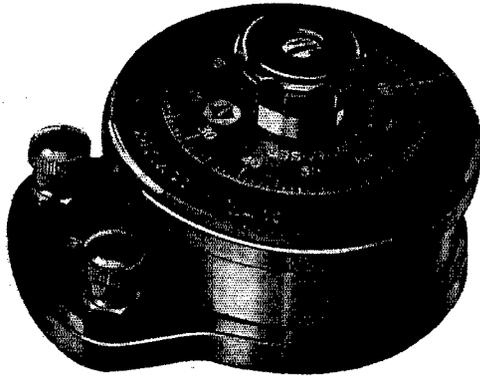
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Our word of honor is our guarantee. Let us prove it.

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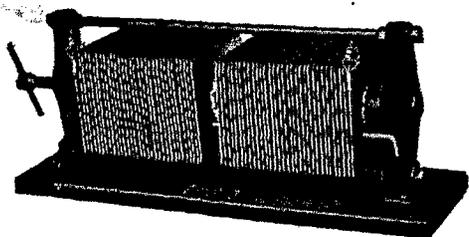


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The CONNECTICUT Research Laboratories have developed a radically new type of Variable Condenser, unique both in design and performance. It is smaller than any other on the market. Much more stable, does not easily get out of order, insures a stronger signal, permits work at the ends of the scale, and obtains much finer adjustment than any previous type.

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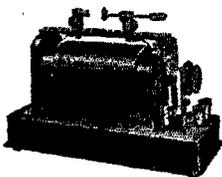
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Type C 6 volt primary \$28.50

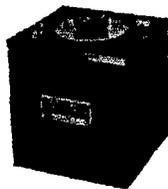
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Type
C



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Type
B



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