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AMERICAN RADIO RELAY LEAGUE

NOVEMBER 1922

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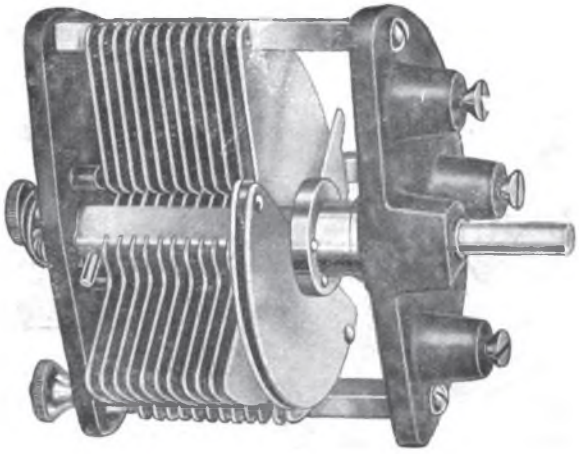

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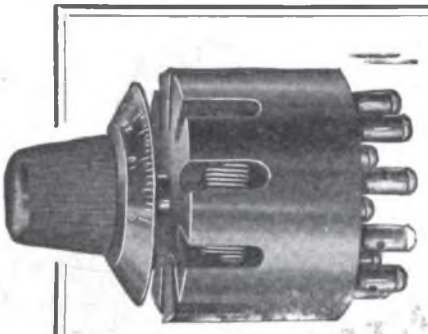

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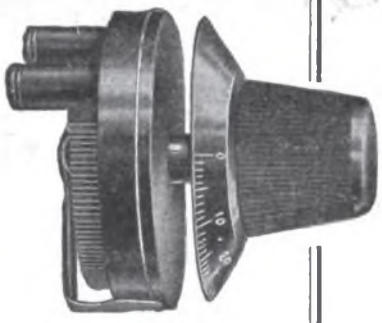

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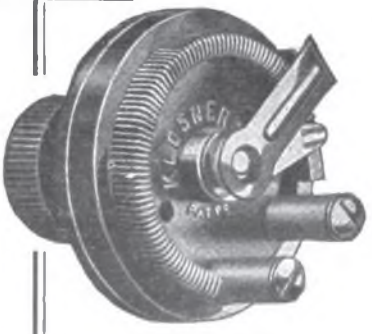

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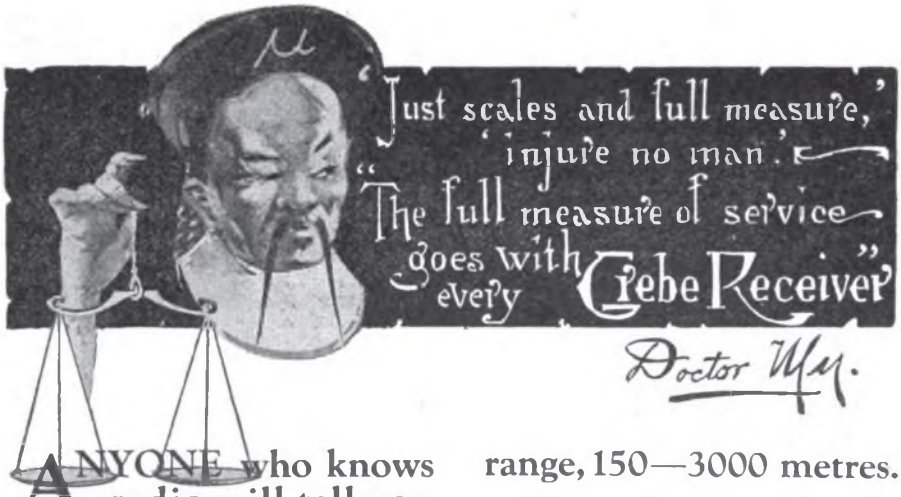

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THE AMERICAN RADIO RELAY LEAGUE, Inc.
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THE AMERICAN RADIO RELAY LEAGUE

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

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

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QST

A Magazine Devoted Exclusively to the Radio Amateur

The Wave Antenna for 200-Meter Reception

By H. H. Beverage

Engineer, Radio Corporation of America

For a year now QST has been endeavoring to secure reliable information on the so-called Beverage Wire or wave antenna, which for special purposes is the best arrangement known today. With the approach of our Transatlantic Tests the matter became of even greater moment and we appealed to the Engineering Department of the Radio Corporation of America. They had never done any practical work with it on amateur wave-lengths but very courteously arranged for a series of special tests at their Belmar station, where engineers were sent and numerous lengthy tests conducted on this special subject. The following article, written especially for the A.R.R.L. and QST, is the result. It is absolutely a classic in the literature of amateur radio, and we are very proud of it. We acknowledge our gratitude to the Radio Corporation and its engineers for their very kind co-operation.

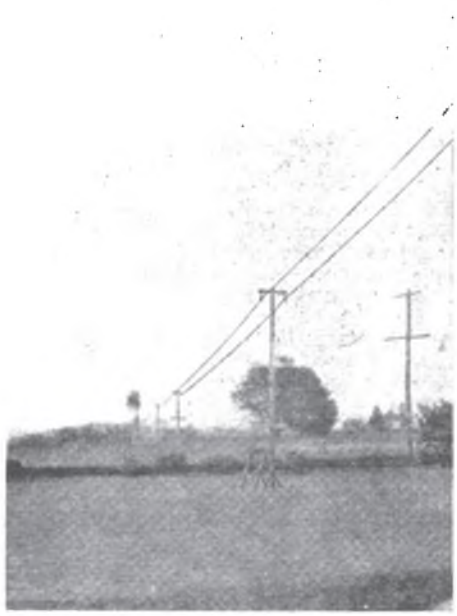
No license rights are to be inferred from the publication of this article, but attention is called to the fact that amateurs are given the privilege of using the wave antenna as set forth and to the extent indicated in the current catalogue of the R.C.A., the owner of the license rights.—Editor.

THE Wave Antenna is a new type of unidirectional antenna which has been developed by the author and Messrs. Chester Rice and E. W. Kellogg of the General Electric Co., and is covered by patents and applications. This antenna has been in existance for some time, but was first brought to the attention of the amateurs by Mr. Paul F. Godley, who described it in his report on the reception of American amateurs at Ardrossan, Scotland. The full theory of this antenna is scheduled to appear in an A.I.E.E. paper for the Pittsburgh convention in November, so this paper will be confined to very elementary theory and practical considerations.

Theory

If a wire is suspended in space, it has a certain capacity and inductance per unit length which bear a definite relation to each other. This relation may be expressed as $1/\sqrt{LC}=V$, where V is a constant. This constant is the velocity of light. For example, if L and C are expressed as the capacity and inductance per meter, then $V=3\times10^8$ meters, which is the velocity of light in meters per second. If a larger wire is used, or if two or more wires are used instead of one, in the ideal case the inductance decreases in the same ratio as the capacity increases, so that $L\times C$ is always a constant. This means that, for the ideal wire, the currents induced in that wire will always travel along it at the velocity of light, independent of the size or number of wires.

A practically-constructed wire must be supported at several points and must run



One of the "Beverage Wires" erected at Belmar for these tests.

horizontal'y within a few feet of the earth. The effect of the supporting insulators and the proximity of the earth is to

increase the capacity in a greater ratio than the inductance decreases, so the velocity of the currents on a practical wire is always somewhat less than the velocity of light. On short wave-lengths, however, the velocity approaches very close to the velocity of light, generally between the limits of 85% and 98% of the velocity of light for 200 meters, depending upon the size and number of wires.

In order to make the antenna unidirectional, it is necessary to stop the reflections at the end farthest from the receiver end. This is accomplished very simply by placing a non-inductive resistance between the antenna and ground at the far end. If this resistance is made equal to the "Surge Impedance" of the wire, it absorbs all of the energy and prevents any of it from being reflected back to

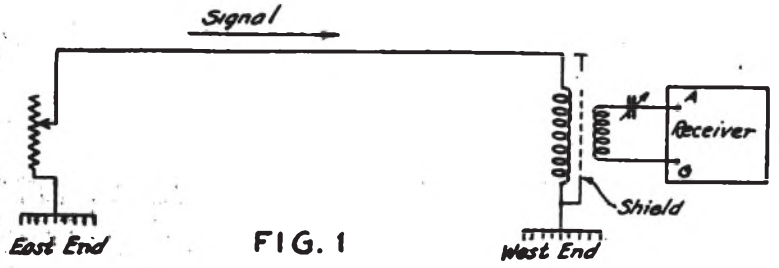


FIG. 1

In Figure 1 is shown the simplest form of Wave Antenna. It consists simply of a wire, at least one wave-length long, stretched in the direction of the transmitting station. For explanation purposes, it may be assumed that the transmitting station is east of the receiving station, and that the receiver is placed at the west end of the antenna, as shown. The travelling wave from the transmitting station moves from east towards the west at the velocity of light. As the wave moves along the antenna, it induces currents in the wire which travel in both directions. The current which travels east moves against the motion of the wave and builds down to practically zero if the antenna is one wavelength long. The currents which travel west, however, travel along the wire with practicaly the velocity of light, and, therefore, move along with the wave in space. The current increments all add up in phase at the west end, producing a strong signal, as shown by curve A in Figure 2. In like manner, static or interference originating in the west will build up to a maximum at the east end of the antenna, as shown by curve B in Figure 2.

If the east end of the antenna were open or grounded through zero resistance, all of the energy represented by curve B would be reflected and would travel back over the antenna to the west end, where part of the energy would pass to earth through the receiver and part would be reflected again, depending upon the impedance of the receiver winding. The horizontal plane intensity diagram would be bi-directional, as shown in Figure 3. The reception from the west is not as good as from the east because some of the energy is lost due to attenuation in the wire as the reflected wave travels back from east to west.

the receiver. The intensity characteristic becomes unidirectional, as shown in Figure 4.

The value of the surge impedance depends upon the size, number, and height of the wires above ground, but is independent of the length of the wire. For practical construction with one or two No. 12 copper wires, the surge impedance lies between the values of 200 and 400 ohms. The surge impedance is theoretically equal to $R = \sqrt{L/C}$, where L and C are the inductance and capacity per unit length.

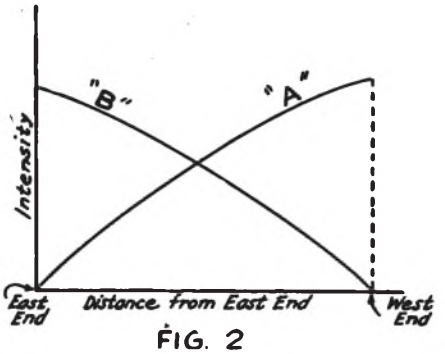


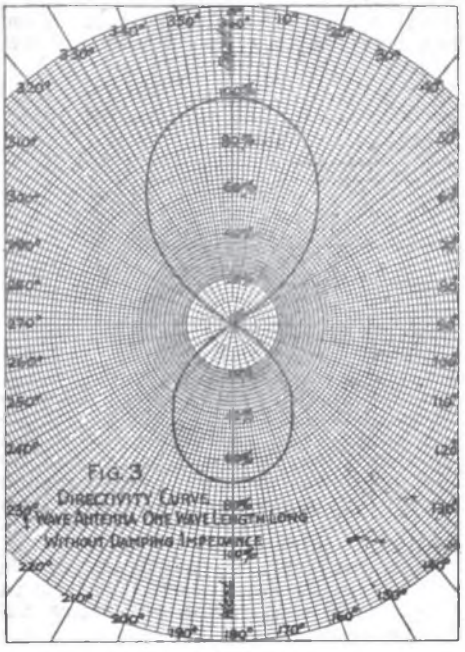
FIG. 2

Godley used the simple form of wave antenna, as shown in Figure 1. However, this is not the most practical form as it is necessary to go to the far end to make adjustments of the damping resistance.

Feed-Back Antennae

If two parallel wires are used, the wave antenna becomes very flexible and the receiver may be placed at either end with local control of the damping. In Figure 5, for reception from the east, the receiver

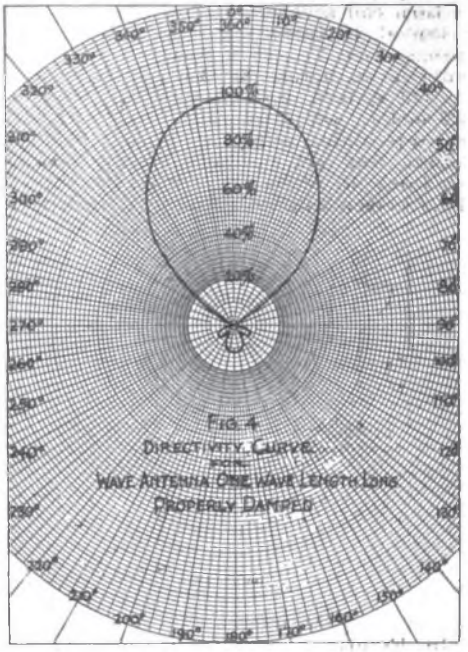
at the west end is replaced by the primary P of a transformer T_2. The primary is coupled to the secondary S as closely as possible, and feeds the energy over the two wires as a transmission line. A second transformer T_1 at the east end feeds the energy from the transmission line into the receiving set. The energy fed over the transmission line circulates around the line



as in an ordinary metallic-circuit telephone line, and, therefore, the currents pass through both halves of the primary of T_1 in the same direction, inducing voltages in the secondary which feeds into the receiving set. On the other hand, currents coming over the wires as an antenna, that is, from the west, are equal and in phase on both wires, and upon passing to ground through the two halves of the primary of the output transformer T_2, they pass through the winding in opposite directions and neutralize. With this circuit, the energy reaching the receiver is the same as it would be if the receiver were placed at the west end, excepting for the transmission line losses, which ordinarily are 20 to 25% with proper design. With this feed-back system, the operator can make adjustments of the surge resistance without leaving the station, and can listen to the signals while he is making the adjustments.

Figure 6 is equivalent electrically to Figure 5, but in this case the transformer T_2 has been replaced by a simpler circuit. By grounding one wire and leaving the other wire open, the energy is reflected on each wire, but the reflected currents on the transmission line are 180 degrees out of phase on the two wires, and, therefore, a difference of potential exists across the terminals of the primary of transformer T_1 exactly the same as when the reflection transformer T_2 of Figure 5 was used. If the ground resistance at the reflecting end is zero, the reflection of energy with the connections of Figure 6 would be 100% efficient, and the only loss would be the transmission line losses. The open-ground reflection connection is preferable to a transformer, on short wave-lengths particularly.

It is possible to damp a two-wire antenna from either end. In the case of Figure 6, the signal from the east built up to a maximum at the west end, and was then reflected up to the east end, where the receiver and damping circuit were placed. In the case shown in Figure 7, the receiver is placed at the west end as in the case of the simple antenna of Figure 1. Instead of placing the damping circuit at the east end, however, it is placed across the transmission line at the west end where the receiver is. This damping circuit is practical-



ly just as effective as it would be if actually placed at the far end. This circuit also has the advantage that the desired signals do not pass over the transmission line, and the transmission line losses are avoided.

In order for the damping circuit to be effective, it is necessary that the two wires of the antenna be joined through an in-

ductance which is of high impedance compared with the impedance of the damping circuit. The best way to acomplish this result is to use a coil with a mid-point tap, as shown at *N* in Figure 7. With respect to the transmission line, the two halves of this coil are adding, so the inductance across the line is high. With respect to the receiver, however, the two halves of the coil are opposing, so that the impedance in series with the output transformer amounts only to the leakage reactance of the coil *N*, which can be made very small. A satisfactory coil for *N* for 200 meters was a 24-turn coil seven inches in diameter, with a tap at 12 turns for feeding the output transformer *T*. This coil was about 0.3 millihenries across the line, or 1900 ohms at 300 meters, and nearly 3000 ohms at 200 meters, which was high enough to have no appreciable influence on the damping circuit, and yet had low enough leakage reactance to allow the signals to pass to the receiver without noticeable weakening.

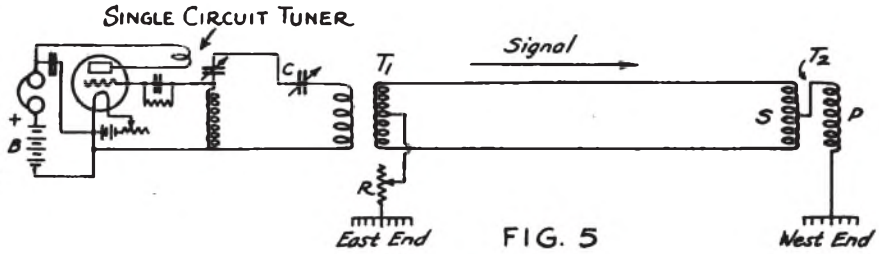


FIG. 5

eliminate. This is made possible by making the damping-circuit reactance, either slightly capacitive or slightly inductive, instead of purely resistive. In some cases it may be desirable to reflect a small amount of energy to neutralize undesirable signals from the back end. This is readily accomplished by adjusting the resistance and capacity of the damping circuit. The capacity and inductance in this damping circuit are usually found to practically neutralize each other for the best adjustment; that is, they should tune approximately throughout the band of wavelengths it is desired to receive. If the wave-length being received is varied over wide limits, it is necessary to readjust the damping circuit condenser for best results, although the adjustment is usually quite broad. The resistance does not need readjustment except in special cases.

For a range of 180 to 360 meters, the damping circuit consists of an inductance of about 0.08 millihenries, a variable con-

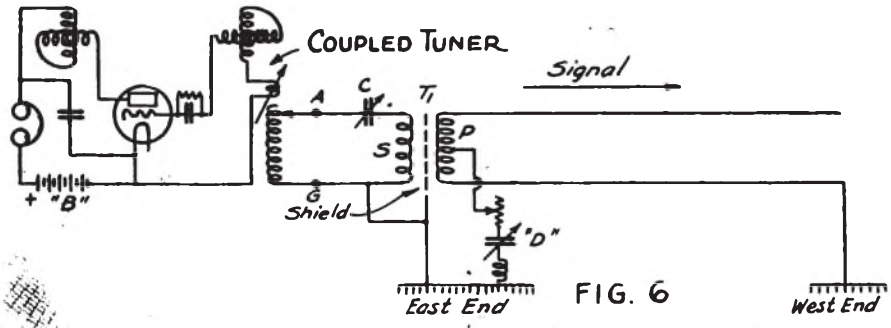


FIG. 6

Damping Circuits

In Figures 6 and 7, damping circuits "*D*" are shown which consist of resistance, inductance, and capacity, in series. Due to distortion on the antenna, to back-wave effects, to interfering signals or static coming from such a direction as to be received on one of the little "ears" on the back of the antenna, as shown in Figure 4, etc., it often happens that there are appreciable residuals which it is desirable to

denser of 0.0015 mfd. maximum capacity, and a non-inductive resistance variable in steps of one ohm from 0 to 500 ohms. A General Radio decade box is ideal for this purpose. However, ordinary resistance wire potentiometers, inductively wound, have been used with entire success in damping circuits. It is necessary to select a potentiometer with sufficiently low inductance to tune well below the shortest wave it is desired to receive; then the induct-

ance of the potentiometer is taken into account when calculating the value of inductance to be used in series with the resistance and capacity. In this manner the inductance of the potentiometer used for the variable resistance may be tuned out, and the damping circuit may be made pure resistance for any one particular wave-length.

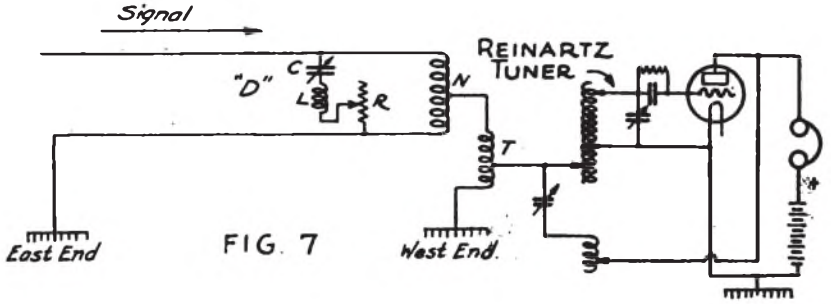


FIG. 7

When the damping circuit is placed across the transmission line as shown in Figure 7, the value of the damping resistance may vary considerably with wave-length, becoming lower for short wave-lengths, due to the increase in attenuation at short wave-lengths partially damping the antenna. In other words, the transmission line acts as a resistance in series with the damping circuit, and the transmission line resistance becomes appreciable at short wave-lengths.

Antenna Design

It is obvious from the theory of the wave antenna just given that it must either point towards the desired signals or that it must point directly away from the desired signals. In case the antenna is pointed away from the signal, then the maximum signal occurs at the far end and must be brought up over the transmission line to the receiver, as shown in Figure 6. In case the antenna is pointed towards the signal, it is necessary to put the damping circuit on the transmission line, as shown in Figure 7. It is possible to use a single antenna for reception from either direction by switching arrangements to change to either the connection of Figure 6 or that of Figure 7 at will. It is preferable on short wave-lengths to point the antenna towards the signal, using the connections of Figure 7, but the feed-back of Figure 6 gives practically the same results, excepting that the signals are not quite as loud due to the transmission line losses.

It is necessary to run the wave antenna in as straight a line as possible and not nearer than 200 feet to other parallel wires, such as telephone and power wires, as the influence of these wires is liable to distort the directive characteristic of the antenna. Other wire lines may be crossed at right angles without undesirable effects. In cases where it is not feasible to run the wave antenna in line with the desired signals, it is possible to get good reception with the antenna somewhat off line by sacrificing signal intensity. By referring to Figure 4 it is seen that for the average antenna one wave length long it is possible to be 45 degrees off line before the signal drops to half intensity. Beyond 45 degrees the signal falls off very rapidly. Twenty degrees off line, the signal intensity has fallen off only 10%, so very good reception may be obtained. If the antenna is two

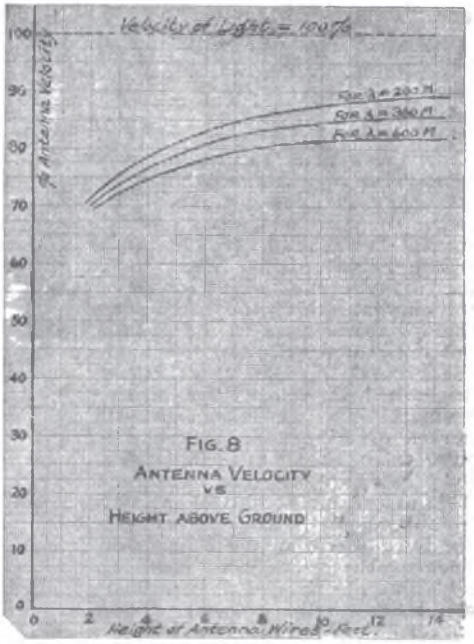
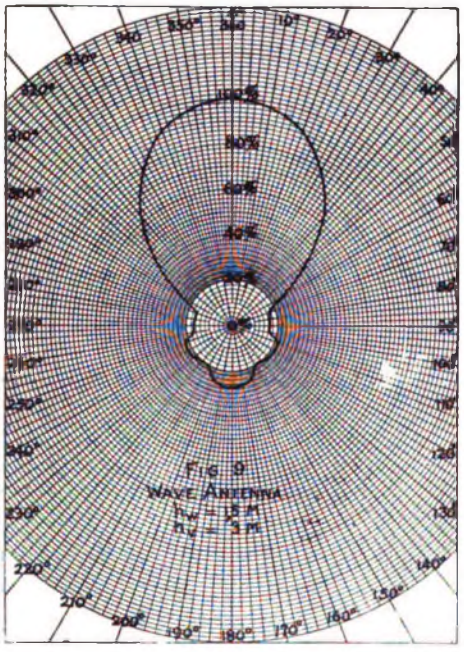


FIG. 8
ANTENNA VELOCITY
VS
HEIGHT ABOVE GROUND

wave-lengths long, it is more directive, and it is not possible to receive well if it is more than 25 or 30 degrees off line.

The antennae are constructed of copper or other non-magnetic material, although

Mr. Cutler of 7IY reported in the October *QST* that he has obtained good results on a galvanized iron wire. The size of the wire is usually between No. 10 and No. 14 B.&S., although it is possible to get fair results even with No. 18 bell wire. The usual construction is to put up two wires



on a cross arm about two to three feet long. The wires are suspended by porcelain cleats, or in more permanent construction standard telephone pins and high grade insulators are used.

The height of the wires above ground has a marked influence on the velocity of the currents along the wires when the wires are close to the ground, but if the wires are ten feet above the ground there is very little to be gained in velocity by making them higher, as shown in the curves of Figure 8. These data were taken on an antenna at Belmar, N. J., by Mr. H. O. Peterson. This antenna extended over fairly conducting soil. The character of the soil underneath the antenna influences the velocity to some extent, but the data of Figure 8 are about the average velocity. These curves show that the velocity becomes lower at longer wavelengths.

If the velocity is too slow, then the currents in the wire lag in phase behind the wave in space, and a point is soon reached when the current in the wire from the far end is so far behind in phase that it not only does not add to the increments from points close to the receiver, but may actually subtract. The maximum length that it is feasible to use is that length at which the current in the wire lags 90 degrees behind the wave in space. This length is given by the formula:

$$L=\frac{\lambda}{4\left(\frac{100}{C}-1\right)}$$

where

λ = wave-length in meters.

C = signal velocity on antenna expressed in per-cent velocity of light.

For example, from Figure 8 we find that the velocity of the currents in the two wires suspended at a height of 10 feet is about 88% of the velocity of light for 200 meters, so the maximum usable length is:

$$L=\frac{200}{4\left(\frac{100}{88}-1\right)}=\frac{200}{.544}=367 \text{ meters.}$$

Therefore it is not feasible to use a two-wire antenna suspended at a height of 10 feet more than two wave-lengths long for 200 meters. By increasing the height, the velocity will increase, and longer wires may be used. Figure 8 shows that the velocity increases slowly with height above 10 feet, so the wires must be much higher to be of material advantage. Making the wires too high introduces a difficulty on short waves which does not occur on long waves, and that is the "end" or vertical-antenna effect. The effective height of a 200 meter wave antenna is about 5% to 10% of its horizontal length, depending upon the nature of the earth beneath the antenna, etc. If an antenna is 200 meters long, therefore, its effective height will be between 10 and 20 meters. If the antenna

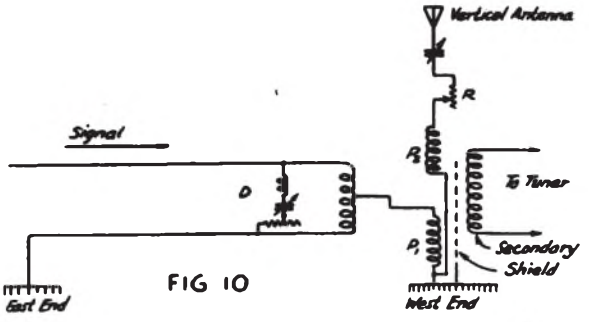


FIG 10

is on supports 10 feet high, the vertical or end effect may be equivalent to an effective height of nearly 3 meters, distorting the directive curve. In Figure 9 is shown

the directive curve of a wave antenna of 15 meters effective height with a vertical or end effect of 3 meters superimposed upon it. It will be noted that the end effect may mount up to very serious proportions if the antenna is made too high. It is, however, possible to balance this end effect by means of a separate vertical antenna, as shown in Figure 10. P_1 is the standard primary, while P_2 is a second primary coil of about the same number of turns, which is wound over P_1 but in the opposite direction. How-

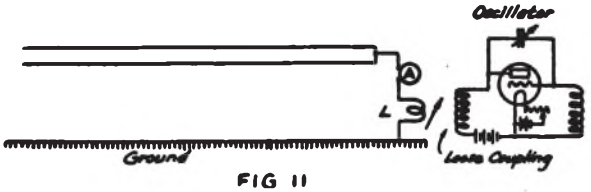


FIG 11

ever, in practice, the end effects seem to be very much smaller than predicted theoretically, so as a general rule if the antenna is not over 10 feet high the end effects are so small that it is not worth the trouble to balance them. From the above considerations, it is evident that 10 feet is a good average height for short wave antennae.

Design of Transformers

With the feed-back circuit of Figure 6 only one transformer is necessary. The output transformer T_1 was made up on a 7-inch cardboard tube. The primary P was 20 turns of No. 24 B.&S. D.C.C. copper wire, with a tap at ten turns or the exact center. Over the primary was placed a shield consisting of a piece of tinfoil insulated from both windings by paper. This shield was grounded to cut out capacity currents between primary and secondary. It is important that the tinfoil be not quite a complete turn around the primary; the ends must not touch or it will act as a short-circuited turn and introduces high losses. The secondary consisted of five turns of No. 18 bell wire wound over the tinfoil shield. The center of the secondary winding was lined up carefully over the center of the primary winding; otherwise the transformer would not be balanced. With the circuit of Figure 6, the transformer balance was tested by opening both wires at the west or reflection end. When the transformer T_1 was properly balanced, the receiver was quiet, indicating that the two halves of the primary were perfectly symmetrical with respect to the secondary.

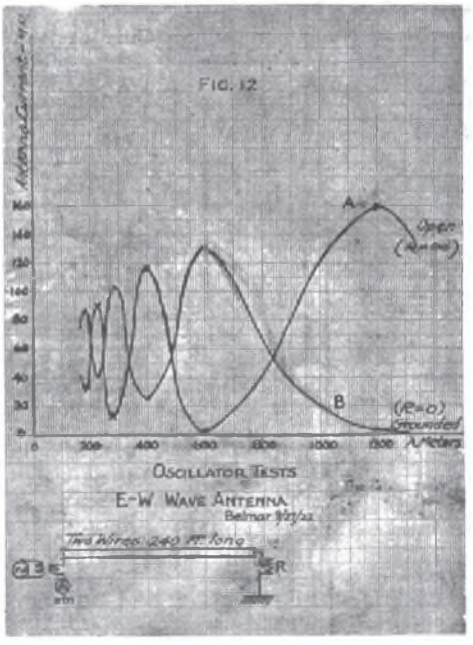
Transformer T_1 of Figure 6 was designed to work with a coupled receiver. The secondary of the output transformer was connected in series with the primary of the receiver and was tuned by the series condenser C. This same transformer can also be used with a single-circuit tuner like the Westinghouse RC or the General Electric AR-1300 tuner. For 200 meters, it is usually better to use a separate condenser C outside of the tuner condenser, as shown in Figure 5, but for longer wave-lengths this series condenser may be omitted.

When the circuit of Figure 7 was used, the transformer described above was used with success but better results were obtained by cutting the primary turns down to 15 turns instead of 20 turns. This transformer is shown in Figure 1, but may be used with the connections of Figure 7. A tinfoil shield is used between primary and secondary, and is grounded as shown. In all of these transformers the coupling between primary and secondary should be as close as possible.

In Figure 7 an auto-transformer T is shown. The total turns are 15, and the receiver is tapped off at 5 turns. The diameter of the turns is 7 inches, but smaller diameters have been used by increasing the number of turns to make the same inductance. This auto transformer connection has been adapted to a Reinartz tuner with excellent results by Mr. Bourne at 2BML.

Determination of Surge Resistance and Velocity

The velocity and surge resistance were easily determined by oscillator tests. An oscillator was coupled to the antenna, as



shown in Figure 11. In the antenna circuit was included a coupling coil L consisting of only two turns. The far end of the antenna was left open for the first test, and a resonance curve of the antenna was taken. The curve is plotted as Curve A in Figure 12. Then both wires of the antenna were grounded at the far end and the resonance curve taken again. This curve is plotted as Curve B in Figure 12. In order to find the velocity, it is necessary to calculate what the resonance points would be if the velocity of the currents on the wires was equal to the velocity of light.

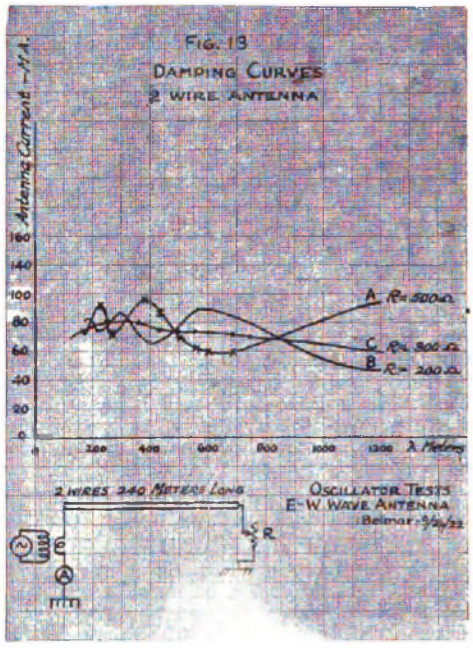
The length of the antenna was carefully measured. In the case of this particular antenna at Belmar, the length was 240 meters. Assuming that the velocity of the currents on the antenna is equal to the velocity of light, the first resonance point with the far end of the antenna open will be the quarter-wave oscillation as in an ordinary antenna. The wave-length will be $4 \times 240 = 960$ meters. The next resonance point will be the three-quarter wave oscillation, or $4/3 \times 240 = 320$ meters. The next will be the 5/4 oscillation, or $4/5 \times 240 = 192$ meters, etc., for all odd multiples of the quarter wave oscillation. In like manner, with the far end of the antenna grounded the antenna will oscillate at all even multiples of the quarter wave oscillation. These calculated values are recorded in the table below. In the next column, the observed values taken from Figure 12 are recorded. By dividing the calculated value by the observed value, we get the actual velocity at that particular wave-length in terms of per-cent of velocity of light.

Calculation of Velocity of Currents on Antenna

Length = 240 meters, 2 No. 10 wires, 3 meters high.

Mode of Oscillation	Wave-length Calculated	Wave-length Observed	Velocity on Wires / Velocity of Light
1/4	960	1200	80%
2/4	480	590	81%
3/4	320	390	82%
4/4	240	280	85%
5/4	192	220	87%
6/4	160	180	89%

To determine the surge resistance, a non-inductive resistance was placed between antenna and ground at the far end, and the resonance curve taken again. Figure 13 shows the results of this test on the Belmar antenna. Curve A, with 500 ohms at the far end, shows broad but unmistakable resonance points at open oscillation wave-lengths. On the other hand Curve B, with 200 ohms at the far end, shows grounded resonance points. Curve C, with 300 ohms at the far end, shows no resonance points, indicating that the antenna is quite aperiodic. Therefore the surge resistance for this particular antenna is approximately 300 ohms. The downward bend of Curve C below 200 meters is not due to the antenna but is due to the oscillator output falling off when the coupling condenser approached zero.



When one of the wires was grounded at the far end and the other wire was left open, and the damping resistance was placed across the wires at the station end, as shown in Figure 7, a smooth curve, similar to Curve C of Figure 13, was obtained when the non-inductive resistance was 500 ohms. In this case, however, there were slight irregularities in the curve which do not appear in Curve C of Figure 13.

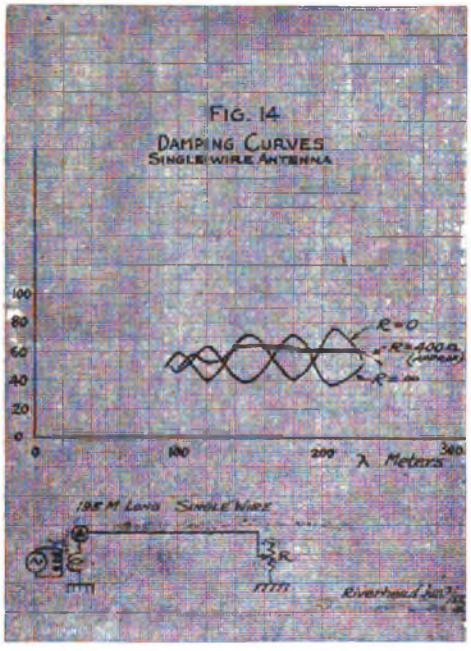
Figure 14 shows the resonance and damping curves taken on a single-wire antenna by Mr. R. B. Bourne at 2BML-2EH. This wire was 195 meters long, and was suspended from trees at a height varying from 15 to 20 feet. It is interesting to note that Mr. Bourne's antenna has a velocity of approximately 93% of the velocity of light at 200 meters and, therefore, shows that a single wire may be used up to a length of over three wave-lengths or approximately 2000 feet. Such an antenna should show very directional properties, but lacks the flexibility and ease of adjustment of the two-wire antenna.

Performance

Two 200-meter wave antennae were erected at Belmar, one running west from the station, and the other running south.

These antennae were arranged with switching such that the connections of Figure 6 or Figure 7 could be selected at will on either antenna. That is, the west antenna could be used for reception from either the east or the west, and the south antenna could be used for reception from either north or south. For comparative purposes a flat-topped single-wire antenna 40 feet high was erected. The effective height of this vertical antenna was estimated as approximately 8 meters. The signals on the wave antennae were about 50% stronger than on the vertical, giving an effective height for the wave antennae of 12 meters. This figure corresponds to about 5½% of the horizontal length of the wave antennae.

Listening tests on these antennae showed marked directive properties, as expected. Listening south, most of the stations heard were in the 3rd and 4th districts, but careful adjustments were necessary to eliminate 2nd district stations to the north. With the antenna directive towards the



north, the best reception was from the 1st and 2nd districts, although several 8th district stations were heard. The east-west antenna worked better than the north-south antenna, probably because the ground resistance at both ends was less than an ohm, whereas the ground resistance at the far end of the north-south antenna was very high, nearly 300 ohms, making it difficult to operate the damping circuit effectively. The reception from the west was excellent, great numbers of 3rd, 8th, 5th, and 9th district C.W. stations being heard without interference from 1st and 2nd district stations. With the antenna directed east, only local 2's, Long Island 2's, and a few 1's were heard. There was considerable static reduction at times on the eastward reception, as the static was often heavy in the south or west.

On the 360-meter broadcast station wavelength, very good results were experienced in eliminating interference, particularly when using the antenna for west reception, and cutting out New York and Schenectady interference. Station WOC at Davenport, Iowa, was received particularly well on the wave antenna at times when reception was impossible on the vertical antenna due to local interference.

Even on 600 meters, these wave antennae showed very good directivity, particularly for reception from ships at sea.

Mr. Bourne's antenna at Riverhead, L. I., runs in a direction about ten degrees north of west. He reports his results as follows: "Signals from the south and southwest come in with about 25% to 50% increase in signal strength over a vertical antenna 60 feet high. Signals from New England are, in general, very weak, and in some cases cannot be heard at all when using the wave antenna. No interference from ships or shore stations using commercial wave-lengths has been noticed. WSA, at Easthampton, about 20 miles away, at times has a very strong harmonic on about 225 meters, which interferes seriously with 200 meter reception when the ordinary antenna is used, but due to the fact that this station is southeast, no interference is experienced when using the wave antenna. Radiophones on 360 meters come in with about the same intensity as with the vertical antenna, but often the signal-static ratio is much improved with the wave antenna, and, as with 200 meter reception, interference from WSA and WBC (East Moriches, 10 miles away) is entirely done away with."

The amount of static reduction experienced with the 200-meter wave antenna at Belmar depended entirely upon the distribution of the static at different times. On several occasions very marked improvement was noted in the signal-static ratio when receiving from the east and north, and sometimes when receiving from the west, but it was rarely observed to make any marked improvement when receiving from the south.

The author wishes to acknowledge the valuable assistance received from Messrs. H. O. Peterson, R. B. Bourne, and A. B. Moulton, in the collection of these data on the 200-meter wave antennae.

Rotten QRM

By "The Old Man"

Ever hear of a "wouff-hong"? Know what it is? Sure, you say, it's some kind of a mythical instrument of torture. But do you know where it came from—how it got into the language of us American hams? "The Old Man" coined the expression, and at the same time he discovered the "rettysnitch" and the "ugerumf," which we know so well, in a story in QST away back in January of 1917. QST was just about a year old then and its circulation was so small that we are sure we must have thousands of readers today who will relish learning the story. The following story is reprinted just as it appeared in QST years ago, altho, thank heaven, the QRM conditions T.O.M. wails about are now a matter of ancient history.—Editor.

THIS QRM business is getting my nanny. Here it is midnight, and this msg. from the fellow whose girl has not had a letter from him for a full twenty-four hours is still stalled. I have smoked myself into a state of funk, the floor is covered with burnt matches, I am losing a perfectly good temper, and there is no sign that this will not continue all night long. How long do these radio bugs sit up at night anyway? Right now, as I write, there is that old gink 2AGJ up in York state fluttering along with that bird-in-the-cage spark of his, 8YO is yelling his darned head off for somebody over on the Pacific Coast apparently, 8NH is still trying her best to be lady-like in spite of a full hour of trouble, old 8AEZ is booming out QSA-but-QRM-bad-CUL, 9PC is trying to do something to 5BV, I distinctly heard 4DI say a bad word, and to the best of my knowledge and belief, no one has got anywhere.

What are we going to do about this business? It used to be that we were perfectly satisfied to listen to SLI and once in a while on Saturday night when we could stay up that late we would listen to Arlington send time. When we heard some commercial say QRM, we had to look it up on the chart to see what it meant. Later, we began talking to the fellow over on the other side of town and then was born our amateur QRM. Sometimes the "little boy with the spark coil" (the latter is all right but dog-gone the hide of the former) would try to call us at the same time, and we used to think we were in trouble. Still later we used to think we were bothered when we were in the middle of a conversation with a fellow in the next town and some whop would butt in. It was about this era that we began to organize radio clubs with high-faluting ambitions about "promoting radio communication and controlling interference."

But when we have a fellow who has not written to his girl for a full twenty-four hours and who positively must get the msg. to her over in Illinois, it becomes a serious matter to have some one else getting gay with the ether, especially when the latter has no conception of the existence of the word "brevity." One thing I will say, and that is that good old 8AEZ is brief. His spark may drown out everybody in the western hemisphere when he sends but he is brief. He says what he has to say in a few words in a few signals and he stops. He also does not go in for long technical discussions about gap speed and condenser construction while forty or fifty others of us are waiting with five or six messages each, many of which have been stuck on the pin a week. Far be it from even me, a real blown-in-the-bottle radio grouch, to find any fault or mention any names, but some of the young gentlemen who burn up valu-

able time every night and thereby multiply this QRM business ought to look up in the dictionary the definition of that particular combination of letters indicated by B-R-I-E-F. I could call off a dozen of them right now, and I would if I thought that editor down east would print them.

The trouble is that the young squirts don't stop to think. They start out and call somebody somewhere every three minutes. Everybody they hear they immediately call. If they can't hear anybody, they send a QST something like this: "QST QST QST QST QST QST de 1 NUT 1NUT 1NUT 1NUT 1NUT 1NUT 1NUT Any station more than fifty miles distant hearing these sigs please send postal to Willie le Nut,

Nutville." Willie repeats each word of this msg. three times. Each letter is sent so slowly it puts you to sleep. He uses up just exactly twelve valuable minutes sending out this hog-wash, and drives an old-timer to the point where he radiates brush discharge from every hair on his head. These fellows ought to be limited to hours between supper time and 8:30, and any one of them slopping over ought to get a letter from every respectable amateur within his range threatening to spank him if he ever transgresses again. I know a certain someone who will put his bid for election to the office of Chairman of the Committee on Chastisement.

Here is a sample coming in right now. Listen to this slop: "Columbus co 2pp 18co all sigs charles 9VY u no hf a motor little heavier than the racine sorry sorry OM QRM QRM pse QTA QTA K fish smell rotten yes yes wyd boston how do you get me gap bum bum rubber band QTA pwf about motors [Bad squeaks here—sick spark coil near at hand—wheezes terribly] want to hear tone like commercial? ARK r r r yes ark r r r listen nw."

Here begins ten minutes of the darndest scratching, screeching, groaning, blowing off steam, blubbering that ever mortal ear heard. At its worst it goes in into "---- fine fine how do u do it? ARK r r r rubber band on vibrator BANG!---" My friend with the 1 k.w. over on the other side of town explodes. He calls an 8-station. When he finishes the scratches reduce. Then we get the long distance QRM again: "CUL om SK spfscity bunk allemo bish mela hash breakfast wunkey wunkey lala lala 2asj QRM bad qsl 3ZW must go to bed now hw hw hw abt abt abt msg msg msg pse pse pse k k k." This is the way my log-book this evening looks. It's enough to raise a blister on a wooden leg.

Here is another sample of QRM slush: "v v v v v v v v v v ----------(somebody sitting on this key)— v v v v v v v linneg se with the wice sore feet commercial wirlih." Now what in heaven's name would you make out of this? Is it to the effect that somebody has a line on a commercial who is on the warpath for some amateur with sore feet? One cannot be sure of these matters. It might be that it is the commercial who has the sore feet, chasing some poor amateur around town probably.

Listen to this: "Yes yes jst wyd glucky wait a mt muddy wouff hong bliftsfy monkey motor." We assume from this msg that Glucky is being asked to wait a minute while Blifsky seeks a wouff hong with which to wallop a monkey the next time the latter faces toward the motor. I do not think I know just exactly what a wouff hong is. Probably some piece of apparatus used in the southern states to beat monkeys with.

It is this form of uninteresting "conversation" which clutters up the air with QRM. Of what moment is it to the rest of the world that this fellow Blifsky is going to smear somebody's monkey with a wouff hong? When anybody relapses into such mental slop as to want to operate with a thing named a "wouff hong" he ought to

keep his trouble to himself and not compel all of us respectable amateurs to listen to his drool. To put out a lot of foolish twaddle like this when that poor girl out in Illinois has not had a letter since yesterday, is plain wicked.

"Sorry Om qrm qrm 9VY few words schlipsh nuzzle his mucket faded undershirt cfrish reptg pain in neck sus gup OM CUL ark." This is a real relay, evidently. 9VY over in Fort Wayne is mixed up in it in some way. Whose undershirt they are talking about and what schlipshing one over is, I do not know exactly, altho I have a rough idea. Whether the signals faded or the undershirt faded, or what was the matter with the sus-gup of the neck of the undershirt, I'll be darned if I know.

Just cast a lingering look at this: "Biirgrmp bru rotary GE GE ugerumf OM with my set rettysnitch spitty tone hit in potimus?" Now what do you suppose the poor gink was trying to say when he unreeled that? You have to guess a lot in wireless, and how would you guess this? Something is wrong with this fellow's birgrmph, his rotary also has a bad case of the ugerumf and somebody around the place must have spit on his rettysnitch, because his tone was so rotten it hit him on his potimus. Sounds bad to me. Why will some people send such personal matter by wireless when the whole country can overhear it? It isn't decent, and it makes the QRM more rotten than ever, and just think of the way it makes a perfectly good log-book appear.

I spent the better part of an hour trying to make out what ailed the poor fellow's biirgrmph, but had to give it up while I listened to a child with a spark coil scratch out this at a rate of around three words a minute: "How do s.....e.....? how be...? how do i cowp....CW...vvvv—come in ? ? ? ark." After a long wait another trouble-maker with a bad cold in his head stumbled back with: "R r r r r r r ok ok please ? ? ? ark." Another pause, followed by the first little demon with: "R r r r r r r qra qra qra pse rat....., ve.....? pse ttt....qta pse repeat ark." These brats kept this up for twenty minutes and they ended up just where they began.

What we ought to do is to organize an Anti-QRM Association. Then let us elect for chairman the worst plug-ugly we can find in these U.S.A. Then let us chip in a little money and hire a clerk with a bad disposition who will write letters threatening the life of everybody whom the members report as causing needless QRM. If anybody gets balky we will all join together and swear the gink is sending with a decrement greater than two tenths, and so report to the local Radio Inspector. If the latter does not within twenty-four hours have the boy arrested and sentenced to life imprisonment, we will all band together and find another job for said Radio Inspector. Let us rise, fellow bugs; rise and crush this octopus which is engulfing and overwhelming us. Eight hours a day and triple time for overtime is death and starvation to our families. Hash for breakfast, rotten smelling fish, and QRM—we will have naught of it. Down with the fellow with the scratchy spark coil, down with the fellow who calls three-times-three,

down with the fellow who calls everybody he hears, and down-down-down with that unspeakable lid who calls somebody and sends a long relay message repeating each word three times when the station to which he is sending is sending something himself.

There, by heck, I have that off my chest. Now you, over there in Illinois, get this call. Let everybody else stand back from now on. I'm tired and sleepy and cross, and I don't care who I QRM until I get this pin cleared off.

T.O.M.

THE ORIGINAL WOUFF-HOUNG—a well preserved and absolutely authoritative specimen forwarded to the Editor of QST by "The Old Man" shortly after the Armistice. It now hangs in the headquarters office of the A.R.R.L., where the Secretary guards it with his life. Subsequent to the writing of this story T.O.M. chanced upon this mysterious instrument, which is peculiarly efficacious in the elimination of unnecessary QRM. Exact details concerning the method of operating it are a little uncertain but it is believed that one lays hold of the smoother end, and we will have to leave to the imagination what is done with the other savage looking terminals.—Editor.

Transatlantic Notice

A record of 1200 miles over land in the Transatlantic Preliminaries is necessary to secure an individual schedule in the December finals. Many stations are not listed in current call books and it will be difficult for them to secure report cards. *QST* accordingly volunteers to act as a clearing-house for such reports.

Participating stations not listed in current call-books are requested to file their QRA with us. Stations logging signals from distances believed to be as great as 1200 miles are requested to send their report cards in our care and we will QSR.

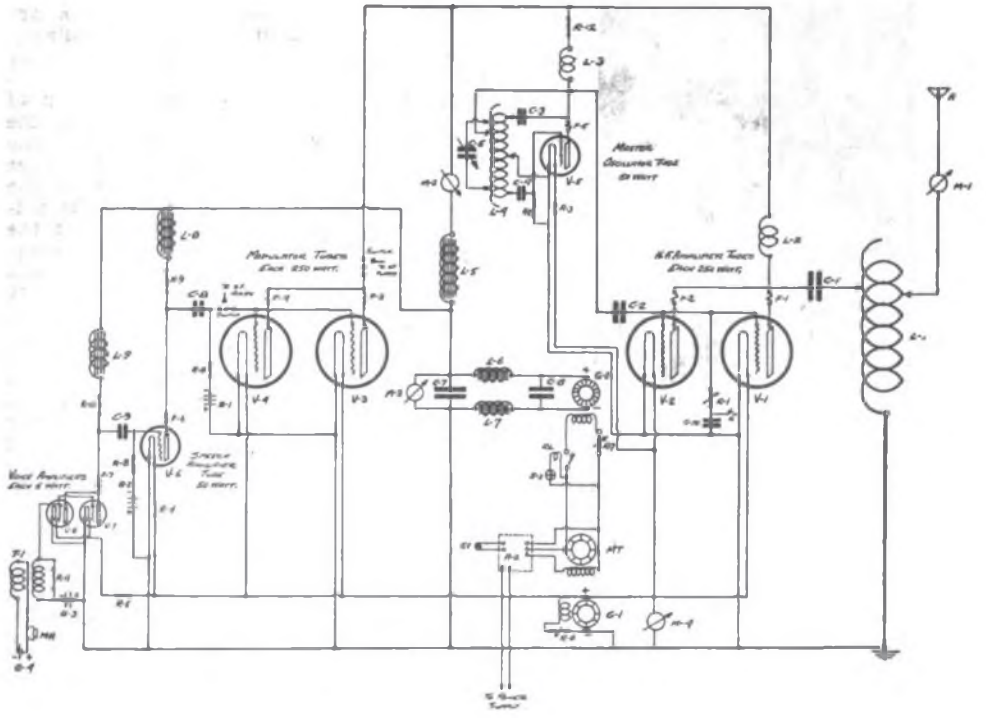
There are two things we should all remember: First, help the other fellow by listening during these tests and being sure to QSL his signals. Second, don't miss this preliminary opportunity to get your receiving set in condition for transatlantic *reception.*

A 1/2 K.W. Radiophone and C.W. Set

By K. B. Warner

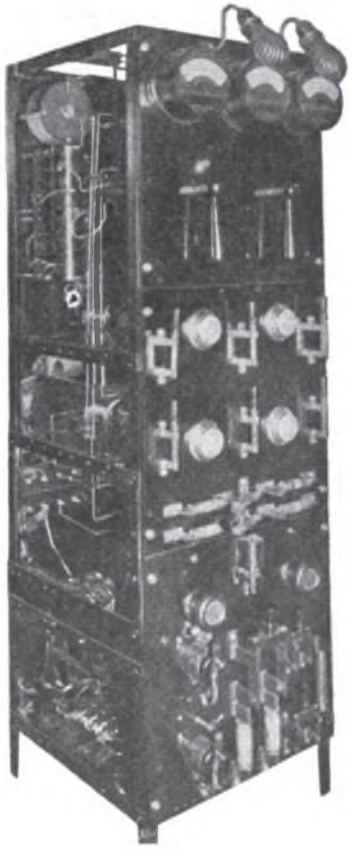
THRU the courtesy of the Experimenters Information Service we present a description of their type 6371-K Radiophone. This set is primarily a high-power broadcasting equipment designed for operation on 360 meters and our readers may well be surprised, at first blush, to see such an article in *QST*, as it is considerably out of our field.

However, the design is capable of complying very well with amateur requirements as to 200-meter wave and 1 k.w. power input, and is furthermore adaptable to sets as low-powered as those using 5-watt tubes. It embodies several very interesting points of design, and in general we feel will convey numerous helpful ideas to transmitting amateurs.



First in consideration is the general type of circuit used. It is well recognized, we believe, that the Heising constant-current method of modulation provides more *voice-modulated power* in the antenna from a given number of tubes than any other telephoning scheme. It is likewise recognized that the so-called master-oscillator method for generation of the high-frequency power is extremely desirable, as it prevents any changes in frequency with resultant swinging and fading of signals due to irregularities at the transmitter. Now Heising modulation has one defect, namely, it produces a relatively "broad wave" and considerable interference. The explanation lies in the action of this method: The oscillators and modulators are in parallel on a constant-current power supply, and as the modulators pass more or less current in accordance with the voice variations, the oscillators inversely are permitted less current or forced to pass more. These changes in oscillator plate current, in accordance with voice modulation, are evidenced by a similarly changing oscillator plate voltage. Such oscillators change frequency as the plate voltage is varied, and so this Heising "varying-potential" method of modulation causes the emission of a relatively "broad wave." Now when a master oscillator is used to exite the grids of the power tubes, which then act as power amplifiers, in the hope of getting an unvarying frequency, the system works all right until Heising modulation is attempted in the master oscil-

lator and then it acts about the same as before, except for added steadiness in the carrier frequency. The reason is not difficult to see. If constant-current modulation is employed in the master oscillator, the latter takes the form, say, of two small tubes in the usual Heising phone circuit except that the output circuit is a dummy or closed non-radiating circuit, and the



modulated output voltage is conveyed to the power amplifiers. This modulated voltage reflects the same inherent variations in the carrier frequency as previously mentioned in the ordinary circuit in which power oscillators are used.

The present circuit is a solution of this difficulty. The master oscillator excites only the power amplifiers, which thereby generate the oscillating power at constant frequency; and in parallel to these power amplifiers the power modulators are connected. The modulators are thereby enabled to modulate the output in the familiar Heising manner, and even tho this causes a varying voltage on the plates of the power amplifiers it cannot change the frequency of oscillation, which is determined by the master oscillator. This circuit arrangement appeals to us very much.

The master oscillator in itself is a device about which the amateur should know more. It has a very definite value in C.W. transmission for it ends for all time the trouble of shifting frequency caused by the transmitting antenna swinging in a gale, by varying plate voltage, etc. The scheme is very simple. A low-power tube is arranged to oscillate into any form of a dummy antenna consisting of inductance and capacity, and this circuit is tuned to the desired wave length. As the inductance and capacity of this circuit are concentrated, its frequency is constant. This circuit is then utilized to excite the power tubes. The power tubes are not connected up with coupled grid and plate circuits, for they do not have to generate oscillations—the oscillations are already generated in the master oscillator. The power tubes are connected up very much as amplifiers are in a receiving circuit. Taps are taken across a portion of the master-oscillator inductance and the high frequency voltage applied to the power amplifier grids. The high-voltage is applied to the amplifier plates in the usual manner, series or shunt, and the output circuit of the amplifiers feeds into the antenna, either inductively or conductively. The oscillator tube may always be of less power than the amplifier, as it has only to provide a voltage variation sufficient to swing the power tube *grids* thru the desired voltage cycle. Thus a receiving amplifier tube will serve for one or two 5-watt power tubes, one 5-watter will act for a considerable number of such tubes or for one or two 50-watters as amplifiers, and one 50-watt oscillator will serve as an exciter for several 250-watt power amplifiers.

With this introduction, let us examine the circuit diagram for this set. V-5 is a 50-watt tube acting as the master oscillator, and exciting the grids of V-1 and V-2, which are two 250-watt tubes in parallel as power amplifiers. The shunt power supply to the plates of these tubes is fed thru the large choke L-5, which serves to maintain practically a constant current at voice-frequency variations, and in parallel on this same supply are the two 250-watt modulators, V-3 and V-4, whose grids are controlled by the voice variations. The speech, however, is first amplified thru two audio stages, the first consisting of two 5-watt tubes, V-7 and V-8, in parallel, and the second a 50-watt tube, V-6. With what has been said previously regarding the theory, it is hoped that this much will be understood so that we may now proceed to an investigation of the details.

Power Supply

The drawing as shown calls for a 5 h.p. 110-volt D.C. motor, the same D.C. supply

serving to excite the field of the high-voltage generator. The filament supply is shown as a 11-volt 75-ampere self-excited generator, the voltage for the main tubes being controllable by the field rheostat and read on the O-15v. D.C. voltmeter, M-4, while separate rheostats, R-3, R-4 and R-5, are provided for the smaller tubes. The plate generator, separately excited, consists of two 1000-volt 1½-ampere units in series. The Electric Specialty Co., Stamford, Conn., is prepared to furnish all four machines mounted on a common bed-plate, interconnected with flexible couplings.

The power supply will vary with the facilities, of course. Where A.C. is available we would much prefer to see it used on the filaments. In such case an induction motor would be necessary as a driver, and a small generator would also be required for the generator field excitation.

All of these values are of a magnitude not commonly of interest to amateurs. They are cited here for what few of our number they may interest, to give a general perspective on the thing, and so that an idea may be had of what will be required for lower powers.

The filter is formed by condensers C-6 and C-7, and chokes L-6 and L-7. For the latter, and for L-5 as well, home-made chokes are recommended, each consisting of a straight core 2" x 2" x 14" built up of silicon steel sheets 14" x 2" x No. 29 gauge, and wound with 10 lbs. of No. 20 D.C.C. wire in even layers. C-6 and C-7 each consist of 5 mfds. capable of standing 3500 volts, to secure which it probably will be necessary to connect ten 1-mfd. condensers in series-parallel. The voltmeter M-3 should read 0-2500 volts, with external multiplier.

The master oscillator is also shunt-fed, thru a 6000-ohm resistance R-12, which reduces the voltage sufficiently for the smaller tube used. The r.f. choke L-3, to prevent the high frequency backing up thru the power supply, is a Radio Corp. choke type UL-1655. L-2, serving a similar purpose in the supply to the power amplifiers, consists of 275 turns of No. 28 D.C.C. wire on a formica tube 2⅜" diam., 6" long. The 50-watt speech amplifier, V-6, is fed thru a resistance R-9, of 6000-ohms, to reduce the plate voltage sufficiently, but instead of L-3 it has an iron-cored choke L-8 to prevent the backing up of the audio-frequency currents. Similarly the two 5-watt voice amplifiers are fed thru L-9 and a 40,000 ohm resistor, R-10. L-8 and L-9 may be Radio Corp. chokes type UP-1654.

The plate current is read on meter M-2, which should be a D.C. instrument reading 0-3 amperes.

The Master Oscillator

This looks like the ordinary Hartley circuit, with the condenser C-5 shunted across the inductance and taking the place of the antenna. For 360-meter work it is recommended that L-4 consist of 150 turns of No. 20 D.C.C. wire, double-spaced and tapped every turn, wound on a 3½-inch formica tube, 20 in. long. For 200-meter work this small diameter should be maintained, for ease in adjustment, but the number of turns reduced proportionately. C-5 should be variable in steps, from .0001 mfd. to .001 mfd., while the blocking condenser C-3 and the grid condenser C-4 may be fixed .002 mfd. capacities. Grid leak R-2 may be the usual 5000-ohm resistor, tapped at 2500 ohms.

The Power Amplifiers

Note the tap on the master-oscillator inductance whereby a variable voltage is conveyed to the grids of the H.F. amplifiers. The proper bias is maintained on these grids by condenser C-2, .002 mfds., with its 2500-5000 ohm leak, R-1, which should be the larger size Radio Corp., UP-1719.

Referring to the modulator tubes, small switches will be seen whereby the modulators grids and plates may be placed in parallel with those of the H.F. amplifiers, making full power available for C.W. telegraphy. A key is shown in series with the power amplifier grid leak, blocking the tubes when it interrupts the circuit, and shunted by a 1 mfd. condenser C-10 to absorb the "click" and prevent local "popping."

The amplifier tubes feed into the antenna circuit thru a .002-mfd. blocking condenser. As here shown, the coupling is conductive, by the medium of L-1, which may consist of 25 turns of heavy ⅜" edgewise-wound copper strip on an 8-inch diameter. Antenna current is indicated on M-1, which should be a 0-10 amp. thermo-couple if the set is to be used for phone only, and higher if arrangements are made to use all tubes as power amplifiers. Care should be used that the total input to the plates does not exceed the legal limit specified for amateur purposes.

The antenna clip on L-1 adjusts the antenna circuit to resonance with the master-oscillator frequency, as indicated by maximum antenna current. Changing the position of this clip naturally varies the antenna output but it cannot affect the wave length, which is determined solely by the frequency of the master oscillator. The plate clip on L-1 controls the power input to the amplifiers and should be adjusted for lowest space current as indicated on M-2 consistent with good output as evidenced on M-1—in other words, it is adjusted for greatest efficiency. In commencing the first adjustments this clip should be at the top of the helix so as to include all the turns in the plate circuit.

The Speech Amplifiers

The voltage fluctuations caused by the voice across the secondary terminals of

the modulation transformer T-1 are not sufficient to control the grids of the large modulator tubes and consequently the two stages of audio-frequency amplification previously referred to are employed. The secondary of T-1, shunted by a ½-meg. leak to avoid saturation, feeds into the paralleled grids of the two 5-watters comprising the first stage of amplification. B-3, of 67½ volts, maintains a bias on the grids. The output of this stage is capacitatively coupled to the next stage by means of condenser C-9, a ½-mfd. mica type, while the bias is preserved by the 67½ volt battery B-2 and a series resistance, R-8, of 20,000 ohms. The output of this stage in turn feeds the grids of the modulators, by an identical coupling and biasing arrangement.

Arrangement

The experimenter probably will prefer to lay out his apparatus on a long table, and this is by far the best method until the set has been completely mastered. Our photograph, however, shows what can be done in the way of building it up into a panel set. Three black insulating panels, 24" x 24" x ½", are required, mounted on an angle-iron frame. This frame may consist of four pieces of 1½" x 1½" x $\frac{3}{16}$" by 6'6" long for the corner pieces, thereby raising the panels 6" from the floor, with cross members of 1½" x $\frac{3}{16}$" bar iron, the entire frame being bolted or riveted together. The lower panel should carry the automatic starter, power line switches, generator field rheostat, relays if any, etc. Behind this panel are mounted L-5, L-6, L-7, C-6 and C-7. The tubes are mounted behind the center panel. The upper panel carries the four meters and two pilot lamps. In the rear, at the top, is another 24 x 24 x ½ panel carrying L-4, L-5, C-3, C-4, R-2, R-3, L-3 and R-12, for the master oscillator. In the rear, at the bottom, a strip 24 x 3 x ½ is provided, carrying the terminals for power line, generator, microphone, key, control switches, antenna, ground, etc.

The foregoing data are presented thru the courtesy of the Experimenters Information Service, of 220 West 42d St., New York, who have available for distribution complete sets of blue-prints covering the entire construction of this equipment.

Arrangements for 1922 Transatlantics

By F. H. Schnell, Traffic Manager

NOTHING in the history of amateur radio has stirred up so much enthusiasm among the radio amateurs as has the announcement of the third series of A.R.R.L. Transatlantic tests which appeared in October *QST*.

Practically every amateur in the United States is brimming over with an eagerness for the night of the tests. At no time has such activity been shown in the overhauling of transmitters, because the success of Godley in copying stations using one or two five-watt tubes shows clearly that every station has a chance, and each man is out for his chance. Receiving equipment is being constructed and overhauled. Every man wants to be the first one to hear a European amateur signal. There is a certain something attached to "the first amateur to hear England or France," and radio frequency amplifiers and superheterodynes are being tested by those who want the last word in reception.

The whole amateur fraternity is running at fever heat and indications are that the tests will eclipse all other events.

Those who do not qualify for the final tests need have no fear of losing out entirely. There will be a free-for-all period each night in addition to the individual schedules.

The tests will start on December 12th and end December 31st. American and Canadian amateurs will transmit for ten nights, beginning December 12th and ending December 21st. From December 22nd until December 31st, English and French Amateurs will transmit and American and Canadian Amateurs will listen. That will be our chance, men, our chance to show our skill in reception!

Through the kindness of Mr. W. A. Winterbottom, Traffic Manager of the Radio Corporation of America, MUU on 14,200 meters and WII on 13,600 meters will broadcast at 2 A.M. Eastern Standard Time the results of reception by the English amateurs.

The one big thing to remember is that we want an absolutely quiet air every night from 7 P.M. to midnight (E.S.T.) when we listen for English and French signals. Just bear in mind that one transmitting station may spoil the whole evening for everybody.

It might be well for you to get your clock squared off for Greenwich Mean Time because the entire schedule will be in G.M.T. The final details will appear in December *QST*, where the complete schedules will be given. Get your station ready and watch for the final announcement.

A One-Tube Super-Regenerator

First Prize Winner in QST's Contest

By A. L. Groves, 3BID

WHILE it is entirely too early to determine with accuracy just what possibilities the "super" offers the average amateur, there is little doubt that this arrangement in some form will gradually take the place of our present regenerative sets just as C.W. transmission is gradually taking the place of spark. As by far the greatest possibilities of the super are to be had when receiving from C.W. stations it begins to look as tho the spark transmitter and regenerative receiver will soon be a thing of the past for the majority of amateurs.

However, it is well to caution the reader right at the start not to expect too much from the super. Capable as it is of picking up and amplifying the faintest signals, its great sensitivity in this respect is in a measure really its undoing, as static, arc interference, local electrical disturbances, etc., are also picked up and amplified, partly at least annulling the effects of super regeneration.

On the other hand the super is so flexible in its character that almost any degree of signal strength or ratio of signal strength to interference can be had by using different values of inductances and capacities in the different circuits, and while it will be impossible to use the super at high efficiency all the time, even at low efficiency its DX ability will far surpass our best regenerative sets and it is certainly a great advantage to have its wonderful powers at your command at all times.

Its minumum efficiency in signal strength and distance closely approaches our present regenerative sets without amplifiers, while its maximum efficiency seems to be limited only by our atmospheric and interference conditions. The maximum output of course is limited by the tube characteristics and battery. The average relay man cares little about this, prefering, as "LQ" says, a moderate signal strength without the orchestral accompaniment.

The super alone will not give the extra-ordinary signal strength that was first apparent from the demonstrations given by Mr. Armstrong and if such signal strength is desired some form of A.F. amplification must be used as was used during the demonstrations, but for comfortable operation with phones on the head amplifiers are not necessary or desirable.

There are several different methods of producing super regeneration but as far as the general amateur is concerned the single tube method seems to be far the simplest, cheapest and best of them all, as it will do everything the two tube arrangements can do and then go them some better. The third tube in the so-called three tube sets being nothing but an A.F. amplifier, and the best results for amateur purposes being obtained with the single tube method, adding an amplifier to it will of course produce even louder signals from two tubes than is possible from three. It has been stated that the two-tube arrangements are simpler to operate

Our Super-Regeneration Contest

Our contest for the best practical articles on the application of the principles of super-regeneration to amateur work, as announced in the August *QST*, closed on October 1st. The judges have carefully gone over the manuscripts entered and have made awards as follows:

First Prize, $50
A. L. Groves, 3BID,
Brooke, Va.

Second Prize, $25
James Wood, jr., 2ALG,
New York City

Third Prize, $15
Leon W. Bishop, 1XP,
Athol, Mass.

Fourth Prize, $10
Wm. Englebretson,
St. Paul, Minn.

The first-prize article appears in this issue of *QST*. Mr. Groves is an old-time contributor to our magazine, and his articles on honeycomb coils and their operation, and the construction of single-layer coils for short waves, have been valuable additions to amateur literature. He writes always from an intensely practical viewpoint and so we are confident that his super article will be of decided help to the A.R.R.L. amateurs.

QST's contest has not developed the last word in super-regeneration, by any means. It did not aspire to, as the time was much too short. It has accomplished its purpose, however, in bringing to light in the least possible time some "practical working dope" on the subject.

The other prize-winning manuscripts will be presented as rapidly as possible.

than the single tube, and while in a way this might be true to those entirely inexperienced in adjusting a regenerative set, to the general amateur who knows something about it the single-tube method will offer even less trouble than the two-tube methods which are of necessity more complicated.

The Circuit

The accompanying diagram, Fig. 1, represents such a single-tube arrangement and as will be noted this represents nothing new to the amateur except the oscillator coils, L4 and L5, with their accompanying condensers. Neither does tuning present any more difficulty than the regular regenerative set, for the oscillator circuit is thrown into oscillation by varying C4 and once adjusted to the desired frequency no further attention is necessary over a consid-

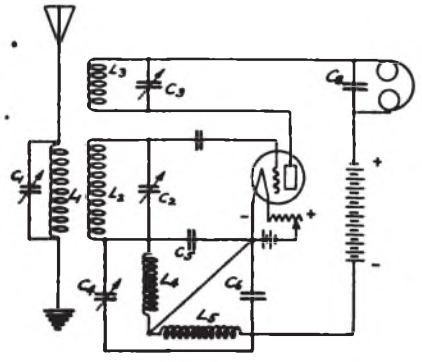


FIG 1

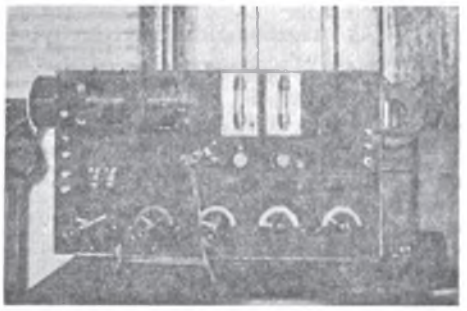
CONSTANTS, 175 TO 250 METERS
OSCILLATOR AT APPROXIMATELY 8,000 CYCLES

L1, Primary, 15 turns 3" dia.
L2, Secondary, 58 turns 3" dia.
L3, Plate or Tickler, 40 turns 3" dia.
L4, Grid oscillator DL-1500,
L5, Plate oscillator DL-1250
C1, 67 plates (.0015 mfd max.)
C2, 13 plates (.00025 " ")
C3, 7 plates (.00015 " ")
C4, 67 plates (.0015 " ")
C5, .0025 mfd. fixed, Dubilier type 600
C6, .001 " " " " "
C7, .0002 " " " " 601
C8, .001 " " " " 600

erable band of wave lengths, and the regular regenerative part is adjusted much the same as if the super were not in existence.

This circuit can be arranged in a number of ways but there is little or no advantage to be gained by changing about and the best plan is to arrange the circuit one certain way and then stick to it until its characteristics are learned.

The larger the oscillator coils, L4 and L5, and the larger the condensers C5 and C6, the lower the frequency; and as best general results seem to be obtained with frequencies around 8,000 to 10,000 cycles per second, DL-1500 is usually the preferred coil for L4 (which is shunted by a .0025 mfd. condenser) and DL-1250 is then usually correct for L5 when shunted by a .001 fixed condenser. This arrangement, when coupled by certain values of C4 allows the circuit to oscillate at about 8,000 cycles. Using DL-1250 at L4 and DL-1000 at L5, with the same condensers, will give about 10,000 cycles. Either of these two arrangements seems to give about the best practical results at wave lengths approximating



Mr. Groves' Super. Only one tube is used.

200 meters, the first arrangement probably having preference especially where wave lengths in excess of 200 meters are to be received.

The amplifying power of the super is apparently governed by the difference in frequency between that of the received signal and that of the oscillator circuit, rather than by the actual frequency at which the oscillator is working, and little advantage seems to be gained by lowering the frequency much below 8,000 cycles. 200 meter signals have a frequency of 1,500,000 cycles and the difference between this and 8,000 cycles is 1,492,000 cycles. Lowering the oscillator frequency one-half or to 4,000 cycles will only make a difference of 4,000 cycles additional, or a total of 1,496,000 cycles. If instead we lower the wave-length of the received signal one-half, giving it a frequency of 3,000,000 cycles (100 meters), the difference between the oscillator and signal frequency will then be 2,992,000 cycles, making an enormously greater difference than could be possible by lowering the oscillator frequency.

Therefore it is at once apparent that the amateur can get much better results from his super if the transmitter is operated below 200 meters instead of above 200, as is the general rule at present. Also as the super tunes rather broad the shorter wave lengths offer greater benefits in selectivity as well.

While I have always been in favor of condenser-tuned sets for short wave lengths, this type of set is especially desirable for the super regenerative sets and

in fact if best results are to maintained over any considerable range of wave lengths the condenser tuned sets are actually a necessity, operated of course in connection with different values of inductance for different wave lengths.

The Panel Lay-out

The diagram, Fig. 2, represents a method of constructing such a set wired as in Fig. 1. This drawing is to scale, the actual size of panel being 12" high and 14" long. L1, L2 and L3 are the mountings for the regular regenerative coils, and are placed 2¼" apart so as to accommodate the single layered coils.

This particular plan is designed for use with a Myers tube but any amplifier tube may be used by arranging the socket to accomodate the tube decided on. However, the Myers tube is especially recommended due to its high amplifying power, freedom from gas, non-criticalness of adjustment and low operating cost, it consuming only .8 amperes at 4 volts.

C1 is an Illinois 67-plate condenser, C2 a 13-plate, C3 a 7-plate and C4 another 67-plate, all of which are equipped with 5" extension handles.

L4 is a regular panel plug and L5 a regular coupling plug, for the oscillator coils, the latter being as a rule kept at right angles to L4 and the coupling between them varied by C4 instead of inductively. There is, however, no harm in using low values of inductive coupling and no special requirements to keep the coils at right angles are needed.

The regenerative coils should be wound on a bakelite cylinder 3" diameter and with ordinary amateur aerial and ground connected in the regular manner, for wave lengths between 175 and 250 meters, L1 should have approximately 15 turns, L2 56 turns, and L3 40 turns. For wave lengths between 240 and 350 meters, L1 should be about 25 turns, L2 75 turns and L3 56 turns. For wave lengths between 350 and 500 meters, L2 should be 100 turns and L3 76 turns. 25 or 40 will do for the primary. It is important that the plate coil, L3, be kept closely coupled to the secondary, L2.

The ratio of inductance to capacity of L2-C2 has a very important bearing upon selectivity and while for maximum signal strength it is best to keep C2 low and L2 high in value, actual work through interference often requires these values to be reversed, and while in such cases we get reduced signal strength from what could be obtained if the interference were not present we get readable signals even under conditions of interference sufficient to entirely drown them out when low capacity and high inductance are used.

Adjustment

Assuming the amateur has built a set closely along the above lines, the operation will be about as follows.

First, the coils for the wave length selected are placed in the regenerative mountings, coupling L3 to within half an inch of L2. C2 should be advanced to maximum and C3 placed at zero, which renders them entirely inoperative. The HC or DL-1500 coil is placed in mounting L4 and HC or DL-1250 in mounting L5, and swung to approximately right angles. Slowly advance C4 and a low thud followed by a faint high pitched tone in the receivers should be heard, which denotes the oscillator circuit is working at an audible frequency and is ready for action. If the oscillator circuits are correct the A.F. hum should stop as soon as the condenser is lowered to a few degrees above the zero position. If it does not stop a smaller coil should be placed at L5. If the condenser has to be advanced a considerable distance before the

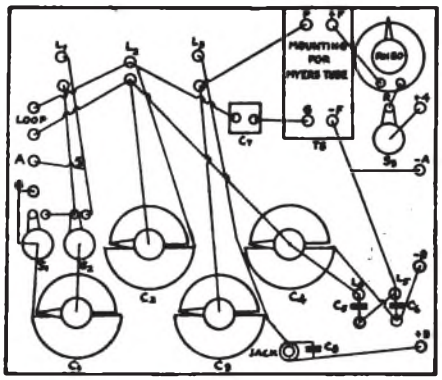


FIG. 2

hum starts, a larger coil should be used or a larger condenser at C6, or the coupling may be closed a little between the coils, but at no time should this be sufficient value to allow the A.F. hum to continue when C4 is at zero.

Second, as soon as the A.F. hum has been settled, leave C4 just above the point where the hum starts and with the hum buzzing faintly turn C2 from maximum towards zero slowly and as it approaches zero a hissing sound will be heard, which will be followed by signals regardless of the primary adjustment. Adjustment of all three condensers slowly and carefully will then serve to clear up all noises and bring the signals in clear and distinct, though it takes practice to bring this about and many harsh and peculiar sounds will be encountered which at first are liable to disgust one entirely. However, with a little practice it will be found that each sound has a mean-

ing and it is just as easy to keep out of the unpleasant ones as it is to keep our present regenerative set from spilling over into oscillation. If the oscillator circuit has a tendency to break off or go dead with a sharp click in the phones upon varying the regenerative condensers, it denotes either too much B battery, not quite enough capacity of C4, or probably insufficient value of C7. It is well to start operating the super with low values of plate voltages, as the howls and squawks will be greatly lessened and while results will not be as good in the way of signal strength it will

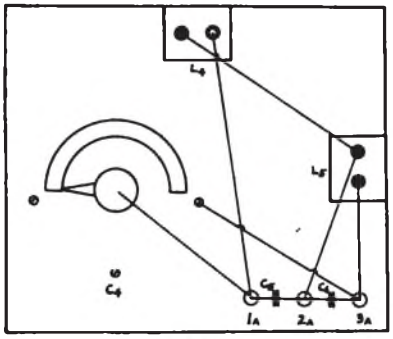


FIG 3

give you a better show at learning. 45 volts B battery on a Myers tube should be used at the start.

Also the value of C7 has a big influence on the howls and steadiness of tube, and values between .0002 and .00025 mfd. seem best for general purposes. The A.F. hum should be watched and not allowed to become loud, as there is nothing to be gained in the way of practical operation and best results are obtained with the hum entirely unnoticable when signals are coming in. As plenty of signals will be heard to practice on, it should not take long to get the run of things sufficiently to allow for fair operating results; the fine points will come in due time. It is impossible to explain them in detail nor is it necessary to offer such explanation to the amateur already familiar with regenerative receivers.

The main issue is to select the best frequency of the oscillator circuit in connection with the value of C4, and the best ratio of inductance to capacity of L2-C2.

The following combinations of coils will be found to work in the oscillator circuit. L-4, two DL-1250 coils clamped together and connected in series, with DL-1500 as L5. L4, DL-1500, with DL-1250 as L5. L4, DL-1000, with DL-600 as L5. L4, DL-750, with DL-400 as L5. These are about the extreme limits practicable. When the smaller coils are used, no A.F. hum will be had in the receivers, due to the fact that the circuit is oscillating above audibility; and the only method to determine that the oscillator is working is by the faint thud occuring when C4 passes a certain point. The operating is done with C4 just above the point where the thud is heard.

Besides changing the oscillator coils, C5 and C6 may also be changed to different values with more or less success. However, in the long run for general results after the correct values have been determined to suit your own requirements of interference, etc., very little heed will be given the oscillator coils or condensers and they will be seldom changed or thought of. Each individual should go over all possible changes in values before deciding upon any one and see for himself which gives the greatest *working* combination regardless of actual signal strength.

Notes on Operating

The actual operating of the set depends much upon the individual and what he desires to accomplish at any given time, and there are at present no fixed rules to follow in all cases. However, a brief outline of the operation as it appears to me during the short period it has been in use may not be amiss.

First of all the operation will be started with the oscillator working within audible frequencies in practically all cases—which is denoted by the faint hum heard in the phones. If the set has been properly constructed and the correct size coils used at L4 and L5 this hum will start with C4 close to zero position. However, it should be remembered that the value of the B battery will make this point vary somewhat and if it is impossible to make the A.F. hum stop with C4 at zero a smaller plate oscillator coil should be used.

It will be at once noticed that spark stations are conspicious for their absence and what few do come through will be in a low cracky tone. However, if the condenser is kept close to the point where the A.F. hum first begins the reading of spark stations will not be difficult and C.W. stations will be heard nicely also. However, it appears that for best results the strength of oscillations should in a measure correspond to the strength of the incoming signals if it is desired to take full advantage of the super, while at the same time the strength of arc or other interference has to be considered.

Where there is no arc interference the operation becomes easier and excellent selectivity can be secured by using the correct value of C4, which controls the strength of oscillations, to correspond to the strength of the incoming signals. In this way if you are receiving from a DX station whose signals are weak, using low values of C4 will give the best results from

this station and you will be little interfered with by some higher power station, as his own strength will tend to choke off any response in the phones. Increasing C4 necessitates a corresponding increase in C3 or a tightening of the coupling between plate and secondary, and then the station with strong signals will come roaring through and not a sound of the former weak station will be heard. This also applies to other interferences such as static. If static is of a certain strength, say of an audibility of 200, and you have a station whose signals can be made say 400 or 800 audibility, then by adjusting C4 to correspond to the best workable strength of the received signal you will not know any static is in existence as long as that station is transmitting. This is unlike any other set, for as we are used to at present the static is heard popping away regardless of the strength of signals. The super can be so adjusted that static will not be heard if the signals are louder. On the other hand if static happens to be fairly severe it will predominate over everything and NO signals will be heard at all. At such times work can only be

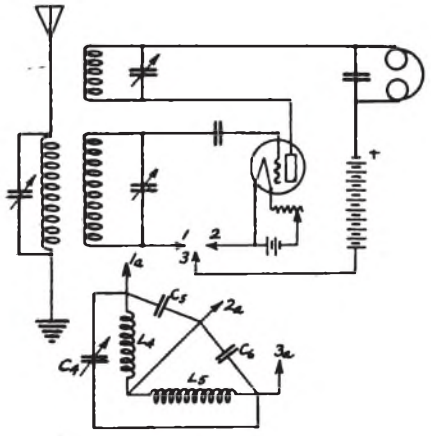


FIG 4

done by using C4 as low as possible and still keeping the A.F. hum audible. The same applies to arc interference. When this is present the condenser has to be worked at low values and excellent results can be obtained, but the very moment the condenser is adjusted to such a point where the strength of oscillations corresponds to the strength of the arc interference, all signals will disappear and nothing but the arc QRM will get through, unless of course signals of nearby stations that are stronger than the interference.

It will also be noted that under different adjustments the C.W. stations are heard with different tones. In all cases this shows the set to be improperly adjusted. Generally if a C.W. station takes a low tone the oscillator is too high for this station's signal strength or the plate and secondary condensers are improperly adjusted. If a C.W. station tends to choke up, the oscillations are not strong enough. If static predominates, the oscillations are too strong; if arc interference prevails, they are too strong; and if signals tend to choke up the variation oscillations are not strong enough.

The same methods are appliable to the reception of phone signals and the best value of C4 must be selected to correspond with the strength of voice. If the oscillations are too strong the voice will tend to be broken. If stronger than the prevailing interference the voice will entirely disappear. But when properly adjusted, phone signals are almost perfect in their clearness, not even a trace of the carrier wave being present. (This of course not applying to some improperly adjusted transmitters.)

It takes considerable time to get on to operating the super to best advantage at all times, and I am sure I have not begun to learn even yet, which leads me to expect the super to be the ideal set for short waves within a very short while.

The reception of spark stations with the super is at best unsatisfactory. The moment oscillations start in the oscillator circuit, whether audible or not, the natural tone of the spark disappears. However, amplification sets in immediately and with C4 just at the point where oscillations begin the note is not at all unpleasant, and by carefully adjusting C4 and the regenerative condensers a tone very near the true tone can be obtained with results about equal to a one step R.F. hooked on to a regular regenerative set, but the set in this condition is not very stable and hardly worth the trouble it takes to adjust it to this condition.

On the other hand as soon as the ocillations stop the set is no longer a super, but acts exactly like a regenerative set plus the resistances of the oscillator coils. All classes of stations can be heard and worked exactly as on a regenerative set, the extreme distance of a regenerative and soft detector not being possible but possibly equally as strong signals are obtained due to the higher voltages and amplifying power of the tube.

At this point under certain adjustments the usual harsh squeal will be heard when C3 is too high. Also it will be noted that another different squeal, resembling the A.F. hum of the oscillator but a little stronger, will be heard. This is a frequency generated by the tube alone and in a manner turns the set into a super though at much less efficiency. Nevertheless the principle is the same and it will be found

that sparks cannot be received in their true tone in this manner any more than with the regular oscillator coils working. Take the grid oscillator coil out entirely and the set still remains a super as long as that little squeal is heard. Take the plate coil out entirely and increase C3 a little, and the set is still a super. Short-circuit C6 and decrease C3 and the super effects will still be had. Short-circuit C5 and most of the super ability will disappear and the set will generally break off into the loud squeal instead of the faint A.F. squeal. This would tend to show that the variation frequency is being generated by the tube itself, assisted by the condenser C5 which probably breaks the frequency up by becoming alternately charged and discharged. While this method of producing super-regeneration is hardly practicable, it is nevertheless super-regeneration in a way, and there is room for further experiments along this line.

Using the above methods of adjusting the strength of oscillations, in connection with different ratios of inductance to capacity in the secondary circuit, and using the various methods of collecting signals such as with ground alone, aerial and ground both connected, loop acting alone or collecting signals from the ungrounded aerial, or simply allowing the secondary coil to collect them (if the set is so placed that the winding runs in the same direction of the aerial) etc., will allow the super to be operated to advantage at all times and under conditions that would absolutely shut down a regenerative set, but like everything else worth while it will take time and patience to learn.

Aerials, Etc.

The operation of the super with both aerial and ground connected in the regular manner is possible, yet it does not work as it should. Disconnecting either aerial or ground and tuning the primary coil with C1 in parallel seems to work just as well if not better.

The super seems to be entirely able to collect its own signals without being bothered by aerials or grounds, and the secondary coil will collect signals from a considerable distance in the direction parallel to its winding if the set is ungrounded.

Also excellent results can be obtained by allowing the secondary coil to collect signals direct from the aerial, which can be accomplished by having the secondary coil parallel to the direction of the aerial and leaving the set ungrounded, and when used in this manner results superior to the best of regenerative sets can be had even if the secondary coil is not more than 3" in diameter. This same principle applies also if the set is grounded and the coil placed at right angles to the aerial, but the results are not nearly as good.

Posts are provided in Fig. 2 for loop connections and excellent results can be obtained with the loop acting either alone or picking up signals from the ungrounded aerial. However, too much dependence should not be placed in the loop for selectivity, as signals will come through from considerable distance with nothing but the regenerative coils acting as collectors, partly annulling the directive effect of the loop.

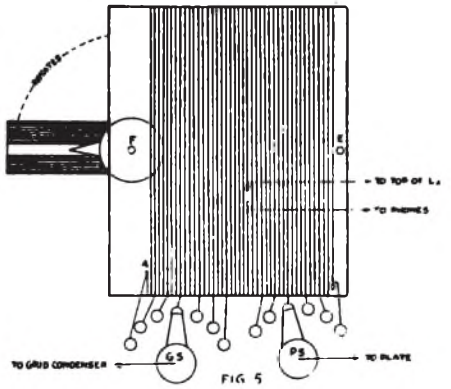


FIG. 5

Many combinations of connections of aerial and ground are possible and different ways give different results at different times and the whole success at any given time seems to depend upon conditions of interference. With little or no interference the best results seem possible with aerial and ground connected in the regular manner, but unfortunately this condition seldom prevails as even if there is no direct amateur interference some of the mush from the high power arcs is always present and this seems to choke up the amplifying power of the set and introduce a disagreeable hissing besides causing signals to swing badly, one letter being very loud and the next probably inaudible. This can at least be partly overcome by using other methods, sometimes a turn or two of wire wrapped around the secondary and connected to the aerial giving almost perfect results as regards ratio of signals to interference. At other times the loop will give the best ratio. At still another the coils themselves are best. There seems to be no "best" method for all occasions and the method must be used to meet existing conditions.

As interferences of all kinds are at a minimum in day-time the super is an ideal instrument for amateur daylight work and in most cases aerial and ground may be used connected in the regular manner to advantage, though other methods can be used as well. As no signals result in the phones when the primary is tuned to the exact wave of the incoming signals it has been found advantageous to use no ground connection at all and an aerial somewhat

above the natural wave-length of the received signal. These are only a few suggestions and many more can be tried and found advantageous under different conditions, but where aerial is used in any method the efficiency of the set will be found to correspond to the efficiency of the aerial just as it does with our present regenerative sets.

A Separate Generator

If the amateur has a good regenerative set of the coil-condenser type it can easily be turned into a super. The oscillator circuit should be made on the order of Fig. 3 which is drawn to scale, the actual size of panel being 6" high and 7" long. L4 represents the plug mounting for the grid oscillator coil and L5 for the plate. C4 is either a .001 mfd. or preferably a .0015 mfd. air variable. No extension handle will be necessary for this condenser. C5 is a fixed mica condenser of .0025 and C6 one of .001 mfd. capacity, the Dubilier type 600 being recommended. The set is wired up as shown, though C5 and C6 may be connected directly across L4 and L5 terminals if more convenient, instead of across the binding posts 1A, 2A and 3A as shown.

The lead from the secondary to the filament of the regenerative set should be disconnected and attached to the post 1A on the oscillator. The lead from the plate to the filament should be disconnected and attached to post marked 3A on the oscillator and the post marked 2A on the oscillator should then be connected to the filament of the regenerative set. Fig. 4 shows the idea, where all connections to filament are broken at 1, 2 and 3 and their ends connected to 1A, 2A and 3A of the oscillator.

Constructing a Tuning Inductance

If the amateur does not like the idea of changing coils for different wave-lengths, an efficient set of coils is shown in Fig. 5 which makes a most desirable arrangement for wave-lengths between 150 and about 450 meters, allowing quick and convenient changes in ratio of inductance to capacity for all requirements and at the same time providing the close coupling necessary between secondary and plate. A cylinder 4½ inches long was used for this purpose, the outside diameter being 5¾ inches.

The winding is started at "A," Fig. 5, which is ¾" from end of cylinder. No. 20 enameled wire was used and a total of 50 turns wound to "B," taps being taken off at 10, 20, 25, 30, 35 and 40 turns, which with the first lead "A" makes a total of 7 taps which are connected to the points of switch GS as shown. Winding is again started at "C" and a total of 40 turns wound to "D," which should leave a space of ¼" between this and end of cylinder. Taps are taken off at 10, 15, 20, 25 and 30 turns, which with the lead "D" makes a total of 6 taps to be connected to switchpoints of switch PS.

At right angles to the point where the taps are taken off a hole is drilled as at "E" for holding the coil to panel. On the opposite end a hole should be drilled as at "F" which serves not only to hold coil in position on panel but also for the primary bearing to work through.

The primary should be 5" outside diameter and wound with about 18 or 20 turns of wire. 1 to 1½ inches wide will do, and a space about ¼" left in center without winding for the bearings, which are made of a couple of ordinary switch levers and a few extra washers and nuts. These make an excellent smooth running and positive contact bearing.

When completed this may be mounted on the panel in place of the coil mountings as shown and the operation and results will prove highly satisfactory to those interested only in these wave-lengths. It is possible to get fair results as high as 600 meters with this arrangement, 'though about 450 is the maximum for efficiency.

General

In conclusion, while the super is capable of giving excellent results at all times, only practice can bring out its full advantages for actual work and it would seem that efficiency is not determined by any actual signal strength but by so adjusting the set as to meet different conditions and getting greatest ratio of signals to interference. The higher the voltage of the B battery the louder the signals, yet it is not advisable to use high voltages at all times, 45 volts working nicely and 90 more than doubling the signal strength. The higher the voltage the lower C4 will have to be adjusted to start oscillations, and on the high voltages it may become impossible to stop oscillations when C4 is at zero. Under such conditions it would be advisable to use a smaller coil at L5.

The length of time the super has been in operation prevents any hard and fast rules from being given as to its operation, and nothing can be stated to be "the best" method as yet. But the operation is so simple and results can be obtained by so many methods that no one should hesitate an instant in making up a super in some form. Then after many get to work on it it will not take long to find what are the best methods suited for general amateur needs. In the meantime let us all unite in extending many thanks to Mr. Armstrong for giving us the fundamental principles of such a wonderful device, which to say the least means as much of an advance over the regenerative sets as the regenerative sets are over the straight audion sets.

[Editor's Note: As to results, Mr. Groves has copied numerous C.W. stations in day-

(Concluded on page 47)

Daylight Transcons

By F. H. Schnell, Traffic Manager

IT will be remembered that our attempt to put a message across the United States in daylight during the month of July failed. Only by failure do we gain valuable information and the reason for such failure usually is obvious. The answer to the failure of the July Daylight Transcons is that only one fourth as many stations were on the job as were needed.

Now let's get together, fellows, and let's do the job right this time. We don't want to be dragging this thing along all year—we can put a west-bound message to Denver in daylight and you all know it. Of course it is quite a task to get over the mountains, but unless we try, we do not know what we can do. If we get to Denver in daylight, we should be satisfied and if the east-bound message gets over the Rockies, all the more reason why we should have the world know it. That's a real task worthy of the greatest effort.

Thanksgiving Day, November 30th, and Sunday, December 3rd, have been selected for the Daylight Transcons. Now the only thing we ask you to do is to stick on the job until you are satisfied you have done your bit. When all of us are on the job, there is less for any one individual to do and on these two days there is no reason why we shouldn't expect a bunch of stations on the air.

There will be two messages started from the West coast, one from Denver, and two from the East coast. West coast messages will start from Seattle, Washington, and from Walnut Grove, California. One east-coast message will start from Boston, Mass., and the other from Wilmington, N. C. Each message will bear a special prefix and a check. The message starting from Seattle will bear the prefix, "Transcon East Nr 1"; from Walnut Grove, "Transcon East Nr 2"; from Denver, "Transcon East Nr 3"; from Boston "Transcon West Nr 1"; from Wilmington, "Transcon West Nr 2." In this way it is possible to recognize each message as it moves along.

There is only one thing to do with any one of those messages if it reaches your station—keep it moving towards its destination. Do not let it backfire!

During the last tests a few logs were received. In the coming tests we want more logs, men, more logs; we want every one we can get.

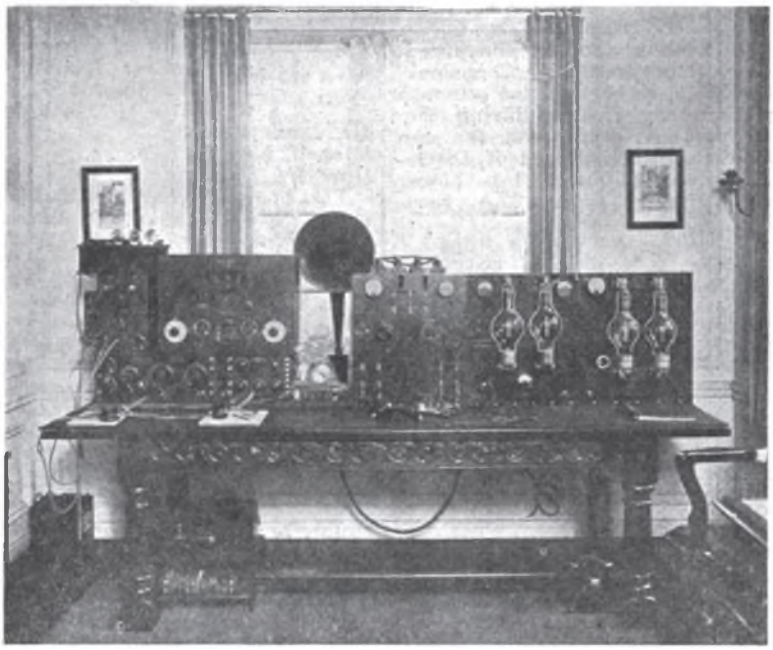
The aim is to get these messages across the continent between the hours of 9:00 A.M. and 6:00 P.M. your local standard time.

What do you say, fellows, does it go over this time? You bet!!!

Working Every District in One Night

HOW would you like to do that with your set, O.M.? Some thrill, eh? So say we all of us, but that is just what happened to Mr. W. A. Remy (of 2KV), operator at 1CCZ, Wianno, Mass. Remy has been operating for eight years and thot he would come no nearer the Seventh Heaven than when he got a card from a ship op reporting 2KV's 10-watt set in the English Channel, but this had everything else stopped.

About 9 P.M. on September 11th Mr. Remy put on the cans and lit the bulbs at 1CCZ. It wasn't a very good night. The first one to trickle in was 9JA out in Iowa. An attempt was made to get a message from 2AJA but QRN was pretty bad. At ten o'clock 9II was worked, QSA, followed by 4GK and 4FT, then some 3's and 8's until midnight. By that time things were perking up and QRN had decreased, with the DX rolling in. 9ARZ and 5KC were raised but QSS and QRM made accurate work impossible. At 1:50 6TV was logged and was called off and on the rest of the night. At 2 A.M. conditions were ideal, and 8CMI and 1CCZ worked back and forth as if in the same town. 4NT and 4BF were worked, 4BF screeching in on one step. At 3:48 6KA was audible all over the room on one step and at 4:11 6TV was heard to call 1CCZ and say "QRK FB." A message was given him to 6KA but QSS and it is not known if he got it. Canadian 3JK was later worked, and at 5:03 7KX answered a CQ. He was heard plainly but soon lost, as sigs began to grow weaker as daylight came on. 2BRB and 8ADT were worked to even things up, and then it was called a night. A summary of the log shows that four 5's, two 6's, one 7, and twenty-one 9's were heard that night. A total of 92 stations were heard and 31 worked, in nine U. S. districts and Canada.



1CCZ is the station of Edward C. Crossett located at Wianno, Cape Cod, Mass. and has done some consistent work during the past summer. The station comprises two receivers and two transmitters and is operated by Mr. Remy.

The long wave receiver is a DeForest RS-501 commercial type with one stage of audio frequency amplification incorporated in it. Special wave-meter coils are used on the amateur wave-lengths and excellent results have been obtained with them. A DeForest two-stage audio-frequency amplifier is used in conjunction with this set. For short waves a Paragon RA-Ten with detector and two-stage amplifier is used. Baldwin and Western Electric phones are used and a Western Electric power ampli-

fier and loud speaker can be used with either receiver.

The main transmitter was designed and built by I. R. Lounsberry and is a C.W., I.C.W. and phone transmitter. Two 250-watt Radiotrons are used in the oscillating circuit, which is a Colpitts circuit, and two more are used in the Heising constant-current modulation system. Two 50-watt Radiotrons are used as a speech amplifier. A 2000-volt generator furnishes plate potential for the tubes. All controls are operated by relays controlled from the operating table. The antenna current of the two oscillators on straight C.W. is six amperes and on phone five amperes.

An auxiliary ten watt I.C.W., not shown in the photograph, is also used. The power service to the station is rather erratic and the auxiliary transmitter was designed to operate on the 110 volt D.C. house lighting plant. A motor-driven chopper delivers 500 cycles interrupted D.C. to the plate and filament transformers. Two five-watt Radiotrons are used and the antenna current is 1.5 amperes. This transmitter has recently been completed and is only used when the power service is interrupted.

K.B.W.

5ZA's 1921 Hoover Cup

SEVERAL months ago we announced that the Department of Commerce Amateur Cup, to be awarded annually by Secretary Hoover during the present administration with the co-operation of the A.R.R.L. Board of Direction, had been awarded for 1921 to Louis Falconi, of the justly famed 5ZA, Roswell, N. M.

The cup has now been forwarded to 5ZA accompanied by the following letter from the Secretary:

Department of Commerce
Office of the Secretary
Washington

August 2, 1922.

Mr. Louis Falconi,
Roswell, New Mexico.
Dear Mr. Falconi:

The Board of Directors of the American Radio Relay League by unanimous vote have decided that you are entitled to the Department of Commerce cup for 1921 in recognition of the notable efficiency of your radio station and your activity in amateur radio work.

It gives me very great pleasure, therefore, to present you with the cup herewith. I also desire to express my hearty congratulations on the success of your work.

Yours faithfully,
(signed) Herbert Hoover.

The cup is a beauty, as may be judged from our illustration. Of solid silver, it stands 10 inches high with a bowl diameter of 6½ inches, a total height on its base of 12½ inches and an overall width across the handles of 9½ inches. On the face is beautifully engraved:

DEPARTMENT OF COMMERCE CUP
DONATED BY
HERBERT HOOVER
TO BE AWARDED TO THE OWNER
OF THE
BEST ALL-AROUND AMATEUR RADIO STATION
IN OPERATION DURING 1921
THE MAJOR PORTION OF WHICH
HAS BEEN DESIGNED AND CONSTRUCTED BY
THE
AMATEUR HIMSELF

On its reverse side it bears the following inscription:

AWARDED TO
LOUIS FALCONI
STATION 5ZA
ROSWELL, NEW MEXICO

Fine business, eh? With the return of good weather Falconi advises that traffic

west is again moving heavily over the southern route and 5ZA is all ready with a brand new station—new aerial, new transmitter and receiver, new counterpoise. First transmission of the season brought cards from every district but the Fourth, with numerous 1's and 2's, using two 50-watters. The Ad Club and Commercial Club of Roswell have shown their appreciation of Falconi's work too, and are donating him two additional 50's which will soon be warming up alongside their brothers.

The Department of Commerce Cup is the highest honor that amateur radio can bestow upon a devotee. A cup will be given for each calendar year during the present administration, to America's best all-around amateur station in which most of the apparatus is home-made. Full particulars were given on pages 20, 21 and 22 of *QST* for January, 1922, to which interested parties should refer. Entries for the 1922 award will be received by The A.R.R.L., under whose auspices the award is made, up to Jan. 15, 1923. Bear this in mind, O.M., and think over the preparation of your exhibits as called for in the regulations.

K.B.W.

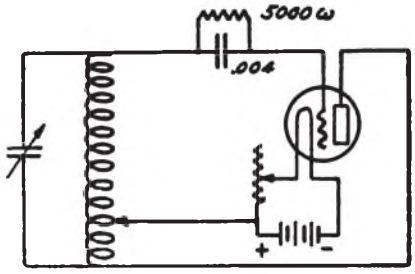
The Canadian Convention

CANADIAN Amateur Radio had its first big convention at the Prince George Hotel in Toronto on the 8th and 9th of September, under the auspices of the Wireless Association of Ontario (affiliated), and, in the words of the small-town newspapers, "A large time was had by all." Several hundred radio bugs, mainly amateurs, attended the sessions, and the job was put over in bang-up style. A good radio show and exhibit occupied stalls around the edge of the convention hall and in several adjoining rooms. Technical papers were presented at some meetings, an amateur gabfest was held and amateur work talked over, and on the night of the 9th a banquet was held which will ever remain one of the bright spots in radio for those who attended it.

A very considerable number of the amateurs present were from the United States —Connecticut, New York, Pennsylvania and Ohio, for the most part.

The apparatus exhibit was a very interesting one, particularly the variety of tubes displayed. The Canadian amateurs have it all over the U. S. hams in the array of valves from which they may select. The Canadian General Electric Co., makes the full line of Radiotrons for Canadian sale; U. S.-made Western Electric 50-watt oxide-coated-filament tubes can be had from some source; the Marconi Company's Canadian branch offers the V-24 and other Marconi-Osram valves; Perkins, Ltd., are importing a quantity of the Dutch Phillips lamps on standard bases; the Northern Electric Co. manufactures the complete line of Western Electric tubes with which U. S. amateurs are familiar and in addition the "N" tube or peanut which is not available in the States (except that the Westinghouse's WD-11 or Aeriotron is the same tube electrically); and Messrs. Powley & Moody, Ltd., of Toronto, offer a complete array of English-made Mullard valves, receiving and transmitting. Outside the very high-power tubes there are eight in the Mullard family, ranging from the familiar "Ora" receiving tube to 500-watt power bulbs. Their tubes are rated on safe plate dissipation, and the larger sizes are not based but have four leads brought out thru cambric insulation, filament and grid at one end and plate at the other. The prices are much lower than in the States: the 100-150 watt, $56; 250 watt, $85; 500 watt, $95. Got any friends in Canada?

The various technical and business sessions were ably presided over by A. H. Keith Russell, president of the W. A. O. O. and A.R.R.L. Ontario Division Manager. Among others, papers were delivered by



Mr. J. H. Thompson, chief engineer, Canadian Marconi Co., on Radio Transmission; Dr. W. B. Cartmel, Engrg. Dept., Northern Electric Co., on the "N" Tube; and Dr. C. A. Culver, Research Dept., Can. Indep. Telephone Co., on recent radio developments. One thing particularly caught our fancy in Dr. Culver's interesting talk: the description of an experimental oscillator without "B" battery, which makes an excellent separate heterodyne. The appended diagram shows a circuit in which there is nothing especially novel, the plate receiving a potential above that of the negative end of the filament equal to the "A" battery voltage, at which most hard

tubes will oscillate if properly handled. It was with regard to features of arrangement that Dr. Culver made a contribution: the use of the large grid capacity, 0.004 mfd., with the low leak resistance of 5000 ohms.

The A.R.R.L. Traffic Manager and Secretary attended, representing Headquarters. The latter addressed the convention on the subject of the purposes of the League in Canada and made it quite clear that the A.R.R.L. is lending a brotherly hand to Canadian amateur radio until more stations develop in the Dominion. We all believe that ill-considered and premature moves at a separate C.R.R.L. have been discouraged for all time.

At the banquet, again presided over by the versatile Mr. Russell as Toastmaster, good fellowship reigned supreme. This is a statement which might be made idly of any amateur banquet, but it is the real truth when applied to this one! Sometimes we fear conventions are becoming an old story for us with their eternal sameness, but this banquet was *real*, the air filled with the good old ham spirit and an air of camaraderie that we fancy only the dyed-in-the-wool gang can inject into a get-together. The peppiest and best-all-around entertainer we have ever seen led the bunch in songs and whooped up enthusiasm in great style and things simply hummed.

After the excellent dinner the Toastmaster opened the ceremonies by proposing toasts to H. M. the King and the President of the United States. Mr. F. Burgess, one of the W. A. O. O.'s directors, then offered a toast to Wireless, which was replied to by Mr. C. P. Edwards, radio chief of the Canadian Government's Department of Marine & Fisheries. Now be it known that Mr. Edwards is the "Terrell" of the Dominion and heartily liked by every ham. He is a peach of a scout (gave us a good drink, by the way), thoroly on to his job, and it's no wonder amateur radio runs smoothly in Canada. Mr. Edwards told his audience that majority rule governed and that they should be careful not to interfere with bumb-bell listening but help instead. It is the policy of his department to make as few actual regulations as possible, permitting the amateur to govern himself within his bands. New regulations had just been made for Canadian amateur radio a few days previously and Mr. Edwards made the first official announcement during his talk. Sparks get the wave of 175 meters, and no other. "That means," Mr. Edwards said, "that the spark has gone on a decline." The C.W. men applauded and the spark advocates booed and hissed their mightiest, but all in good fun. C.W. was permitted specific wave-lengths of 150, 175, 200, and 225; power limited to ½ K.W.; experimental "9"-licenses, 275 meters. Provision is also made for an amateur broadcasting license, to be used especially in localities where there are no broadcasting stations, wave length 250 meters. This class of license is to be issued only to duly organized associations, transferable by the club to any member thereof and good for operation during such hours as the club may determine. By this process the community is permitted to govern itself and there must be agreement. Public broadcasting continues on 400 to 450 meters as present. Mr. Edwards urged consideration in listening as well as receiving and solicited membership in his "Society for the Suppression of Useless Canaries." We picked up a good Canadian slang term from him, too: "P.B.O."—poor bloody operator!

Mr. Galbraith, of the locals, welcomed the visitors and proposed a toast to the Yanks—"for they are jolly good fellows!" Let us tell you chaps who weren't there that there is no such thing as a boundary line between these States and the Dominion!

Then followed Chas. Taylor of Buffalo, presenting to the convention the greetings of the Radio Assn. of Western N. Y.; a few words by 2FP and his gang, who had driven up; some from Ross of WHAM and 8AMQ on how it feels to run a broadcasting station; and an outline of conditions in Quebec by Mr. Wiggs of Quebec city. "Big Bill" Gray, of Chatham, complained of the temperature and wondered how it was that a radio fan wasn't automatically cool; and told of the interesting radio club they have in Chatham in connection with their industrial school.

Mr. W. C. C. Duncan, former president of the W. A. O. O. and a director in our A.R.R.L., told the gang that as a director he saw the inside of the League and knew that it was right, pointed out that the real interest in the game lies in relaying, and expressed the pleasure of the association at the better understanding between Canadian and U. S. amateurs certain to result from this convention and because of their joint membership in the A.R.R.L. And then Mr. Duncan offered a toast to the League, and right heartily it went down. Traffic Manager Schnell replied, incidentally announcing the plans for the forthcoming Transatlantic Tests, which were greeted with enthusiasm. In between, the Toastmaster called upon A.R.R.L. Secretary Warner to show off his English toppiece, the famous trophy of last year's Transatlantics. This was the first public exhibition of the London Lid, and we are sure we looked very sweet in it.

This banquet was a real one, the talks

(Concluded on next page)

QST SUBSCRIPTION CONTEST

LAST CALL!

Have you been doing your very derndest in our Sub Contest? If you have you'll have some mighty nice apparatus coming to you for we have known right along that it was easy to corrall the subs if you tried even half-way. If you haven't, it's time you shook a punky sock, for this contest ends on November 10th and this is a last call to action.

You contestants have been getting regular bulletins from me showing your respective standings, so there's no use taking up space in *QST* for that. I have a chance in this space, however, to give you a final warning that things are coming to a showdown soon, and to urge you to put in your best licks in these final days. You can't tell how many subs some of these birds have salted away; in fact, I'm morally certain somebody is holding out on me. One thing is certain: the subscriptions are there for the asking.

When this reaches you there will be about ten days left in the contest. Ten more days in which to garner in a few signatures and let *QST* have the pleasure of fitting you up for the Transatlantics. This thing is going to have a whirlwind climax, fellows, and it's going to take determined effort to win; there's no doubt about that. It is worth your very best endeavor, however, and I earnestly urge you to whoop 'er up and show some real speed. Remember that the prizes are real ones, liberal, and well worth spending all your time these last few days in the business of getting subscriptions for our *QST*. It looks like some of the smaller prizes aren't going to be qualified for and even now there is a good chance for a really energetic chap to jump in and pick off something worth while. If you want in on it, take in the subscriptions and wire me for blanks.

One final word: don't forget to mail in all your subscriptions by November 10th—they don't count after that.

Here's the ohm-saw; cut out that resistance and show some radiation!

THE CONTEST MANAGER.

THE CANADIAN CONVENTION

(Concluded from preceding page)

were interesting, the atmosphere inspiring, and the whole thing was over by about 10 o'clock—which shows that it can be done. The usual informal post-mortem then convened, during which arrangements were made for a Boiled Owl's Party the following week, and then most of the bunch drifted out to get on the air at various Toronto stations.

8TT and 8AWX bummed their way up from Ohio by various autos and made the round trip for a total of 8¢ each. Even they got their money's worth, for the Wireless Association of Ontario may well feel proud of the splendid job it did in the First Canadian National Radio Convention. *K.B.W.*

That Relay to Hawaii

IN our September issue we reported a relay during July from 1AW to 6ZAC and remarked about the unusual accomplishment of slipping this unheralded message so easily across the continent in a time of bad static and difficult transmission. At that time no information was available on the route followed by the message but reports received in response to our request show a history about as follows:

The message left Hartford on the night of July 1st, to 1AWB in Woodbridge, Conn., who early the next morning, July 2d, gave it to 8SP in Fairmont, W. Va. At 1:55 the same morning 8SP gave it to 9UU in Chicago, who QSR'd to 9BSG in Ames, Iowa, who passed it on to 9AMB in Denver. The message was on the hook at 5ZA, Roswell, N.M., on the night of July 3d. 5ZA raised 6AEH in San Diego (one 5-watter) and tried several times to give him the message but was unable to get any QSL. 6AEH, however, had copied it OK and forwarded it to 6EN in Los Angeles; just when, however, we do not know. 6EN was up in the mountains on a camping trip on the night of July 3d, and of course had a receiving set. He copied the message direct from 5ZA, broke camp, and hurried home to QSR. Sometime about then he got the message from 6AEH also. It was in

QSR'ing to 6EX that 6EN was over-heard by 6ZAC in Hawaii, who thereby received the message at 7:44 P.M. Hawaiian time on July 7th.

There is still one gap in the story: 6AEH and 6EN had the message on the night of July 3d but it was not until July 7th that 6EN was overheard QSR'ing. Where was it the intervening four days?

K.B.W.

A Radiophone Job in China

ROBERT F. GOWEN of 2XX, Ossining, N. Y., former chief engineer of the deForest company, has but recently returned from a most interesting 40,000-mile trip around the world during which he spent five months in China in radio work. American amateur skill stood him in good stead and he had some fascinating experiences in China which will undoubtedly interest our readers.

Commencement Day and the graduating class, the school and members of the Radio Communication Dept. of the province, with staff officers sent by the Governor for the occasion. The ladies are Mrs. Gowen and Mrs. Chung, wife of the Director of Communications, who, as a special courtesy to Mrs. Gowen, came to act as hostess altho she speaks not a word of English.

We are indebted to Mr. Gowen for the illustrations of his valuable "souvenirs," and to the Ossining *Citizen-Sentinel*, from whose story of his trip most of this account is abstracted.

Mr. Gowen has installed the first working phones in China, created their first radio school, and has seen the first class graduated. This in a country a thousand years behind the times where modern methods are not known, with no tools, among a people generally illiterate. But the stations are up, the school's text-book is written, and the students are learning.

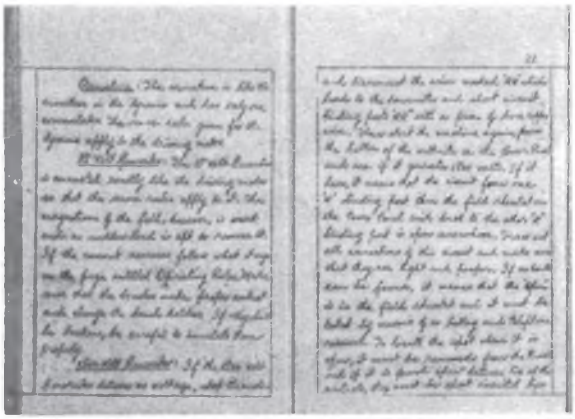
Bob was married in Ossining in early October of last year and left for China on the same day, with his bride, as the engineer of a large American firm operating in China. Arriving at Hong Kong he received orders to proceed to Canton to install eighteen phone stations for the governor of the province of Kwang Tung. In the States this would have been a child's play, but remember that this was China.

In the first place, these sets had a history. Radio was first introduced into this part of China by the Germans about ten years ago. They installed some spark

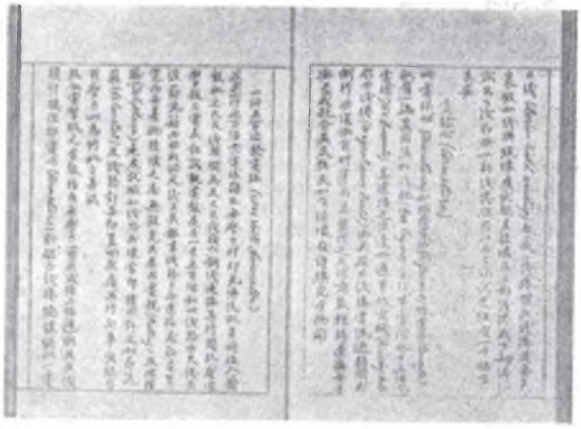
sets of a type now obsolete and succeeded after a fashion in teaching some native operators. These chappies received the munificent compensation of $8 per month, and the coolie workmen who kept up the sets rejoiced in the reception of $2 for the same period. About three years ago the province of Kwang Sie, which adjoins Kwang Tung, purchased eighteen deForest radiophones. Now our conception of the Chinaman is based largely on our acquaintance with our laundryman and he seems a cheerful good-natured fellow. They don't all seem to be that way, however, for it happens that Kwang Tung declared war on Kwang Sie and part of the spoils were these eighteen phone sets. They were considered a valuable capture but there is no particular hurry about anything in China, so they were stored in a damp cellar and left to shift for themselves. A year before Gowen arrived a San Francisco engineer had spent many months trying to get things going and gave up in disgust—the sets were almost hopeless and conditions were much more so. Enters Gowen, with orders to install the eighteen sets at eighteen different points. He found the sets covered with an inch of mold and the metallic parts corroded, no tools of any kind to work with and no trained workmen. The only bright spot was also a new arrival in China, a former U.S. navy radio man. Him Gowen seized as assistant and set to work. They corralled the Chinese "mechanics," showed them how to scrape metal and clean insulation, and before Christmas four of the stations were installed and operating.

After Christmas the government ran short of money, a chronic condition of Chinese governments. They decided they could do the job themselves with their $2-a-month labor and took over the contract from the American company, and darned if they didn't engage Gowen as consulting engineer and technical advisor to the governor, with pay in advance. From then on he was virtually an official of the China Government, enjoying all official prerogatives and carrying credentials admitting him to all government departments and an imposing document which upon presentation required the head official of any town to provide him with an armed guard. The only bad feature about this was that the soldiers were nearly as dangerous as the bandits they were supposed to protect his party from.

Well, the government wanted more stations built but Mr. Gowen balked. He had no trained men to do the work but offered as an alternative to train the Chinese in the work so they could do it themselves. A school was started. Now trying to put up stations is one matter but running a



Typical pages in the English version of the school text-book.



The finished radio station at Shui Chow, "SW."

Chinese school is still another. First he had to have a text-book. There weren't any, so Gowen wrote one! In English it filled 200 pages. Then he had his interperter, a bright Chinese lad who had learned

Autographed photograph of His Exc., Chung Kwing Ming, governor of Kwang-Tung, now self-appointed president of the Republic of China, presented to Gowen on his departure, April 3d.

English in Hong Kong high school, translate all but the drawings into Chinese. He knew nothing of radio and none of the technical terms, even in English. The technical terms in fact are not capable of translation, as there are no equivalent words in Chinese. Nevertheless the in-

The Dept. of Radio Communications, Republic of China. Gowen's office and school room on the second floor.

terpreter tackled the job, and then read it back in English to Gowen. His English-to-Chinese-to-English had considerable distortion in process and Gowen changed the language to make it simpler, this procedure being necessary several times before the demodulation sounded like the original. By that time the text-book was right down to ten-year-old stuff, but that was what was needed. Then the books were mimeographed and copies prepared for the students. There were thirty of them, including the director and assistant director of radio communication of the province. For two

This important-looking document is one which on presentation to any village magistrate ordered that he furnish Gowen with a guard of soldiers as an escort for protection from bandits.

hours every morning Gowen would lecture thru an interpreter. It was tough work. He got about as much response out of his class as from a brick wall. He would speak; the interpreter sing-sang what he guessed to be its Chinese equivalent; the thirty scholars quietly listened with inexpressive faces. He instructed his students to keep note books in Chinese; they would listen all day and were eager to learn but they balked at doing any work, and likewise at examinations, claiming they weren't paid enough to bother with exams. But eventually they came around to it and with all these handicaps a good part of the students did learn about radio. Before Gowen left they had a complete station of their own construction set up and running.

Telephony of course is the only thing possible with the Chinese language; it defies telegraphing. The alphabet has many thousands of characters and many of these have multitudinous meanings. For ex-

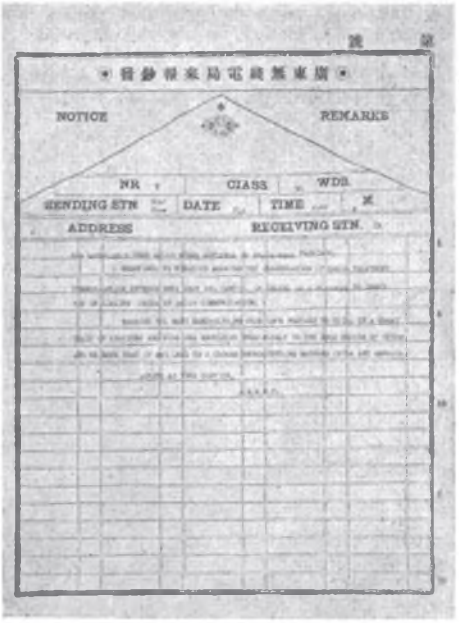
ample, the translation of Mr. Gowen's name in Chinese is "Gow Hen," the component words of which mean, literally, "Glorious Cloud." There are nine different ways of pronouncing "Gow" and each one gives the word a separate meaning. For names of wireless parts it was necessary to have the Chinese learn the English names. "Armature," for instance, can be translated into Chinese no better than as "ball of wire," and coils and inductances would have to be translated by the same term. Learning the English name was the only solution.

The Gowens found living conditions surprisingly fine and a splendid "foreign" quarter where they enjoyed an apartment fitted with American furniture, had six

An autographed photograph of Director of Radio Communications, Chung Yuk Hang. Note the very choice pose.

servants, and a chef serving American food who knew how to cook. At Christmas the American colony had a Christmas Tree and everything. They found the Chinese hospitable and appreciative; they showered Gowen with honors and when he left, at the graduation of the first class, the students of his school presented him with a beautiful silver vase with a touching testimonial engraved thereon. Official honors were paid too, and the governor of the province, Gen. Chung Quing Ming, now president of South China, gave Gowen an audience and presented him with an autographed photograph of himself.

Returning via Singapore, Calcutta, Bombay, Egypt, Italy, France and England,



A Chinese radiogram blank, a huge sheet 9½ x 13½ inches. This photo is a copy of the first message sent from Shui Chow, a message of felicitations to His Excellency Chan Quing Ming, governor of Kwang Tung Province.

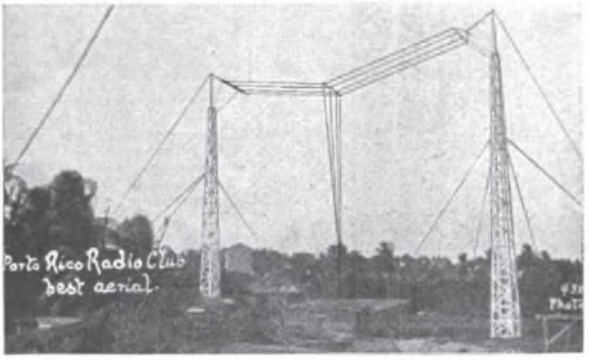
Gowen's business card. Reading down the columns, the words are, first column: Live Near Bund Second Horse-Road (street) Chinese American Medicine Company Fourth Floor. Second column: Glorious Cloud (i. e., Gow Hen, the nearest Chinese approach to Gowen). Third column: American Country less Wire Telegraph Chief Work Task (engineer) Teacher.

Gowen in 40,000 miles met but two persons he had ever seen before and these, by a strange coincidence, were the Duncan Sisters, playing at a London theatre. The Duncan Sisters, it will be remembered, were the performers at the very first radio vaudeville broadcasting ever staged in America, which took place from Mr. Gowen's station, 2XX, in March of last year.

K.B.W.

QSO Porto Rico

PORTO RICO has put itself on the amateur map and A.R.R.L. traffic between that island and our South Atlantic coast is moving every night! This is another glorious accomplishment in amateur radio, the credit for which is shared by the A.R.R.L. Roanoke Division and the Porto Rico Radio Club, affiliated. Bravo, gang!



4OI's beautiful aerial, best on the Island

4OI, in Martin Pena, is the Porto Rican terminal and 4FT and 4BX, by a coincidence both in Wilmington, N. C., the QSO stations on the mainland, the intervening distance being about 1300 miles. Communication was first established between 4FT and 4OI on Sept. 15th, and at this writing something over forty regular messages have been handled, with almost nightly communication. Meanwhile 4OI was reporting 4BX very QSA too, and this additional link was opened on Sept. 23d when 4BX found 4OI.

On Sept. 16th 4OI gave 4FT a message for Hartford reading as follows:

Nr 1 fm San Juan, Porto Rico
Amer Radio Relay League
Hartford Conn.
Greetings from the Porto Rico Radio Club upon inauguration of traffic with us.
J Agusty President

Apparently this message suffered delay in Wilmington, for it was not until the 21st that 4BX gave it to 1QP, in which process it was intercepted by Traffic Manager Schnell. A reply was filed at 1QP on the evening of the 22d reading as follows:

Porto Rico Radio Club
San Juan, Porto Rico.
Your message received Sincere congratulations on the establishment of amateur communication with the mainland May it be permanent.
A R R L Headquarters
Maxim Warner and Schnell

At 9:48 P.M. on the 22nd 1QP gave this to 3AQR, who QSR'd to 4FT at 9:54. 4FT passed it across town to 4BX who worked 4OI that night and at 11:15 the message was delivered in Porto Rico.

We are indebted to Mr. Joaquin Agusty, president of the Porto Rico Radio Club, for photographs and particulars on 4OI. This station is owned by Mr. Luis Rexach and boasts the finest aerial on the island, a 4-wire flat-top "T" on 105-ft. towers, with a perfect radial ground of heavy copper ribbon below the antenna and buried 3 ft. deep in wet ground. The station is only 50 ft. from the sea. 4OI uses two 50-watt bottles and gets 4 amps. in this antenna.

Mr. Rexach has made remarkable progress in radio. Only a few months ago he

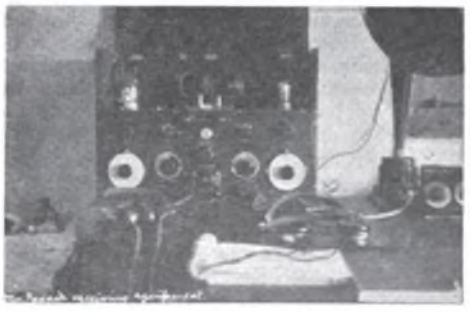
was a beginner, with a Ford coil. So great was his interest that he learned the code and got a license in three months, and now he is the first to establish DX traffic connections with the mainland. His wife and small son, Master Luis Rexach, jr., the latter incidentally the club's mascot

4OI Junior, Master Luis Rexach, the club's mascot

and the youngest ham on the Island, share his joy in radio work.

4BX is the station of G. S. Smith, the well-known City Manager of Wilmington, and puts 3½ amps. in the antenna from three 5-watters. Current call-books show 4FT as Atlanta but this is incorrect, the call having been reassigned on Aug. 15th to Donald McR. Parsley, also in Wilmington. 4FT's signals are most consistent at 4OI, as attested by the kick with which the latter acknowledges, but he is badly handicapped for power, getting 1½ amp. in the aerial from a 15-watt set supplied by a 32v.-500v. dynamotor operating on a farm lighting outfit. It is worthy of note that Wilmington is one of the nearest cities on the mainland to San Juan.

Mr. C. A. Service, jr., Assistant A.R.R.L.

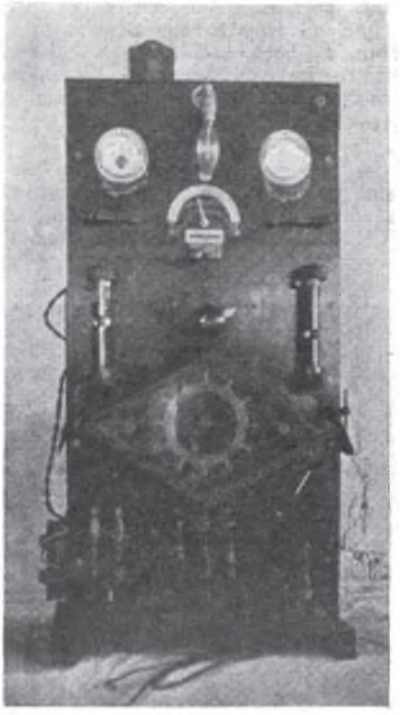


4OI's receiver

Secretary, while on a vacation in Nova Scotia, heard 4OI consistently all during the evening of Sept. 21st, a distance of some 1800 miles but all over water.

Mr. Agusty, mentioned previously as the president of the Island club, writes us as follows:

"Radio is going fast in Porto Rico. Everybody has the fever and a simple explanation will help. On the 25th of December, 1921, at a meeting in the Carnegie Library here the Porto Rico Radio Club was born. To-day we are officially affiliated with the A.R.R.L. We have 302 members, three-quarters of whom are studying radio thru the Club's free course. There are six transmitting licenses now: 4JE, 4LG, 4KT, 4KS, 4JV, 4DA and 4OI. Mr. Pinero (4KT) installed the first radiophone and C.W. set and Mr. Rexach of 4OI has established communication with the States.



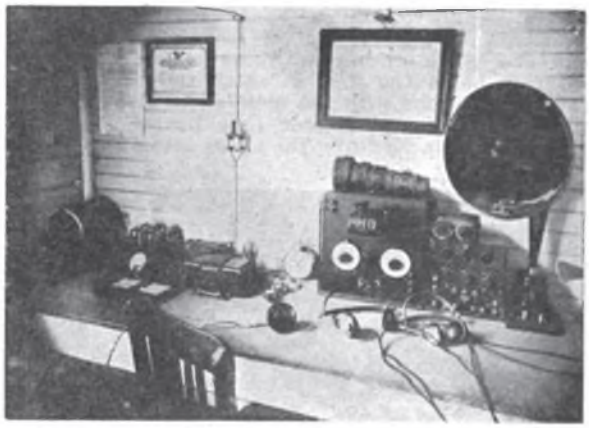
4JE's old spark transmitter, the first amateur set in P. R.

We are here for radio. Soon we will accept traffic for South America and soon we will send some for 6ZAC in Hawaii. We must say that Mr. E. C. Stephens, director of the Escuela Hispano Americana de Radiotelegrafia, is doing much to help radio in Porto Rico. He is publishing "Radio," a magazine in Spanish.

"The Porto Rico Radio Club sends greetings to all amateurs in the United States and will QRX for traffic, even for South America when this route becomes open. Any inquiries should be sent to Box 868, San Juan, P. R."

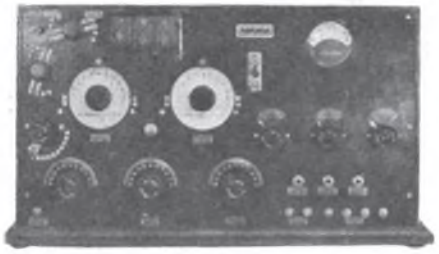
Mr. Agusty, 4JE, is the father of amateur radio in Porto Rico. Thru his kind-

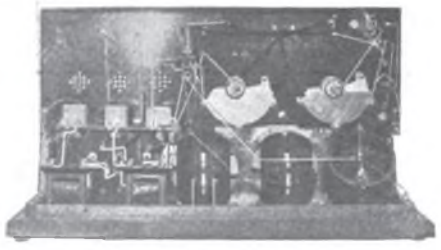
ness we present views of his excellent receiving set, home-built, and of his old spark transmitter, the first on the Island. The receiver employs honeycomb coils and is a "universal," POZ and LCM being copied regularly on the long waves and the reception of 9RT very QSA being citied as proof of its efficiency on short waves. The transmitter is a ½ k.w. spark with enclosed non-synchronous rotary gap, rheostats to control gap speed and transformer input, and control for three wave lengths, 150, 175 and 200 meters. This set will soon find its way to the Club's museum, as both 4JE and 4KT expect to have 100-watt C.W. sets in operation by December.



4KT (20 watt phone) at Carolina, P. R.

Porto Rico is directly in line for relaying to South America and the amateurs there will play an important part in the international relay work which is certain to develop. Soon our A.R.R.L. may have to establish a West Indian Division! Meanwhile route your Porto Rican traffic into the old Roanoke Division for QSR.





An example of P. R. amateur construction—Mr. Agusty's receiving set.

Hats off, fellows! Three big cheers for the Porto Rico Radio Club and the Roanoke Division!

K.B.W.

Prevention of Sparking at Key Contacts

By H. P. Corwith, 2BRC

I BELIEVE that the best position for the key in C.W. work is in the plate circuit. Trouble is often experienced, however from sparking and arcing. If the contacts are shunted with a condenser the trouble from arcing is cured, especially where a D.C. supply is used. However, the sparking is still bad if not worse, as it takes the form of a harsh click which burns the key contacts badly. If, however, a capacity and a resistance in series are shunted across the key contacts, the sparking will almost entirely disappear if the resistance and capacity are properly chosen.

The action may be likened to that of springs and snubbers on a car. The condenser absorbs the shocks like the spring and the resistance acts as a snubber to slow the spring action down or it may be likened to a dash-pot effect.

I haven't experimented much with condenser values at 2BRC but found that a 2-mfd. condenser was apparently too large. Accordingly, Dubilier type 277 of 0.01 mfds. capacity was chosen with a resistance of 100 ohms in series. On breaking a plate voltage of 500 V. D.C. and 200 mils, the sparking is hardly noticeable.

A suggested method for finding the proper resistance is to note the character of the sparking at the contacts. If the spark is snappy, the resistance is too small; if it is mushy and inclined to arc the resistance is too large, the proper value lying somewhere between these limits.

EDITORIALS
de AMERICAN RADIO RELAY LEAGUE

Hi!

RADIO NEWS says we're DOOMED, fellows! In one of the characteristic articles for which it has attained its unenviable reputation, our A.R.R.L. deathknell is sounded. From what we have been receiving in the mail, we should say that most of you fellows had either read the two "obituaries" or at least had heard about them. We usually are inclined to let these yellow efforts pass unnoticed. In this case, however, it is a little more extravagant than usual, and if it does not rub you the wrong way it makes you smile.

Of course there is the usual big dollar-sign hanging in the back-ground. The contributor is obviously influenced by the amount of space he can fill, and the editorial is obviously influenced by the $500 prize contest. It seems too bad that New York should have so much of this sort of thing, and that New York people, at least a certain kind of New York people, are so blind to the effect of their transparent efforts upon the people in the rest of the country.

"The amateur is doomed unless something is done to get him out of the present rut."

Who does this sound like, fellows? If you read it in South America, you would know instantly who wrote it. The "rut" is our A.R.R.L., of course. We are all wrong, and so deep down in a "rut" that we cannot see out over the top. We ought to be stringing antenna wire, explaining static, and showing how to get selectivity on a single-circuit tuner for the benefit of our neighbor across the street, who happens for the moment to think he is interested in radio. We are criticised for developing organization, encouraging good-will, and struggling to secure orderly operating and efficient two-way communication on short waves. Think of it!

Here is another sample, which it really is hard to believe actually was put into print:

"The amateur to-day is not recognized in the community."

Can you beat that—much! Those bales of newspaper clippings about our Transatlantics, the fact that we were mentioned in every single newspaper printed in the United States and nearly every magazine, and that in many places we have intimate working arrangements with the police departments of the cities, and that some of us are actual police officers, sworn in and wearing badges, and that we are soon to be Federal Deputy Radio Inspectors, is lightly brushed aside by a wave of the hand. To those of us who heard what Secretary of Commerce Hoover had to say about us, what the Navy Department had to say about us, what the Congressmen and Senators had to say about us, during the recent radio commission conference in Washington, it certainly must be edifying to read that we are *"not recognized in the community."* Really, you know, it is funny, especially when we recall the letter a certain person wrote to Washington asking to be appointed upon the Radio Commission, and the answer he got back, which was to the effect that Mr. Maxim, President of the A.R.R.L., would adequately represent the amateurs of the country.

Here is another choice morsel taken from *Radio News:*

"There is to-day no real purpose for the radio amateur."

Let's see you match that, even in the political world, where the facts usually do not cut any very astonishing figure. Is it any wonder that the person who would write such things gets the treatment he does at most of our radio conventions? Every amateur must wince over these things. Certainly, "'twere better left unsaid."

How does this one strike you, taken from this same article:

"We wish to state right here that we have no axe to grind..... What we wish therefore, fellow amateurs (the nerve of him), *is a manuscript of not more than 1000 words, setting forth your idea as to the best plan to put the radio amateurs on a solid footing..... This contest will close in New York, November 15, 1922, and the prize winners will be announced in the January 1923 issue of Radio News. Address all manuscripts to Editor, $500 Amateur Prize Contest, care of this publication."*

They used to say, "Butchered for a Roman holiday." You might say to-day, "Butchered for a Fulton Street holiday."

It certainly is to smile, when the facts are that our Board of Direction went all

over this matter, spending weeks upon it, as a result of the suggestion of Paul Godley, which he made the night we gave him the Goodbye Dinner in 1921, just before he sailed for England on last year's Transatlantics. We see in fancy the faces of our good old Board of Direction as they read this—and we end as we began—HI!

W.M.S.

The Voluntary Lid

AS a result of experience thru the past year of broadcasting, we have a definite program to recommend for amateur consideration. There have been many unjustified complaints against amateur QRM and of course where amateurs in cities have hogged the air all evening there have been justifiable complaints. Most of us have realized that broadcasting was capable of becoming a powerful force for good in our country, of tremendous social, economic and educational value, and have known that meant the passing of the old days when we could pound brass from supper-time on and the ushering in of a new era when the air had to be shared. As we have pointed out previously, many of us have gone so far in the business of sharing that we have almost been afraid to operate at any time, and amateur radio has suffered for the lack of a definite plan. On the other hand there are uninformed novice listeners who object to amateur transmission at any hour of night, and again the need for a recognized scheme has been shown. This we now offer.

Broadcasting is admittedly an institution of the early evening hours. That is the time that quiet air should prevail, when the greatest good can be done for the greatest number. When should we open up our stations for transmission? Our Board has considered that question and has decided upon 10:30 P.M. as the proper time. We're regretfully obliged to conclude, fellows, that the time is here when we should voluntarily keep our transmitters silent during the early evening hours if their operation interferes with listening. This means that in all congested communities amateur stations should be quiet between the hours of 7 P.M. and 10:30 P.M. This is no new thing for most of us—we've been doing it already—but it makes it a recognized principle of amateur work.

We urge our members and clubs to get together with the listening-in element in their community and have an understanding on the subject. Acceptance of this plan on the part of the amateurs means that they recognize the rights of the listeners to hear their concerts undisturbed, and that they will keep quiet between these hours. Acceptance of this plan by the novice listeners means that they recognize the rights of us amateurs to transmit and carry on our useful work and that they will not complain against the "meaningless buzzes" when the lid goes off at 10:30. This plan was proposed at a meeting of all radio people in Rochester recently and was adopted as a solution of the local difficulty. We may well call it "the Rochester Plan."

Whenever a community gets together and agrees upon such a plan, we feel that it should become as law and that the mere possession of a transmitting license should not entitle an amateur to go contrary to the sentiment of all his fellows. It is our view that such operation, unless justified by an emergency or official tests, would constitute deliberate and malicious interference within the meaning of the federal radio law, and we believe the Department of Commerce will agree with us. On the other hand, in localities where this plan is adopted and quiet air is maintained between 7 and 10:30 P.M., we will expect amateur transmission to proceed without complaint after 10:30, and the A.R.R.L. will protect with every resource at its command the right of any of its members to so transmit if unjustly accused while legally operating in such a community.

Now we have a working plan. Let us adopt it, fellow amateurs. This puts an important duty of self-policing on the shoulders of our affiliated clubs and we are depending upon them to handle the job. When this plan is adopted it must be respected, religiously, and this means that unlicensed and improperly adjusted stations must be hunted down and turned in. In bygone days such a station bothered no-one but its neighborhood amateurs, and if they could put up with it there was no harm done; but to-day such a station will bring discredit upon all of amateur radio and must not be permitted to exist. We would suggest that clubs establish committees to help local amateurs and render assistance when needed to get a station properly adjusted, but if the operator persists in operating illegally after being warned he should be turned in to the inspector without mercy—we have too much at stake. Other folks are watching us too, and while we think about it we want to tip off everybody to get their station and operator licenses renewed promptly upon expiration.

What about local work, which used to occur in the early hours of the evening? Honestly, we don't know, and it will be up to the amateurs of each club to decide for themselves how they will divide their hours. The time after 10:30 is going to be very precious and, solely because it is not as important as DX work, we are afraid local work will have to be got over with by the time 7 o'clock rolls around. Low-powered battery-operated C.W. sets of course can be used for local work all evening long and not cause a particle of QRM for the broad-

casting fan next door, but most of the lads who do local work have a far different kind of equipment—hi!

Our transmitters must improve. There will be too many of us with traffic to move at 10:30 and too many listeners with dumbbell tuners for us to continue much longer with the cycle-consuming spark of pre-war days. For the very efficiency of our traffic moving the selfish spark will have to yield to the valve set. We hasten to say, though, that there are selfish C.W. sets too, and we are just as much agin a bum C.W. without rectifiers and filters as we are against the ordinary spark, and for exactly the same reason—it takes up too big a place in the air, its wave is too broad. We cannot be pushed into an adoption of C.W. versus spark against our will, but left to our own devices we believe it is evident to any thinking amateur that the quiet efficiency of the little bottles is just the thing we need —filtered D.C. C.W. transmitters.

Now let's get busy on our self-imposed 10:30 lid. Remember that the League does not feel that it can back a member who runs loco in a congested locality and smears a whole county with QRM from the minute his supper is down, but that it will safeguard the interests of its law-abiding members in communities where the Rochester Plan is adopted and *respected*.

One thing more. Noise this about a bit. Let it be known that we amateurs have decided among ourselves to preserve some quiet hours, out of consideration for the broadcast listeners. Spread a little honest propaganda in your local newspapers.

K.B.W.

The December Transatlantics

NOW for a happy subject—our coming transatlantic tests! Doesn't the very mention make you thrill to the possibilities of achievement? Here is one of the big classics of amateur radio, one of the things that make the game worth while, an opportunity to show what your station can do. Things have whizzed in amateur work this summer and early fall and the A.R.R.L. has cut another half-dozen notches in its Wouff-Hong, but in December comes the *creme de creme*, the chance for the real DX-hound to show his mettle in both reception and transmission.

The Britons won't need help this year but the amateurs in France, Holland, Italy, Finland, Australia, China, Hawaii, and numerous points in South America and the West Indies will be observing our tests and helping in the reception. This is an unrivaled opportunity to make a distance record for your transmitter. Can any further inducement be offered?

But we're also *listening* ten nights this year, like the British amateurs did last year. How good are we in reception? Present indications are that there will be several high-powered C.W. stations entered in the contest in both England and France. Fellows, we must not fail—we simply *must* copy signals. If we don't the British amateurs will be sending over one of their chappies next year with their best gear, to show us how to do it! We've had excellent articles in *QST* during the past year on every phase of receiving, tuners, radio amplifiers, supers, heterodynes, etc., and in this issue we wind up the job by presenting the first authoritative information given the world on the wave antenna for short waves. Surely we have everything we need. "Let us then be up and doing!"

Two matters of co-operation remain to be handled. The first one concerns only ourselves. We must have absolutely quiet air during our reception tests. We must not let a lack of co-operation among ourselves mar our chances for success, we who boast so of our co-operative spirit. Prepare right now to keep your station silent during the listening hours when British and French amateurs are transmitting, unless you want to go down to posterity as the poor fish who gummed America's chances in the tests. And help the uninformed amateurs outside our A.R.R.L. who do not know of the tests, as they will be glad to co-operate and participate in the reception effort. The other matter concerns the broadcast listeners who unfortunately are going to be considerably bothered during our ten-day transmission periods, both in the preliminaries and the finals. We believe that they will appreciate a frank explanation of what all the hubbub is about and we would suggest that it be given them, with the assurance that it isn't a regular feature, so that they may understand how a thing so at variance with our 10:30 plan could happen.

Do we copy Europe?

K.B.W.

The Roanoke

DOWN in old Virginia there is a real A.R.R.L. division, a bunch of regular fellows, some sure-enough stations, and very considerable of the *esprit de corps* that has made our organization what it is. Quietly, efficiently, without trumpets and without ostentation, the fellows there have built, solidly and for the future.

A year ago the Roanoke Division was a baby, possessing no spirit of its own, running near the cellar position in A.R.R.L. work. In recent months its progress has been absolutely wonderful. The division has a network of quiet C.W. stations which handle traffic with machine precision and the message totals have been rolling bigger every month. There is but one DX spark station in the division. The whole outfit

(Concluded on page 66)

INTERNATIONAL Amateur Radio

Transatlantic Observers Wanted

As announced in this and previous issues of *QST*, a third series of Transatlantic Tests will be held this coming December between United States and Canadian amateurs on this side, and British and French amateurs on the other, with Holland and Italian amateurs listening. Transmission tests will be arranged in both directions across the ocean.

This item in *QST* will be read by qualified amateurs in every country—Iceland, South Africa, Japan and China, Argentina, Hawaii, Uruguay, the Philippines, Finland, Syria, Australia, everywhere. We wish to urge such readers to listen in on the tests. Amateur short wave signals have an amazing facility for covering unexpected distances and will have no doubt that during these tests amateur signals of some sort can be heard anywhere on the face of the earth. *QST* readers in other countries are cordially invited to get their receiving gear in operation and endeavor to pick up some of the test signals, reporting their results to the League offices at Hartford, Conn.

Holland Letter

Mr. K. F. M. Kunen, First Secretary of the *Nederlandsche Vereeniging voor Radiotelegrafie* (Holland Radiotelegraphy Society), has kindly consented to write monthly letters on amateur activity in the Netherlands for *QST* readers. We take pleasure in presenting his first communication:

Mr. Kunen

"On the request of the editor I'm going to tell monthly something about the position over here, and I hope our American collegues will take an interest in our doings.

"First I want to ask you American amateurs if you really know what 'Liberty' is? I tell you no, because you are living in the land of liberty and with some restrictions about wave-length and knowledge you can work as you like. Over here, where only receiving is allowed, you ask a license of the Postmaster (manager of the government telegraph office) who signs the license and after some time comes to see your set. As to sending, all kinds of requests have been sent to our Ministers of Waterworks but they have all refused to grant a license. Last year our Association, with about 2000 members, sent a request and were answered that as at the present it is even very difficult to assure the secrecy of public correspondence by the unlimited licenses of receiving sets, the free working of amateur stations could not be allowed. So it is forbidden now and . . . we don't send at all.

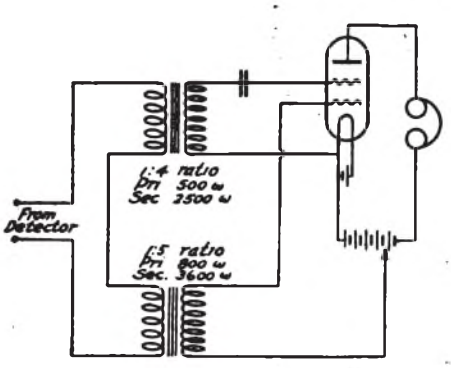
"I cannot feel that the situation has been well handled. The government says it is impossible but the right way would have been to follow the practice in the States where the government asks the advice of experts and the opinion of the amateurs. As yet this has never taken place in Holland but we still hope that we may get rid of persons suffering from littleness of mind and have them replaced by well-acquainted radio experts. Numerous examples can be given to show that permits could be given for transmission but nothing helps; the government forbids, so we must keep quiet. From this you will see, dear colleagues over there, that our position is anything but agreeable.

"An exception is made for dealers and manufacturers, who are allowed on certain hours to give radiophone concerts. Perhaps you have heard of our famous PCGG, the *Nederlandsche Radioindustrie* at The Hague, whose concerts are also heard in England. He gives his concerts every Thursday and Sunday night from 7 to 8 Greenwich Time for the *Daily Mail* and their readers in the United Kingdom, and even replies to letters received by means of his phone, and is heard well in England.

"Many of the amateurs are satisfied with the hearing of concerts and there are many among them not acquainted with the Morse code, which is the way that should be followed by a real amateur. Concerts from

the amateur viewpoint must be considered as an affectation, the cardinal points being training in the code, the studying of diagrams, and the operation of the apparatus. It is true that trying to get good reception of music leads to perfection of the apparatus and it must be said that good results have been obtained, but the right way of working the apparatus has not; for it is not difficult to get strong signals when much amplification is used but tuning well and getting good signals when only two audions, one as detector and the other as high-frequency amplifier, are used is a good test.

"Many amateurs here use the double-grid audions in all kinds of circuits. In Holland different makes of such bulbs are available such as the Siemens-Schottky, well known on account of its low price, the Heussen, etc. In the September issue



of our magazine, *Radio Nieuws*, Mr. J. Corver published the diagram shown herewith where he used a Heussen double-grid. In this circuit the effect depended on the transformer used and different results were obtained by testing various kinds of audions with the same transformer.

"We are working here at full strength for the radio exhibition which starts on Nov. 17th, where both amateur and manufactured work will be shown.

"A few words about our radio station in our East Indies, at Malabar near Bandoeing, no doubt often heard in America. In the end of July the new engine-sender [high-speed automatic transmitter?—Ed] of Telefunken make was set into action for tests. Recently when the new aerial was being hoisted one of the cables broke and fell among the natives; two were killed and five seriously injured. The service is troubled heavily.

"For this month I finish, and wish good success to the tryers and experimenters with the diagram given."

Kunen.

A ONE-TUBE SUPER-REGENERATOR

(Concluded from page 29)

light at distances in excess of 500 miles. The night range seems limited only by interference. Lists of calls heard and verification cards received were submitted by Mr. Groves but are not printed because of lack of space.]

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 October 1, 1922.

County of Hartford } ss.
State of Connecticut }

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 443, 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 the individual owners, or, if a corporation, give its names and the names and adresses 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 they are none, so state.) None.

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 on the books of the company but also, in cases where the stockholder or security holder appeared upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustees 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 each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is .....(This information is required from daily publications only.)

Sworn to and subscribed before me this 26th day of September, 1922.

K. B. Warner.

Wm. Lacey Wells, Notary Public
(My commission expires February 1, 1925.)

The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.

YES men, its too bad that this good old amateur radio game is dying as one of our foolish contemporaries says. But oh, what a happy death! Would that it die as much each month as it did last. It's a crime, fellows. Honestly we are dying away to the tune of 16,330 messages for this month as compared to 10,228 for last month. The huge crepe that our contemporaries see is nothing more or less than that big bubble of listeners which blinds them; but the amateur is in the back ground reposing peacefully on a solid foundation and is carrying on as never before. Some folk have the idea that because the amateur is a co-operative sort of person who gave up his pleasure night after night just so the "new baby" could play with the funny little lamps, that he is dying. It is a noble death to die for another, but the amateur is not dead, nor is he even sick.

On the other hand he has had a rest that will make him physically fit for the big problems which will be taken up this winter. True enough, we do burn a lot of midnight oil in conducting our affairs and we predict that the coming year will be the greatest year in the history of amateur radio.

You know fellows, sometimes as we are compiling the message traffic report along the first of the month, we see just a few hundred messages and it looks like a dull month, when all of a sudden the postman brings us the message report for the Roanoke Division with a big total—it's a grand and glorious feeling!

Those "ether combers" down in Gravely's Division are making things hum; no wonder old man QRN has moved out. Gess it gets a bit too hot for him and even he with all his cunning couldn't stop 'em. Many congrat's to you all.

Why our poor little Roanoke Division only rolled up a total of 2437 messages as compared to 1615 for last month. 'tis a sad state of affairs when the total used to be in the neighborhood of four or five hundred for a good winter month.

No sir! the poor lil' amateur hasn't done a thing. Of course we might mention that amateur radio communication was established with Porto Rico and on

Message Traffic Report By Divisions
SEPTEMBER

Division	C.W. Stns.	C.W. Msgs.	C.W. M.P.S.	SPARK Stns.	SPARK Msgs.	SPARK M.P.S.	TOTAL Stns.	TOTAL Msgs.	TOTAL M.P.S.
Atlantic	46	1774	38	23	1108	48	69	2882	42
Central	42	2522	60	29	1530	52	71	4052	57
Dakota	17	721	41	2	21	11	19	742	39
Delta	6	92	15	6	154	25	12	243	20
East Gulf	20	826	41	5	130	26	25	956	38
Midwest	21	1040	50	10	255	26	31	1295	43
New England	22	1989	90	7	235	33	29	2224	76
Northwestern	10	195	19	15	419	27	25	614	24
Ontario	7	113	16	1	8	8	8	121	15
Pacific	12	207	17	7	106	15	19	313	16
Roanoke	38	2179	57	4	258	64	42	2437	58
Rocky Mtn.	8	391	39	5	64	13	13	455	35
Vancouver	2	18	9	6	85	14	8	103	13
West Gulf	22	441	20	13	186	14	35	627	18
Winnipeg	2	50	25	1	2	2	3	52	17
Total	329	12458	38	134	3872	28	463	16330	35

C.W. Messages, 12,458—76%
Spark Messages, 3,872—24%
Total 16,330

one night a message started from A.R.R.L. Headquarters at 9:48 P.M. and landed in Porto Rico at 11:15 the same night, but what is that. Nothing at all, only it has not been done before. Now a route is open to Porto Rico via 4FT or 4BX. Nil desperandum!

50,000 Messages

That is going to be our aim for the business of one month. We will handle a total of 50,000 citizen messages during some one month before this season gives way to warmer weather and strong atmospherics. With the business of traffic handling starting not later than 10:30 P.M. our traffic will be moving regularly and consistently with despatch. To work men! Let's go after that mark with keys unrestrained.

The new directory of the Operating Department appears in the front of this issue and there you will find the name of I. Vermilya, 1ZE, given as manager of the New England Division, vice P. F. Robinson, who resigned because of business pressure. When W. D. Woods gave up the Vancouver Division to attend school in Seattle, J. T. North, Jr., was appointed in his place.

The traffic honors for this month go to a C.W. station.

Worcester County Radio Association
1BKQ
Worcester, Mass.
New England Division
472 messages

TRAFFIC REPORT

Atlantic Division—C.W.: 2AEQ, 76; 2AVE, 23; 2AJF, 10; 2SQ, 3; 2ARS, 10; 2CBK, 5; 2FC, 24; 3CDK, 15; 3CG, 42; 2BQC, 8; 2BNZ, 105; 2ALY, 75; 2VA, 10; 2AFC, 48; 2CDR, 40; 8ASL, 16; 3ANJ, 38; 3BJY, 25; 3AGN, 4; 3BIT, 62; 3SM, 59; 3FS, 53; 3QV, 38; 3VW, 18; 3BNU, 122; 3ADX, 107; 3AWH, 20; 3ZO, 234; 3BTY, 43; 8ACF, 41; 8CKM, 17; 8AKW, 7; 8AIO, 43; 8BJX, 20; 8SE, 26; 8BRL, 10; 8LF, 7; 8AKW, 7; 3AJD, 30; 3WF, 21; 3SQ, 5; 3HG, 38; 3ALN, 87; 3IL, 22; 3LR, 12; 3ZW, 17; total, 1774. Spark: 2DI, 114; 2AEO, 34; 2PF, 33; 2BRB, 54; 2CJX, 28; 2BQZ, 20; 2SQ, 16; 2OM, 197; 2NF, 78; 2ARB, 48; 2CDR, 28; 8AXN, 57; 2WB, 150; 3QN, 4; 8ALF, 22; 8ZD, 81; 8EW, 63; 8BRL, 20; 8CEJ, 32; 8HY, 4; 3AC, 1; 3KM, 2; 3OK, 10; total, 1108.

Central Division—C.W.: 8FT, 247; 8ASZ, 213; 8IJ, 206; 8BWA, 143; 9BHD, 15; 9DQU, 75; 9APS, 114; 8BDO, 112; 8ZZ, 110; 9EI, 109; 8AB, 100; 8AM, 85; 8BEF, 85; 8ZAG, 68; 9AAP, 33; 8ANB, 54; 8DZ, 51; 8CAB, 46; 8CBX, 44; 8WI, 51; 8ZAF, 39; 8CGX, 41; 8BVR, 39; 9ALW, 12; 9CCN, 16; 8AIM, 37; 8CDZ, 33; 8ZF, 32; 8CAZ, 31; 9BLC, 28; 8CMI, 22; 8AWN, 19; 8AND, 17; 9AFN, 9; 9DCR, 10; 8CVM, 14; 9AWS, 6; 9YB, 6; 9ALR, 5; 8BAH, 4; 8BEP, 1; 9OX, 140; total, 2522. Spark: 9ZN, 215; 8ZO, 158; 8FT, 154; 9UH, 162; 9ACL, 25; 9MC, 19; 8AUX, 122; 8UC, 122; 8AIZ, 112; 8ZY, 98; 8BEP, 78; 9AZA, 35; 8BXC, 35; 9AFK, 30; 9BLU, 11; 8TK, 15; 8EB, 15; 8CMI, 14; 8WI, 9; 8TT, 8; 9DEL, 7; 9DXT, 5; 9YB, 5; 8ALK, 3; 9WX, 57; 8DZ, 3; 8ANB, 2; 8CUM, 2; 9OX, 9; total, 1530.

Dakota Division—C.W.: 9BAV, 8; 9CPV, 3; 9AGW, 2; 9EA, 7; 9BAF, 22; 9ZC, 8; 9DGE, 20; 9BJV, 117; 9DR, 62; 9BBF, 18; 9DYZ, 3; 9MF, 35; 9APW, 148; 9YAJ, 102; 9AUL, 74; 9BTT, 17; 9AVZ, 75; total, 721. Spark: 9ZC, 16; 9AIF, 5; total, 21.

East Gulf Division—C.W.: 4BQ, 25; 4NM, 5; 4IV, 10; 4FV, 5; 4KU, 14; 4HW, 264; 4KF, 80; 4CY, 8; 4JY, 38; 4AU, 66; 4EH, 15; 4CG, 4; 4EB, 32; 4BY, 4; 4EL, 32; 4FQ, 38; 4JK, 35; 4EG, 38; 4BF, 100; 5ES, 13; total, 826. Spark: 4BI, 71; 4HS, 40; 4HX, 10; 4MY, 3; 5XA, 6; total, 130.

Ontario Division—C.W.: 3CO, 10; 9AL, 38; 3HE, 10; 3JI, 10; 3JK, 10; 3KP, 30; 3ACJ, 5; total, 113. Spark: 3FO, 8.

Rocky Mountain Division—C.W.: 9ZAF, 30; 9DTE, 10; 9AMB, 61; 9DTM, 38; 7AFW, 7; 7LU, 206; 7ZO, 19; 6BOE, 20; total, 391. Spark: 7DH, 9; 6ATH, 17; 6BKE, 9; 6ATQ, 19; 6ARU, 10; total, 64.

Vancouver Division—C.W.: 5BQ, 12; 5CT, 6; total, 18. Spark: 5CN, 15; 5DO, 5; 5EC, 8; 5DK, 6; 5CD, 5; 9BD, 46; total, 85.

West Gulf Division—C.W.: 5DW, 33; 5SF, 34; 5QI, 132; 5DI, 39; 5IR, 26; 5QS, 10; 5VA, 25; 5XY, 7; 5VO, 5; 5YK, 2; 5AE, 27; 5BA, 12; 5ZX, 1; 5IM, 15; 5XV, 7; 5ACF, 5; 5PO, 3; 5ZA, 19; 5ZM, 2; 5ZAV, 15; 5ZG, 7; 5RJ, 15; total, 441. Spark: 5ACQ, 25; 5TU, 36; 5QT, 6; 5CK, 6; 5UG, 5; 5IR, 30; 5WU, 2; 5QS, 15; 5ZAW, 10; 5ZC, 3; 5ZAE, 8; 5ACU, 5; 5YK, 35; total, 186.

Winnipeg Division—C.W.: 4BV, 45; 4GB, 5; total, 50. Spark: 4CE, 2.

Midwest Division—C.W.: 9DRA, 14; 9JA, 53; 9DBL, 4; 9AMU, 20; 9ARZ, 30; 9PSZ, 30; 9DZQ, 55; 9AYS, 100; 9AON, 250; 9BED, 50; 9DXN, 3; 9NU, 5; 9FM, 8; 9DJB, 15; 9AQR, 3; 9BSG, 167; 9BGH, 70; 9BZI, 53; 9AMI, 44; 9DKY, 40; 9FK, 26; total, 1040. Spark: 9YM, 16; 9AAU, 3; 9DZY, 50; 9RR, 50; 9DJB, 30; 9BMN, 40; 9DRA, 17; 9JA, 29; 9YA, 14; 9FK, 6; total, 255.

Roanoke Division—C.W.: 8AFD, 150; 8BPU, 23; 8AUE, 7; 8SP, 56; 8CAY, 12; 8AMD, 148; 8BDB, 26; 8BKE, 53; 4LJ, 13; 4NV, 23; 4EN, 17; 4DC, 39; 4GX, 32; 4GH, 104; 4DS, 34; 4LP, 15; 4KC, 4;

4EA, 340; 4FT, 28; 4BX, 320; 4NT, 27; 4ID, 18; 4CQ, 6; 3BLF, 99; 3BZ, 36; 3AEV, 31; 3BVL, 35; 3CA, 34; 3BIJ, 18; 3APR, 12; 3AJG, 12; 3MO, 2; 3AUU, 23; 3BMN, 8; 3TJ, 70; 3MK, 212; 3ZZ, 85; 3IW, 7; total, 2179. Spark: 8IC, 3; 8BDA, 224; 4MF, 10; 3ACK, 21; total, 258.

Northwestern Division—C.W.: 7TH, 43; 7OT, 32; 7IY, 30; 7MF, 22; 7NN, 17; 7OE, 14; 7AGF, 13; 7QD, 12; 7HM, 7; 7UU, 5; total, 195. Spark: 7BK, 96; 7AW, 77; 7GE, 67; 7NW, 41; 7BG, 33; 7KJ, 27; 7OT, 24; 7IW, 14; 7IB, 14; 7NC, 6; 7ON, 6; 7TW, 6; 7FD, 3; 7PQ, 3; 7FH, 2; total 419.

New England Division—C.W.: 1ACU, 197; 1ASF, 148; 1AZW, 72; 1BAS, 27; 1BDU, 27; 1BKQ, 472; 1BNP, 23; 1BVH, 44; 1BRQ, 36; 1CAJ, 24; 1CBJ, 4; 1CBP, 58; 1CCZ, 33; 1CHJ, 126; 1CK, 30, 1CMK, 107; 1COT, 42; 1CPN, 312; 1GV, 63; 1PT, 23; 1SC. 20; 1SD, 101; total, 1989. Spark: 1AHT, 21; 1BJS, 23; 1BRQ, 3; 1BVB, 95; 1DY, 10; 1LZ, 63; 1SC, 20; total. 235.

Delta Division—C.W.: 5JB, 10; 5UK, 15; 5EK, 25; 5NV, 18; 5DO, 12; 5FV, 12; total. 92. Spark: 5ZL. 81; 5XAC, 29; 5JF, 11; 5ZAU, 8; 5BW, 5; 5MO, 20. total, 154..

Pacific Division—C.W.: 6BJX, 33; 6AGH, 1; 6BPZ, 18; 6BQC, 19; 6CU, 28; 6ALU, 18; 6EB, 11; 6FT, 22; 6RR, 15; 6JD, 6; 6KA, 22; 6EN, 14; total. 207. Spark: 6AWE, 10; 6BPZ, 17; 6ADG, 2; 6KE, 13; 6OD, 31; 6ALD, 5; 6OL, 28; total, 106.

ALASKAN DIVISION
Roy A. Anderson, Mgr.

Mr. Leon C. Grove, former 7EP, of Kenai was in Ketchikan attending the Teacher's Institute and while there paid a visit to the D M. Mr. Grove said that he hoped to install a fifty watt set (C.W.) this year at Haines where he is to teach. In view of the fact that Haines is sort of a hole. it is doubtful that even such a powerful set will carry the signals from there to the States, but it is hoped that some sort of a relay can be effected between Haines and the States.

Sturley in Chignik reports that between schedules and daylight he has little chance to listen for any DX. 7UF at that place now has a Reinartz and it is hoped that the long winter nights will bring some in the line of good DX.

ATLANTIC DIVISION
Chas. H. Stewart, Mgr.

The message traffic report for this division shows that there is a rapid returning to the game. Stations in and around New York are doing much better work and the change of weather brings more and more stations on the air every night. New Jersey stations continue to move traffic with the same reliability and traffic routes are open in all directions. A great deal of traffic moves into the southern divisions by way of New Jersey. Next month will see some regular detailed reports from New York and New Jersey in addition to a much larger traffic report.

PENNSYLVANIA: Unless Rau gets some action from some of his men he is going to withdraw some certificates. ('atta boy Jimmy, 100% or nil—F. H. S.) 3QN is back on the job with three ops. 3BNU is using his squeak boxes on tubes, FB. 3ZO has schedules with 3ADX, 3ANJ, 3ALN, 8XJ and 8ZZ. Philadelphia is well equipped for all traffic with 3ANJ, 3BJY, 3AGN, 3SM, 3FS, 3QV and 3VW. The following appointment has been made in Western Penn: G. L. Crossley, chief op at 8XE. superintendent of district #7. W. K. Thomas, 17 Emerson Ave., Crafton, Pa., has some vacancies and wants to hear from men desiring to participate in League work.

DIST. OF COLUMBIA: The Washington Radio Club called a special meeting to elect H. A. Wadsworth, 3JJ, assistant division manager for D. C. Washington has some excellent traffic movers in 3ALN, 3ZW, 3JJ, 3LR, 3IL, 3KM and 3OK. In a short time Herb Hoover, jr., will break out with a C.W. set of about 500 watts, with the call 3ZH. (FB OM, we welcome you on the air and trust you will give the gang a lift with tfc—F. H. S.)

MARYLAND: Outside of the work being done by 3HG, 3AJD and 3WF there is not much to report. Maryland stations have not returned to the fold as yet. ('smatter gang, is the broad-caster stepping on your toes? Come on, get back on the air, we need you!—F. H. S.)

CENTRAL DIVISION
R. H. G. Mathews, Mgr.

MICHIGAN: The 375 meter route through to Grand Rapids is functioning without a hitch thru 8ZZ, 8ZF and 8ZAG in daylight.

Inasmuch as nearly all operators are back on the work now we expect to swell our traffic reports very much. This month shows a decided increase. Detroit has 24 stations doing DX work, at least they try, but QRM is awful for getting traffic through. QRN has been almost incessant throughout the month and many of us have almost come to the conclusion that the Gulf District was trying to put something over on us. No messages were handled so far, but we are going to get started 100%.

We are very desirous of hearing from stations in the state who can maintain

a daylight schedule. Please let us hear from you at once. We believe we are much better equipped to handle the work efficiently than ever before and look for improved service through this District.

Mr. Sirrine, D.S. of district #3 has resigned for lack of time and in his place Chas. E. Holmes 8ZAG, 310 W. Bron St., Grand Rapids, Mich, has been appointed. 9BOH is on with 1 k. w. spark. 9AXN at Laurium has junked the spark coil and purchased a ½ k. w. spark. 9AEN has the 100 watt C.W. set nearly completed. 9AJU is temporarily out of commission owing to that famous spark illness of punctured condenser, but will be on again in a few nights. No report from 9DWV this month, but he has his 10 watt C.W. set finished. 9CGE is undergoing improvements remodeling the ½ k. w. spark and installing a new receiver. 9CE is on with the 10 watt C.W. set. 9BTC will be on before long with a C.W. set. 9DRR is on with both ½ k. w. spark and C.W. 9DWR is on again with a new oil immersed condenser and is trying to blast the ether on full power. 9OL is on nightly except Sundays with five operators.

We are very glad to note the increased enthusiasm in district #4 and certainly hope that things continue in this district as well as they have started.

INDIANA: 9YB has been in operation a few nights, but will be more active hereafter as arrangements have been made for power from 10 P.M. until 1 A.M. on every night of the week except Friday. This will enable 9YB to get into the DX game in better shape than before. 8XJ, Ohio State University, is a convenient connection to the east. 9BLC will be off from the air for sometime, as Mr. L. M. Clearwaters, the owner of the station, is in a hospital in Indianapolis due to a recurrence of an old disability contracted during the war.

We have not had the opportunity to look over our fall group of operators, but there are quite a number of well known amateurs here. Among the new ones are: 9FS, 9DEK, 9VL, 9AGR and others. An operators' course is being planned which will be held periodically for the purpose of code practice, study of radio laws, and handling of message traffic in accordance with the A.R.R.L. practice, etc. We think there will be a very good bunch of operators developed before the end of the year, thus improving one of our weak points in the past.

KENTUCKY: Because of the pressure of other business Mr. Kolb, assistant division manager for Kentucky, has resigned and Mr. B. L. Brown, 9UH, of Newport, has been appointed acting assistant division manager for Kentucky.

The following appointments have been made: Mr. Pflumm, 9OX, district superintendent of Louisville and vicinity; Mr. Anderson, 9EI, district superintendent of Lexington and vicinity; Mr. Defenbroch, 9APS, city manager of Covington supercedes Mr. Kleaman, 9VZ, who has temporarily dropped out of the game. 9GX is now city manager of Louisville and 9IO is city manager of Newport.

There is now a daylight route from Newport to Louisville via 9APS, 9UH, 9EI and 9OX, also traffic can now be successfully handled between 9OX and 9UH at night on C.W. It was an impossibility heretofore.

OHIO: In Ohio things are progressing as usual under the able leadership of Mr. Candler, and the message totals continue to pile up as a glance at them will show. R. D. McCommon, of East Palestine, Ohio, has resigned his position as district superintendent of district #6. His successor has not yet been appointed. A great number of new appointments have been made as official relay stations and in general, Ohio is living up to its past record. 8ZY has his station in operation and is handling traffic again. A number of new appointments will be made in the Toledo district as Mr. Duerk has not received the cooperation that he should have, and accordingly, this district will receive a thorough shake-up. Applicants for city manager and official relay station appointments are requested to get in touch with Mr. Duerk at Defiance, Ohio at once. In the Toledo district 8BEP, 8BRY, 8ZY, 8TK and 8ASZ are handling the bulk of the traffic.

WISCONSIN: No report received for September from the assistant division manager for Wisconsin, but two reports received direct from the district superintendent of the second district of Wisconsin and from the West Allis Radio Club. 9AFK has a noon day schedule with 9WX, 9AJH, and some others around Chicago and vicinity. Also on Monday, 9DHK, C.W.: Tuesday 9ALR, C.W.; Wednesday, 9AFK, C.W.; Thursday, 9BAC; Friday, 9DEL, spark and C.W., and Saturday, 9DXT, spark and C.W. These men will be on all evening of the days stated.

The Chicago Plan governs here with a few changes made necessary by local conditions. Mr. Maas of district #2 reports that things are getting lined up in his district with his station 9AZA handling considerable traffic.

DAKOTA DIVISION
N. H. Jensen, Mgr.

The weather man or whoever it is that dishes out static so generously during the summer months has certainly had a change of heart the past month. The atmosphere

has cleared up to a great extent and traffic has started to move in big chunks, especially through southern Minnesota. Some complaints are being received about broadcasting stations monopolizing the air until late hours, and it occurs to the D.M. that in cities where broadcasting is being done after 10 P.M., it would be well to have the radio club or other amateur organization send a representative to confer with the management of such broadcast station with a view of regulating the hours for the different classes of radio work. This would tend to create a better feeling and better understanding between the amateurs and those in charge of the broadcast stations.

MINNESOTA: City Manager E. S. Hayes, has had a conference with the operator in charge of WJAP about the QRM caused by the station, and Mr. Hayes was politely informed that he (the Opr.) would broadcast any time he pleased and as long as he pleased. This is far from the A.R.R.L. spirit. 9BAV and 9BAF are doing good work. 9ABB expects to have his 10 watt C.W. going soon. 9FH is getting in shape for the big rush. 9GW reports that he will have his station overhauled and ready. 9ADF will be on the job strong again this fall if he can ever get those 50 watters he has ordered. 9CO has sold his rock crusher and is thinking kindly of C.W. now. 9PN is on the air with C.W. and expects to have his spark going soon. 9ZC reports that he has worked 9CDV in daylite and looks for a good relay station in 9CDV the coming season. 9ZC clears regularly with 9YAF at 10:45 A.M.

The division convention seems to have stirred up a little more activity in this district and traffic is moving much better. In the Twin Cities the broadcast stations keep the air jammed until 11 P.M., so 9DR, 9APW, 9BJV, and others go to bed early and get up about 2 A.M. and in this way make use of the best hours of the night. 9YAJ is keeping an all night watch on Tuesday, Thursdays, and Saturdays. 9BBF is on the air quite regularly with 100 watts and 9AWM is on part of the time with his big fellow (250 watter). The Fairmont gang, who have been laying somewhat low during the summer, are again active. 9DGE and 9BKV are going with 50 watts each, and 9BJP and 9ACD are back on the air with spark and are getting out fairly well. 9DGM is on with 100 watts C.W. 9XI will be heard when school starts. 9YX is heard occasionally with a sink spark, 200 watt C.W. and fone. 9MF has been heard 1090 miles with 5 watts. 9CMM will soon be going with 10 watts. 9APW is doing exceptionally good relay work, as also are 9BJV and 9DR. 9BTT has a 10 watt C.W. and is getting out in fine shape.

SOUTH DAKOTA: 9AVZ again heads the list for traffic handled in this district. Burning out a 50 watter caused this station to go out of commission for a short time on September 10th. He has a distance record of 150 miles to 2BRC. 9AIF and 9AIG are again on the air occasionally. 9DKQ is reaching out in good shape and should make a good relay station this year. 9YAK, 9BRI and 9BOF are being overhauled and will be going soon. 9AYW is out of commission for a short time with a punctured condenser. District superintendent, Charles T. Norton is leaving this month for Ames, Iowa where he will attend school.

DELTA DIVISION
J. M. Clayton, Mgr.

Traffic is again moving along in fair quantities, due to steadily improving weather conditions. Static has shown signs of abatement and both sparks and C.W.'s are getting through in fine style.

ARKANSAS: After a summer of the most terrific QRN ever known, Arkansas is taking a new lease on life, wirelessly speaking All of the stations have not yet resumed operations but signs of life can be noticed on close observation. 5ZU in spite of the often expressed love for his spark, is flirting with C.W. and next month should see him with a full fledged 20-watt set in operation. 5JF is on occasionally, and has handled some traffic. 5JB has moved his station to an observatory 900 feet above Hot Springs, and has his aerial on a 185 foot tower. He is putting 3 amps of C.W. energy in his antenna and is now on regular schedule from 10 P.M. to 2 A.M. 5XAC has been appointed D S. of district A. All stations in this district should send reports on form No. 1 to him. 5WF is still on the retired list. 5ZAZ, D S. of district B, reports ND in his section, and also reports that he may soon boom forth with 2 K.W. spark in addition to his C.W. set.

LOUISIANA: Mr. J. A. Pullen, famous 5ZAB of Houma, Louisiana, has been appointed Assistant Division Manager for the state of Louisiana. Nothing startling or new has taken place during the past month. 5UK and 5LA at New Orleans, are punching the ether full of holes and moving a considerable amount of traffic.

MISSISSIPPI: 5YE will be with us very shortly. 5ZAU, at Bay St. Louis is now ready for operation but tied down by a peculiar kind of static that inhabits that part of the country.

TENNESSEE: District number one is beginning to show life and no doubt will continue to advance towards the front place while district number two is still

waiting for broadcasting to cease. (?) At Chattanooga, 5HL was the first station that succeeded in reaching beyond the city walls. He is getting out fairly well with his 10 watt C.W. transmitter and is ready to handle traffic for his city. The city manager is still unable to reach out with his 20 watt set and will soon try 100 watts. Nashville, 5ER, city manager, having returned from an all summer vacation, is now ready to handle traffic and promises to keep on watch all winter. 5FV has been the only station in operation and is handling some traffic. (Keep 'er up FV!) Knoxville seems to be a center of inactivity.

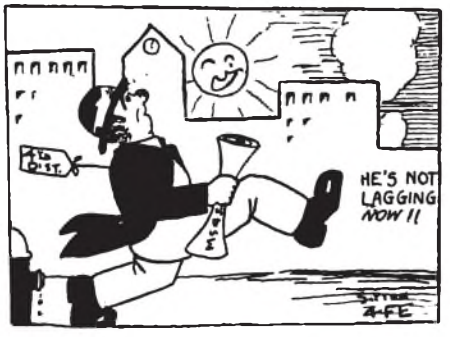
EAST GULF DIVISION
B. W. Benning, Mgr.

GEORGIA: 4BQ is back on the air with his 500 watt C.W. set and is punching a terrible hole in the ether. He is working daylight schedules with practically every station in North Georgia and is trying to connect with 4BY. 4NM is working daylight schedules with 4IV, 4FV and 4EB. He is reaching all over the country on his 10 watt C.W. set and will make a good relay link this winter. 4IV is still doing fine work and reports that his city is connected with Rome, Athens, Winder, Atlanta, and Palmetto by daylight routes. 4AG reports that his antenna is down and no transmitting is being done. Rumor has it that the Old Man will be located in Atlanta soon and if this is so we will have another fine station in the Gate City. 4FV is reaching out with his small C W. set in fine style and will take care of all traffic through Athens in spite of the loss of 4AG.

This district is certainly leading the East Gulf in the daylight routes. Traffic is going from Atlanta to Savannah via the short jump daylight route.

Although 4BK has sent in no report for the month we have the reports direct. Mr. C. L. Donaldson, 4RI, has recently been appointed city manager of Atlanta. He reports that the local broadcasting schedules make it practically impossible to do any work before midnight, but that traffic is going through in spite of the mush. The local C.W. men are able to work after 10:00 P.M. and are pushing stuff through but the spark stations are very seldom neard handling traffic until after midnight. 4HS is now a member of the early morning club and is never heard on the air until 3:30 A.M. or 4 A.M. 4HW our star station is fast becoming a member of the boiled owl's club as he is on until daylight practically every night and is growing corns on his ears from a continual wearing of the cans. 4EH is going strong with his 20 watt C.W. set and has been reported QSA in the 6th district on 1.6 amps. The following stations are all doing good work: 4CG, 4KF, 4HX, 4MY, 4CY, 4AU and 4KU. 4AY has dismantled his station for the winter due to leaving the city. 4EB is reaching out all over the country with his 20 watt C.W. set and handling traffic like a veteran. 4DH is getting his station back in shape again. A C.W. set will be included in his new installation. 4GN and 4FD are still plugging away with their rock crushers, handling traffic and cussing the D M. for not reporting their stuff. (Right here said D.M. wants to say that after this month some changes will be made in district #2) 4EL is doing the best work in this city at present. 4BY's new 500 watt C.W. set is on the air but is not working just right up to the present. He says that both he and 4GL will be going strong by the time this report is out.

SOUTH CAROLINA: This state is coming out of the hole rapidly and is getting lined up for a rushing relay season.



Districts are being laid out and superintendents being appointed. Good stations are getting into the air and some little traffic is passing through every night. 4FQ is still handling traffic on his 5 watt bottle. 4LA is reaching out and working quite a few DX stations of the 8th and 9th districts. New stations are springing up fast and at present the following are in operation and doing good work: 4FE, 4KE, 4KI, 4IB and 4JK. 4JK is doing the best work with his small 20 watt set and has daylight schedules with 4EG of Woodruff and 4FQ. He is pushing the traffic into North Carolina and Georgia; something that has been impossible before.

Mr. G. W. Etheredge, Jr., has been appointed assistant division manager to take his brother's place as Mr. W. C. Etheredge has resigned. Young Etheredge is going after his men and is rapidly getting the state into shape for a real live relay season. He is operating 4EG and is handling most of the traffic in daylight with 4FQ and 4JK.

FLORIDA: A.D M. Harrod has gone to college and C. F. Clark, 4EZ, has been ap-

pointed to serve in his place during his absence. We regret very much that we must lose 4II this winter, and we will welcome his return next spring.

Jacksonville, Fla. is suffering a relapse. All stations are out of operation for various reasons, and immediate prospects are discouraging. 4HZ made a good start with his C.W. set, but blew his tubes and is out until they can be replaced.

4BF has his C.W. set going again and is working PACIFIC COAST STATIONS, although he has been in operation but a few days. 4JY has been having his difficulties. Although he blew two fifty watters, he is not discouraged and is working real DX and handling messages. 4IZ C.W., falied to report but he is heard consistently and is handling messages.

Superintendent Woods, advises no activity and nothing to report. Superintendent Brookwalter reports that activities in his section are lagging, but we believe he is holding out on us. 4DL and 4BC are heard getting through in fine style, but we have no report from them. 4DZ now has a C.W. set in operation, in addition to his reliable spark.

ALABAMA: 5ZAS has not handled any traffic this month as they are rebuilding their station for the winter work. 5DG is ready with a 15 watt C.W. set. On a test with Mobile he was reported QSA there, so should have no difficulty in working the fellows there. 5ZI is ready with 100 watts of C.W. and promises to make things hum. 5CP is starting out with 5 watts. He has the makings of a real amateur and we are looking for good work from him. Due to bad location, 5AX, with his ½ K.W. spark and 5BQ with 20 watts of C.W. have not been able to reach out anywhere. 5ES is the leading station in the state for the month. Both, 5AEK and 5VJ are just opening up with small C W. stations and look promising from a DX standpoint.

5XA is just opening up a new super station and threatens to lead the whole south in handling traffic this minter. They have six complete transmitting sets both spark and C.W. ranging from 200 watts to 5 K.W. and their receiving system includes 6 different sets. This station will be operated by 9 first class operators and a continuous watch will be held. 5XAE is on the air with 100 watts, operating at present on 275 meters, but no traffic handled yet. This station reports hearing 5XA of Auburn and 5DG of Birmingham consistently. We are glad to hear this and hope that they will have no trouble in working both ways as it has never been done before.

The division manager is glad to report that this month has been the turning point of the summer season. For the first time in three months we have reports from every state in the division nad it is sincerely hoped that the good work will be kept up.

MIDWEST DIVISION
G. S. Turner, Mgr.

All the fellows in the division are to be thanked for getting the reports in on time, and we will forget the past because we have too much to do in thinking of the future. Each state has been divided that the work may be distributed more evenly for the present. At a later date all states in the Midwest Division will be sub-divided into districts by counties, making room for more officers to carry on the League work. Assistant division managers in the Midwest division are as follows: Nebraska, J. G. O'Rourke; Iowa, P. A. Stover; Missouri, C. L. Klenk; Kansas, C. Himoe.

NEBRASKA: Nebraska is divided into a northern district and a southern district by the Platte River.

The following named men have been appointed in Nebraska; District Superintendent South Platte, Paul Palmer, 9NC, 3145 "S" St., Lincoln, Nebr.; route manager, Edwin R. Anderson, 9EW, 308 North 27th Ave., Omaha, Nebr.; Omaha city manager, Porter H. Quimby, 9DXY, Benson Gardens, Omaha, Nebr.; Lincoln city manager, Paul C. Rohwer, 9AYS, 2041 "K" St., Lincoln, Nebr.

Mr. Anderson, the route manager for the district, is busily engaged in re-organizing the old Nebraska short jump relay routes. Many of the old standby stations are in operation and traffic is moving efficiently in practically all directions. 9AYS grabs the first prize for the number of messages handled this month.

Omaha expects to have at least one real station on duty this winter that will be able to handle all traffic that comes its way. 9SC is being combined with 9HT, the station belonging to the assistant division manager. These two fellows have a lot located on the highest point in Omaha and are installing two of the big tubes. They stand a good chance of being the star station in this division this winter.

IOWA: Iowa is divided into an eastern district and a western district by drawing a north and south line through Des Moines.

The following named officers are appointed for the state of Iowa: District superintendent Eastern Iowa, D. I. Bailey, 9CS, 525 Knelworth Ct., Clinton, Iowa.; District superintendent western Iowa, D. R. Watts, 9ARZ, Clear Lake, Iowa; Route Manager, Anthony Paone, 9BSG, 606 S. E. First St., Des Moines, Iowa.

Weather conditions have been favorable and a great increase in traffic was noticed during the past month throughout the state. Stations are again able to work DX

with ease. 9BSG handled the bulk of the traffic. 9BSZ is with us again on C.W. 9BGH, 9BZI and 9AMI are doing some excellent work all on C.W. 9FK seems to be the most reliable station in the Eastern section. We crave action from Davenport. Get out the old Rock Crusher if you can't pick up a C.W. set. Messages pile up for Davenport with no way of getting them there. 9AOU and 9DRA are hitting the ball again after a several weeks lay up for repairs. 9JA has been moved from Marengo to Iowa City and will be going as strong as ever there. 9YA will be on this winter with 200 watt C.W. on 200 meters.

MISSOURI: Missouri has been divided into an eastern district and a western district by drawing a north and a south line through Moberly.

Only two appointments have been made for Missouri due to the fact that an insufficient amount of time has been allowed to properly comb the field. The following appointments have been made: Route manager O. McDaniels, 9YM, 816 Rollins St., Columbia, Mo.; City manager, Leslie Essington, 9BED, St. Louis, Mo.

Sedalia is rapidly coming to the front and should have an A.R.R.L. representative on hand there for duty. Cape Girardeau in the southeastern part of the state is coming fast. It is reported that Slater, Sikeston, Chafee, Marshall and Jackson have good stations and require organization.

Among the more active stations in Missouri are: 9AON, 9BED, 9DZY, 9BMN, 9DJB, and 9RR. A number of the other fellows sent in their message reports but did not handle many. The route manager is working over the old routes and you fellows who desire to get lined up on any of these routes please get in touch with the D.M. Kansas City and St. Louis are still holding their own against the broadcasting stations, thanks to a few good hard boiled DX owls.

KANSAS: Kansas has been divided into a northern and a southern district by drawing an east and west line through Emporia.

The new appointments in this state are as follows: District superintendent southern district, Clifford Rogers, 9ABV, 226 E. 6th St., Hutchinson, Kansas; District Superintendent northern district, Earle Beardmore, 9AEY, Glasco, Kansas; Route manager, Ray Youngmeyer, 9PS, 125 N. Volutsia Ave., Wichita, Kansas.

Many of the last year's sparks are gone for good this year. 9PS has dismantled his sink spark and is using C.W. entirely now. 9DSD, 9DUG and 9ABV, all former sparks, are doing most of their work on C.W. now. 9AEY is working on a 50-watt tube and 9DEF is installing a ten-watt set. 9CCS, 9BHN, 9DUN and 9CFI have all been doing excellent work on low powers. All are C.W. too, which explains it.

Work is being done on the organization of "sure-fire" daylight routes and we are preparing for all special tests now. Our one hope is that all messages on any special tests get as far as Kansas so we can show what we can do. We desire to hear from anyone in the state of Kansas who is interested in our A.R.R.L. Let us all co-operate and make Kansas one of the best states in this Division.

NEW ENGLAND DIVISION
P. F. Robinson, Mgr.

MAINE: This state is not up to its usual standard this month but still manages to keep its head above water and keep the traffic moving. Handy, 1BDI, reports that he will be on the job this winter at the University of Maine with a 100-watt C.W. set and is getting all set for the next Transatlantics. Hilton and McShane have been trying to get their districts going a little better and by cold weather we will see the results of their work in the shape of traffic.

NEW HAMPSHIRE: New Hampshire is dead, or at least no one up there is making any noise to disprove this statement. How cum N. H.?

VERMONT: Vermont is right in New Hampshire's class except that every once in a while 1ARY gets that great big stone crusher going and then— But what's the matter with the reports?

MASSACHUSETTS: This state takes the prize this month in the New England division for the amount of traffic handled and 1BKQ seems to top the list with 20-watts of C W. and 472 messages moved, 1CPN, 1CMK and 1ASF are also pushing the traffic along with their C.W. 1CNI is making an awful disturbance with his spark, being heard in about every district in the country but evidently doesn't handle any traffic; anyway, no report turned in. Any msgs, Reynolds?

RHODE ISLAND: Since the appointment of Fancher, 1BVD, Rhode Island has surely taken a new lease on life, new sparks are opening up and also new C.Ws. By next month we should hear who is who in the DX gang. 1AZW is now in Providence operating the broadcasting at WEAN and pushing the key at 1GV along with Tilley; they are planning on a 100-watt set soon. 1CJN is operating a ½ K.W. spark and should turn in a good account of himself before long. Fancher says he is experimenting with a 5-watt C.W. set for "local work" which marks the passing of another stone-crusher.

CONNECTICUT: Experimenting with antennae must have got 1QP out of the habit of turning in reports but from the R. I. A.D.M. comes the information that

1ACU, one of the standbys of Southern New England, has closed up at Groton, Long Point and gone to Phillips Exeter Academy, Exeter, N. H., for the winter. Maybe we can get him to put N. H. back on the map. Our ears tell us the 1QP is still on the air along with a surprisingly large and continually increasing bunch of C.W. down in Connecticut. Someone musta stucka pin into the gang at 1AW, they're on quite a lot lately. When arya gonna put in C.W. so we can hear you up around Boston with some satisfaction?

Robinson, 1CK, has resigned as Division Manager owing to lack of time to put into the work and our old friend VN, Irving Vermilya, ex-1HAA now 1ZE has taken over the job. Lets all us followers get behind Amateur Number One and make New England the best division in the A.R.R.L.

NORTHWESTERN DIVISION
H. F. Mason, Mgr.

MONTANA: The following change in personnel has been made since last month. 7AGF at Troy, Montana has been appointed Dist. Supt. for Dist. No. 1, succeeding 7VZ, who has left the state. Many stations are opening up, and traffic is passed through this state in fine shape now. 7AFG at Troy is keeping up 7VZ's good work in the northwestern part of the state, and handling things well. The following stations are on the air regularly, and QSR relay traffic, 7ZU, 7ZG, 7AGF, 7QD, and 7HM.

IDAHO: Activities are on the increase with the coming of winter. 7JF and 7WG are keeping the air clear in the northern part of the state, but report no new stations on the air. 7OT, 7YA, 7AEM, and 7LO are making Boise quite a relay center of the northwest. 7YA is using his old spark set temporarily but will have that 200-watts of C.W. on the air soon. 7LN and 7EG are handling traffic in the southern part of the state. The static season being over, the fellows are coming back on the air again, and getting down to business. The ninth district stations are pounding in with their old time intensity, only we miss the sparks. Traffic through Idaho will be handled promptly if routed through one of the above stations.

OREGON: Mr. Royal Mumford, 7ZJ, A.D.M. for Oregon, has resigned owing to the pressure of other business. We are all sorry to lose him as he knows the amateur game well. However, we'll call the gang together soon, and elect a man to fill his place. In the meantime, we can only give a summary of the activities. In Portland, stations doing DX are 7ZB, 7JW, 7ABS, and 7VF. In Eugene, 7MF, 7IW, and 7TW are still doing good work. Summer static has stopped, and receiving conditions are much improved. There seems to be quite a bit of activity throughout the state, but in some parts, there's something lacking. Guess its the spirit. Let everyone operating a transmitter in Oregon think matters over seriously, and when we get the new Asst. Div. Manager appointed, give him your whole-hearted co-operation towards better reports in *QST* and a livelier interest in things in general.

WASHINGTON: Traffic over this state is taking a turn for the better. C.W. is playing an important part. In the Grays Harbor District, D.S. Hemrich reports the following stations on the air and taking traffic, 7NN, 7SC, and 7SF. 7NW has gone to Pullman to college, and expects to pound brass at 7FI this winter. In the Tacoma District, 7AGI, 7AW, 7BG on spark, and 7WM and 7QE on C.W. are doing a little DX. If some stations in this district would give as much attention to LD work, as they do to local chewing, we would walk off with the honors every time.

Conditions in the Seattle District are very much improved this month. QRN has abated somewhat, and a new set of traffic regulations are in force. 7IY has been showing the boys how to get out on a five watt tube, and a number are following his good example. Among them are 7FD, 7ADL, 7TN, 7BS, and 7OO. 7IM started to junk his spark, but changed his mind. 7BK and 7IY are handling the bulk of the traffic. 7OE in Bremerton is reaching out with his C.W. He states that the QRM from the sparks annoys the ops at NPC, so the Bremerton bunch had to resort to C.W. FB. At present there are three stations here. 7RK, 7OE, and 7WS all on C.W. with more going in soon. Considerable traffic is being handled in this district. Mr. Maybee, 7GE, D.S. of District No. 11 has been appointed Acting Dist. Supt. for Dist. No. 10, and states that if there any stations in this district (Kittitas, Yakima, Klickitat and Benton counties) he will make a trip to see them, and help them out in getting amps into their antennae. 7GE has no trouble in working east or south. 7TH at Walla Walla is also doing good work, clearing 7LU consistently.

In general the routes handling most of the relay traffic are as follows: The route east, which starts at the coast from either 7IY or 7BK or other Sound stations, or from 7SC or 7NW in the Grays Harbor Country, or from 7VF, 7JW, 7DP or 7ZB or others in the Portland District. These stations pass traffic to 7GE at Pasco, or 7TH in Walla Walla. 7AGF alternates for some of the traffic from the northern points. These stations usually pass the messages on to either 7ZU, 7ZG or 7LU, who work the ninth district regularly. 7OT at Boise is also handling a considerable portion of the traffic over this route. It is hard to define a route along the coast into California.

Traffic for those parts usually gets to one of a few traffic clearing stations in Vancouver BC, Seattle, Portland, or Eugene, Oregon, and goes direct to a number of sixth district stations, all of whom are very consistent.

Receiving conditions have improved wonderfully thruout the division, and a large number of stations have logged calls from every district. Everyone seems to be letting traffic slide since the advent of this super-DX craze which the C.W. has brought about. However, we predict that before long, the C.W. DX records will be commonplace, and we'll all settle down and push traffic through again.

ONTARIO DIVISION
A. H. K. Russell, Mgr.

Ontario is going to be right along with the rest of the gang in DX relaying this winter if September is any indication of what will come off later. New C.W. stations are heard on the air every night. The Radio Convention held in the early part of the month in Toronto brought out the boys from all over the country and one and all swore they would be on the air this winter to put the Ontario Division on the map.

With the awakened interest in view, and to make the Ontario Division more easily handled, the division manager has concelled the previous layout of stations by districts. There were formerly six Ontario districts, but these have been cut in half and called western, central and eastern Ontario. All of Ontario lying west of the 81st degree of longitude is in the western Ontario district, and all east of the 78th degree, in the eastern district. All Ontario between these two parallels is in the central district. In accordance with the above redistribution of territory, all appointments in the Ontario Division have been cancelled. The western district hereafter will be looked after as district superintendent by H. R. Byerlay, 9BS, Ingersoll, Ontario. The central district will be handled by the division manager. The eastern district will be handled by Orton Donnelly, 3HE, in Kingston. All men looking for appointments as city managers etc., are requested to get in touch at once, with their respective district superintendent.

Western Ontario, when it gets going, is going to be a regular hive of C.W. activity. 3TA, 3ABX, 3HD, 3BS, and 3BV all will be on with C.W. immediately.

In central Ontario the change to C.W. has been practically complete. 3KP, 3ACJ, 3SJ on the Niagara Peninsula are all members of the Niagara District Radio Association affiliated with the A.R.R.L., and all have well working C.W. transmitters. This organization has appointed G. A. Threader, 3KP, their traffic manager, and his assistance will be greatly appreciated by the D.M. He lives in St. Catherines. All men in that district should correspond with him. Across the lake in Toronto and vicinity, what efficiency could not do, the inspector has completed. The cutting down and enforcement of the wave of 175 meters announced for spark transmitters has resulted in the practical elimination of this type of transmitter. 3CO has opened up with 2 Mullard 250 watt tubes and is covering great distances. 3CZ, 3CY, 3GK, 9AW and 9AL all have 50 watters going. 3BP is heard occasionally but his commercial activities take up most of his time. 9BJ will operate 100 watts.

In eastern Ontario things have also taken on a rosier aspect. 3NE and 3HE in Kingston are operating both spark and C.W. 3LU is opening up with a couple of Mullard 250 watters. He has Lowry from Toronto down there helping him. 3IL is erecting a 125 foot mast and putting in a 10 watt C.W. Queens University have a special license 9BT but will likely broadcast only. The most promising feature of Kingston is that they are working on schedule with 2AN and 2AV in Montreal.

PACIFIC DIVISION
J. V. Wise, Mgr.

(Manager Wise has been away from home for the past month and writes us from Lake Tahoe that he will be unable to get in much dope this month. He hopes to be back with the gang sometime in October. —T.M.)

The weather is getting better every night in this Division and we will soon be back on the old winter schedule again. The eastern stuff is beginning to come better. The route east via Denver is still open. Several of the fellows are putting in sink rectifiers now and will double their kick.

6AAK reports no traffic for his district for this month.

As may be seen from the traffic report of messages handled, C.W. has the lead and it looks as if we would soon have the sparks dragging.

ROANOKE DIVISION
W. T. Gravely, Mgr.

Its a sad story mates but we didn't reach that 2500 goal. However, a grand total of 2437 isn't so bad. Make it 3000 next month. Traffic this month is a 500% increase over that of a few months ago. There are a lot of outstanding features in this report and it deserves careful perusal, especially that Porto Rico dope.

Some of the gang have been pining to get in the little box in *QST*. In order that their wish may be gratified to some extent, we hereby inaugurate our own box which will be a regular feature in our report hereafter. High Traffic station both spark and C.W. will be included.

C.W.
Albert Parker, 4EA
340
New Bern, N. C.

Spark
Stealey & Morris, 8BDA
224
Parkersburg, W. Va.

WEST VIRGINIA: A.D.M. Heck reports great awakening of activity and interest in his state. Although lagging a little in recent reports, it has come forward with a rush this month and eclipsed Virginia and is running North Carolina a close second. 8CHO for several reasons has not been able to handle any traffic this month but he keeps a close watch on the activities of his stations.

First District: D.S. Jones, 8SP, turns in a fine report for his district. 8AFD is heavy man in this district. He is on practically every night and worked 194 stations last month and only using 15 watts. FB. 8BPU and 8AUE are both reaching out and helping make this district a reliable traffic point. 8SP has been working only in jerks but managed to get off 56, including message to Hawaii from 1AW. Watch out for 8AQV with 100 watts and 8AUE with 10 watts, coming up.

Second District: No report from this district. Only one station in it, that of the D.S. Liller of Keyser. We understand he has been on the move which accounts for his inactivity.

Third, Fourth and Fifth Districts: No special report of activities in these districts. Each of the D.S.'s got off some traffic as report shows. Stalnaker at 8CAY 12, Murrill 8AMD fine work with 148. In the Sixth 8BDB and 8BKE to old reliable contributed to the quota. (We wish 8BDB wasn't so hard to send, we might work him more often.) 8BKE is on the air often and handles traffic in snappy style. 8CQH at Huntington is opening up with 50 watter.

A word in passing; your D.M. has heard several comments on the snappy way traffic moves through your division. Keep it up.

Sixth District: Here is where the sparks shine. Our "super" spark 8BDA throws a scare in the C.W. camp with 224, leading the state by a safe margin, using a 1 k.w. coffin, and has worked 5ZA QSA vy. "Watch our Dust!" is their slogan. 8IC, another spark, turns in 3.

VIRGINIA: What's the matter fellows? Everyone sort of slacked off this month. With a little more activity here we would have gotten that 2500. However, with 3IW back with us, believe we can regain our place in the sun. A.D.M. Wohlford requests a little more promptness in turning in reports and that they be itemized more fully.

First District: Only a few stations are working in this district, yet they handled the bulk of the state's traffic. 3MK is a regular "boiled owl" and uses that 100 watts to shove through 212. He is an old timer who knows how to get the stuff through. F.B., OM. 3ZZ is testing out the 500 watt outfit but hasn't yet struck its stride. 3ACK on spark has handled 21. 3ACZ is moving out of state. 3ATZ and 3BVC have finished their overhauling and are with us once again.

Second District: Say, OM, get that report in earlier and make it more detailed. 3TJ contributed 70 this time which is FB. Petersburg is right with us again, 3AUU 23; and 3BMN 8. 3AUU is working Danville, 150 miles, in daylight regularly.

Third District: 3AJG has a fifty watter on the way but is now using two fives until the big set is completed. He is a newcomer to our traffic report but will be a big help. 3BVL, is breaking through in good shape and handling more and more traffic every month. 3MO has not yet gotten up his sticks and is usnig the chimney as a support with the aerial only 8 ft. off roof. Daylight schedules are being maintained regularly with Norfolk stations. 3BIJ is adding another fifty and will be back strong next month.

Fourth District: 3BLF is the only station here. He has just completed an 82' mast and other improvements and will resume his old place in the traffic report.

Fifth District: D.S., Lewis, 3IW, has been off on a Naval cruise and is sorely missed in this month's traffic report, but we are happy to say he will be with us again with both feet foremost next month.

Sixth District: No report. Understand D.S. Bradley is off on a visit.

Seventh District: 3ZX shot a condenser on his spark and is out until he can make repairs. Use C.W. OM, and forget about it. D.S. Key, 3ZAA, has finished his C.W. outfit and will be on soon. He hopes to get stations at Staunton lined up and would like to hear from those interested.

Eighth District: Owens of 3APR at South Boston is now D.S. for this district. He is doing some remarkable work considering the difficulties he has to encounter. He maintains a daylight schedule with 3CA at Roanoke and 3BZ and 3AEV at Danville and is getting some good DX besides. 3BZ and 3AEV at Danville are warming up now and will try and hold down this section of the state. 3BZ is being heard far and wide but other affairs prevent him from working at the set more.

Ninth District: 3RF is back in the game and should be heard soon. 3BHS at Salem is installing C.W. and will be with the gang soon we hope. 3CA is doing the majority of the traffic work in this district.

Tenth District: No report.

NORTH CAROLINA: Just thought we would save the best for the last fellows. The old north state is THERE. We have

got to hand it to you. Over a thousand messages in this state alone! We believe that there is more activity along relay lines in this state than any other in the union. If you don't believe it, read the following:

First District: This district now has a whole string of good ones, 4DC, 4GX, 4LJ, 4NV, 4EN all going strong. Much daylight work is being done and good distances covered. About 25 messages go through this district every Sunday afternoon. In fact, through the entire division a great deal of Sunday daylight work is carried on.

Second District: That Asheville bunch never falls down. Always on the job with a big report. Here's a district where the A.R.R.L. spirit runs high. The old reliables, 4GH, 4DS, 4LP and 4KC are keeping up the good work with 4MW temporarily out of the running, due to transformer troubles. Asheville and vicinity is always a reliable relay point and the good station of that district will keep it so.

Third District: D.S. Robertson reports that nothing can be gotten out of the Charlotte bunch but that he is in hopes that some one will come forward and help out the relay situation there. Charlotte is a horrible example of what broadcasting will do to a town. His own station 4ID has been fairly active and 18 messages have been handled. 4CQ is also heard from with 6.

Fourth District: Oh Boy! listen to this. Over 800 messages handled in this district alone. Surely no division manager could want two better workers than 4EA and 4BX or two more promising ones than 4FT or 4NT. 4FT is working on regular schedule with Porto Rico and handled 8 messages with station 4OI on that island. This is the best piece of individual work done in the division for some time. 4FT by the way, has been reassigned to Donald Parsley, of Wilmington, N. C. and is not located in Atlanta, Ga. 4BX and 4EA have both worked 4OI. All three stations deserve the greatest credit possible for this fine work.

NOTICE: ALL TRAFFIC FOR PORTO RICO SHOULD BE HEADED INTO THE ROANOKE DIVISION WHERE IT WILL BE QSR'ED TO 4FT, 4BX OR 4EA AND PROMPTLY PASSED ON TO 4OI. We claim to be the first division in the country to organize and work a traffic route to Porto Rico and the three stations mentioned above did it. (Wake up East Gulf!) 4NT rolled up 27 this month. FB. OM. D.S. Donahue, 4MF, is still operating spark and handled 10. He is changing over to C.W. Watch the traffic grow. Congrats on your district, OM. (Correction: We said your name was Haiiant in our last report. Our mistake, OM, we know now it is Hinnant, but what's a name among hams. Get a call.—T.M.)

Fellows, we don't know where this Roanoke Division will stop. We have got them all taking notice and well they might. Keep up the same spirit and go to it. We just can't express our joy at the fine work being done.

ROCKY MOUNTAIN DIVISION
N. R. Hood, Mgr.

COLORADO: The Reynolds Radio Company of Denver started handling A.R.R.L. tramc. In a period of five days they put thirty messages through and the nightly total is growing.

J. F. Carpenter, formerly of Minneapolis, Minn., has become associated with 9ZAF and is now city manager of Denver. Mr. Carpenter needs no introduction to *QST* readers as he will be remembered as the hero of the storm routes up in the Twin Cities last spring.

It sure sounds good to listen to oceans of C.W. sigs, and lots of I.C.W. stations pounding in with winter intensity. The sparks are there also, but seem to be fewer in number. 9AMB is using one five watt tube for transmitting and he reports that he is getting 2.8 amps antenna current.

The radio club activities have taken a big jump and the entire radio game is rapidly smoothing out. There still exists a need in the phone proposition that will soon become more regulated. Due to that fact not much traffic can be moved through Denver until at least 10:00 P.M.

WYOMING: Wyoming shows a pick up of traffic work along with the rest of the states in the division. Take note of what 7LU has done in traffic handling. 206 messages all on C.W. of 15 watts. 7LU has had two operators on and the station has been on the air consistently. That shows what can be done when we stick by the ship. 7DH has a 10 watt set just about completed and with his spark set, has kept his station on the air. 7AFW using a 5 watt bottle has been heard consistently over a 900 mile radius. He is district superintendent for district #1 of Wyoming. 7ZV has a dinger of a regenerative set made and C.W. sigs pound in. His 20 watts on C.W. with a big "T" aerial will be heard as far as his old spark set, which was one of the best in this country. 7GK is back at Laramie now and we may expect something from the Wyoming U. soon, as radio activities there have started with the fall term of school. 7ZO has a new Reinartz and sigs from the coast to Ohio are QSA. One thing that makes us feel good is that QRN is rapidly on the decline and the nights are practically clear now. More 6th district stations are being heard now and west bound traffic is moving through quite nicely. With a western outlet open we now have outlets in all directions.

UTAH: 6AWH is back on the air with a wicked ¼ K.W. spark set that seems to

shatter the C.W. records we hear so much about. 6AWH has a wonder spark set and nightly covers great distances. 6BOE is another wonder C.W. station in this state. With one 50 watter he pushes 5-T.C. amps. up the lead-in. He is vy QSA all over this division. District #2, has made things move as far as traffic is concerned. It sure looks good to see some of the old A.R.R.L. pep getting back in the state and to see the traffic reports jumping. We have a great many very interesting things to happen this winter which will be the banner year for Utah. 6ATQ, 6ARU, 6ATH and 6BKE did not get a full start but are out for blood now. 6BGH, 6ARU and the Snow Normal School are on with ten watts each and 6ATH and 6ATQ have 5 watters each. 6ATQ has done some wonderful work with his five watts as have the rest of them, being reported QSA in San Diego, Calif. and reliable communication has been carried on with 9BS. Harold Chirstensen, 6ARU, has been appointed city manager for Provo, and Glen Quillman, 6AEZ, has been appointed city manager for Ogden.

VANCOUVER DIVISION
J. T. North, Mgr.

Traffic has been light, but most encouraging reports are coming in from all sections of the division regarding the preparations that are being made for the winter season. Alberta has brought forth two promising stations. 9AC at Calgary, Alta., and 4DQ at Vulcan. Both are working out fine with C.W. sets.

VANCOUVER: The stations handling traffic in this district during the past month are: 5CN, 5DO, 5CD, 3EC, 5DK and 9BD, all on spark. On C.W. 5BQ is the only one on consistently, but 5BR worked south for a short time with 5 watts. 5CN has just got going again on spark but his C.W. is still in the making. 9BD handles traffic with 4BV Loreburn, Sask., regularly and also with 9AC Calgary on schedule and has no trouble working them, as well as dozens of southern stations. There will be a great deal doing in this division in the months following as there are a great many new stations under way.

DUNCAN: Superintendent, 5CT is going fine on low power C.W. and will be doubling his power soon.

PRINCE RUPERT: No report in from Supt. Barnsley, but 5CX on C.W. has just been heard in Vancouver so we should soon be QSO with P.R. and Alaska.

VICTORIA: No appointments have been made here as yet, but 5DX is getting around to 7's on his spark, and is QSO Vancouver. We would like to hear a few more Victoria stations as there are plenty of "nearly good" transmitters over there that should be improved.

In the Province of Alberta, 4DQ, C.W., has been reaching out of late and can QSR east and south. 9AC in Calgary is doing good work with a 100 watt set. Alberta amateurs who are willing to take a part in A.R.R.L. work, QSL to the new division manager, 5AK, at Vancouver, and give him a description of your outfit. 9BD will continue to operate all through the winter but the D.M.'s new QRA will be Seattle, where the 7's hold the ether.

5CZ Vancouver, is the new assistant division manager for B.C. and 5CN is city manager for Vancouver. The new crew should keep things moving in relay lines and the "Gang" should give them all the support possible.

WEST GULF DIVISION
F. M. Corlett, Mgr.

There seems to be some misunderstanding about MEMBER STATIONS reporting traffic handled regardless of whether they are OFFICIAL RELAY STATIONS or not. Why certainly, all A.R.R.L. stations are to report the activities of their stations each month. By reporting to your district superintendent he will be in a position to know what you are really doing and if you deserve an OFFICIAL RELAY STATION APPOINTMENT or not. The idea is, all stations that are handling relay traffic will be issued OFFICIAL APPOINTMENTS and eventually it will work out to where only the OFFICIAL RELAY STATIONS will be the ones reporting each month, unless it is some new member station just opening up. Occasionally, district superintendents will include in their reports, reports of non-member stations or stations who have allowed their membership to expire and of course there is nothing for the division manager to do except "blue pencil" these reports.

NEW MEXICO: Traffic is going through OK to the west. No appointments have been made as yet, so applications should be made to assistant division manager, Louis Falconi, Box 421, Roswell, New Mexico, or get in touch with him by radio, 5ZA.

SOUTHERN TEXAS: Summer is gone, and each night seems to be better than the one just passed for relay work. The stations that are operating, no matter where, are all being received in South Texas by the more selective and more up to date instruments which are now in use by practically every old time amateur. And have you too noticed that 10 watt DX comes through with much the same signal strength as the 50 and 250-watt bottles do. East Texas district superintendent Harvey C. Sundstrom, 1716 Lubbock, is still sending out his plea for correspondence with those interested in transmitting in the relay game. Houston has been well represented by 5AE and 5BA during the past month, who are among the few who opened

the season with completed instruments. 5XV was not so good this month. 5IM at Galveston is holding down the island with an efficient C.W. set. Central Texas has the same complaint of lack of stations operating. Dist. superintendent E. A. Sahm, at New Braunfels, is the proper one to correspond with regarding relay station appointments. 5RA deserves special credit for his persistency and good work west this month. District superintendent L. D. Wall, 216 Pereida St., San Antonio, writes that everything is still in his district this month but if building is any indication, next month's report will be startling. 5ADI of the San Benito Radio Club, located way down in the valley, is practically ready to open up, and will be our farthest south station. Far west Texas with El Paso as the center receives no representation this month because of their failure to answer correspondence regarding appointments. Please bear in mind that as individuals you should correspond with your district superintendent, and the district superintendents should correspond with the assistant division manager of your section. This would eliminate the much too heavy correspondence the division manager and the assistant division manager are burdened with.

NORTHERN TEXAS: Mr. J. R. Martin, 517 12th St., Wichita Falls, Texas, has accepted the appointment of district superintendent of district #3 which includes the following counties: Hardeman, Foard, Knox, Haskell, Jones, Shackelford, Throckmorton, Baylor, Wilharger, Wichuta, Archer, Young, Stephens, Palopinto, Jack, Clay, Montague, Wise and Parker. All men in these counties please let Mr. Martin hear from you.

District superintendent West, has just returned from a big trip and says that everything is now set for a good season. He is now designing a 100 watt C.W. set. At present Mr. West is operating with Mr. Homver Carr station 5TU. 5TU has no trouble getting messages east and west via 5ZL and 5JB.

5AL has decided that two can live as cheap as one so he has an O.W. for a partner but some how traffic has fallen off this last month. 5DI has a new C.W. station and has done some real DX. 5QI has replaced his old spark with 10 watt C.W. and has worked every district since he started. There will be a 5 watt C.W. at 5PJ which will be operated by the O.W. of the Ft. Worth City Manager, Mr. Garrett. The O.W. at 5PJ will be glad to QSR regularly 10 to 11 P.M. any day. Mrs. Garrett is conducting a class in radio at the Brantley-Draughon College and has turned out several who are doing DX work over the state.

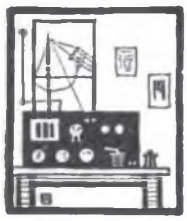
District superintendent Martin reports an increase in activities in his territory. C.W. signals on amateur waves are increasing and sixth district stations are becoming readable through the atmospherics. Relay routes are under construction in the west part of district 5 and the east part of district 6. 5IF now 5ZH has been licensed to work 375 meters along with 100 watts of C.W. 5ZAW is installing 10 watts of C.W. 5VA is installing spark to work along with his 10 watt C.W. (!)

OKLAHOMA: Tulsa now has two dependable A.R.R.L. stations. 5SR has just completed a 20 watt C.W. and I.C.W. using A.C. 5WX has completed a 20 watter using a self-rectifying circuit. Many broadcast listeners of that section have begun to turn and are sending in for licenses, which indicates that some good relay stations may open up soon.

Well! Well! Oklahoma City now has a sure enough O.W.! Can copy about 10 per and learning fast which sounds like business. Of course you are wondering who she is but just to be contrary we are going to keep it a secret for the time being anyway, however, watch you step when working 5ZAT, for the Mrs. may be at the key!

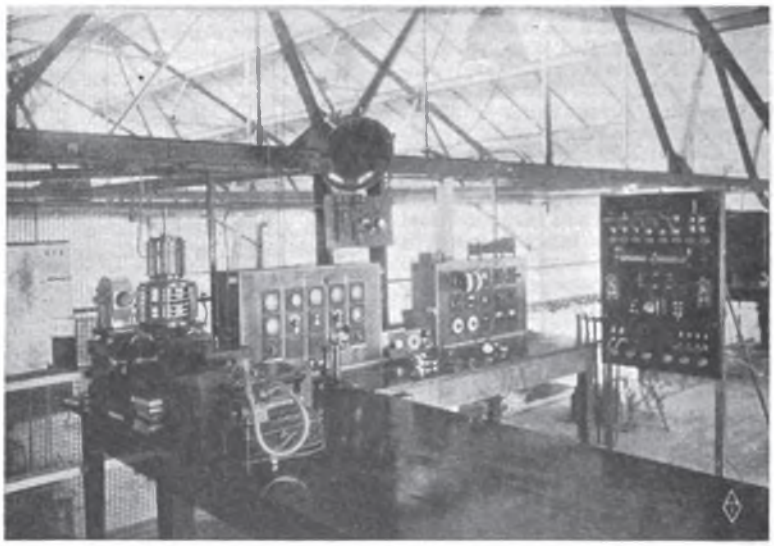
Just seems as if we can't get anybody lined up in the northern part of the state. 5ZZ of Blackwell will not be in operation this winter due to Schonwald being in school. 5ZQ is also away in school and his station will be silent. 5LO has turned toward the commercial game which eliminates another good traffic station. 5PU manages to keep going but latest reports indicate that he will not be on more than three nights per week. 5ZM has been very consistent during the past summer and should be in a position to do some good relay work this season. 5ZAT's 140 foot self-supporting steel mast looks like business to us. This gives Okla City two amateur masts each of which is more than 120 feet in height. 5ZAV is the other "lucky bird." 5XT and 5ZG have arranged a daylight schedule and traffic will be handled. 5ZM will probably be included in this schedule and we predict splendid results. During the summer 5RJ of Sapulpa operated a 10 watter and got out in fine style. 5BM and others are getting lined up for some real work. "BM" reports that his 50 watt set will be going soon after moving to his new location and everything in general rebuilt. Not much activity going on in our southeast and southwest districts. 5DS will be heard before long as a new C.W. is about completed. We have 5TJ, 5HA, 5VM, 5ABB and 5ZG who will be heard during this season. 5ZG will work on daylight schedules almost entirely at which traffic will be handled on fone. 5QH is completely dismantled and may not work any more. 5LB is putting in a fone set. 5MP and 5ADQ are installing 100-watts sets which makes us want to cast a tear for the

(Continued on page 64)



Amateur Radio Stations

9XAQ, Boulder, Colo.

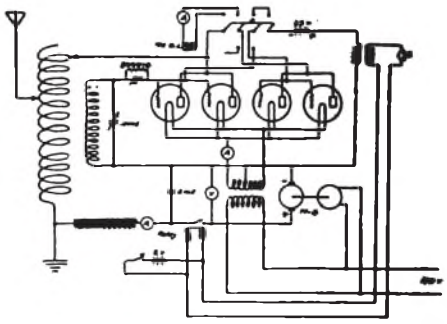


9XAQ is the station of the Electrical Engineering Dept. of the University of Colorado at Boulder, Colorado. Much attention has been given to the most efficient arrangement of apparatus in the station.

The receiving aerial is 300-ft. long, 160-ft. high at one end and 50-ft. high at the other. The transmitting aerial is a 6-wire inverted L directive west, 100-ft. long and 50-ft. high. Ground connection is made to the steel frame of the building in which the operating room is located.

The receiving set consists of a three-coil honeycomb set on unit panels, with one step of audio amplification. Single-layer coils are used for short waves. Several other experimental receiving sets are available, but the honeycomb set is used for regular work and has given complete satisfaction. Brandes, Federal and Baldwin phones are used.

The spark transmitter is used only for emergency work, though it has some good records to its credit. It consists of a Clapp-Eastham 40,000-volt 1 K.W. transformer, Clapp-Eastham condenser, 10-point Benwood gap, and a "bird cage" O.T. The spark has been heard in 23 states.

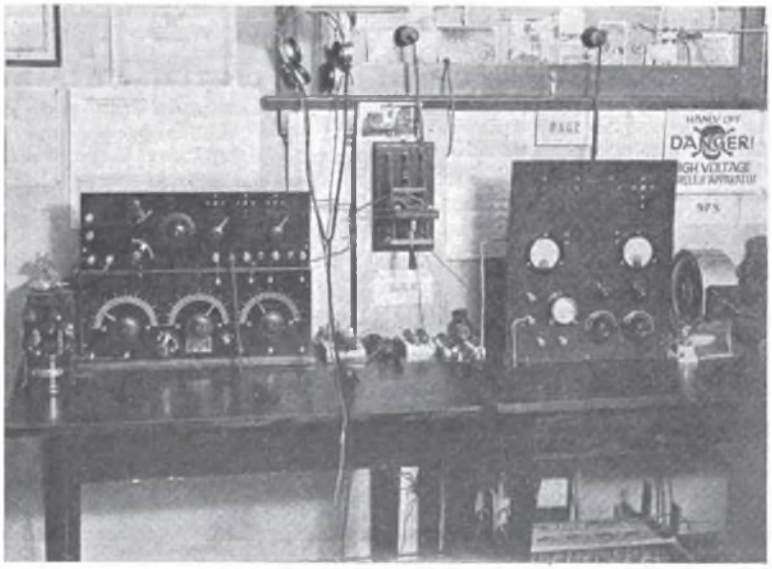


The 20-watt C.W. set, superseding the spark, uses four Western Electric "E" tubes in the 1DH circuit. For phone, two

tubes are used as oscillators and two as modulators in the Heising constant-current system. The antenna-plate inductance consists of 40 turns of No. 12 wire on a 4-inch tube, and the grid coil of 14 turns of No. 20 shunted by a .0005-mfd. variable condenser. The grid condenser is of the same capacity and is shunted by an 8000-ohm grid leak. A Federal anti-capacity switch serves to change from C.W. to phone, as shown in the diagram. Keying is accomplished by breaking the positive high-voltage lead by means of a relay. The Federal microphone is connected in the circuit only when the key is down, thus making it impossible for the operator to leave the station with the battery in circuit with the microphone. The high voltage is furnished by a 600-volt motor-generator set which was wound by the Vocational department. Due to the large number of commutator segments, the oscillograms obtained from the D.C. supply are very good and no hum is noticeable on phone at a distance of 25 miles.

The switchboard on the right handles all the controls with a minimum of time and effort, and with flexibility enough to serve the laboratory for the radio courses taught. This board contains the switches for the 110 and 220-volt A.C. and 110-volt D.C. lines, the generator field rheostat, the battery charging switch and ampere-hour meter, the C.W. and spark relays, and the starting switches for the C.W. and spark, as well as the lines from the other electrical laboratories in the building. Each relay is ingeniously made by bending the lever of a telegraph key so it hangs over a telegraph sounder and substituting the armature of the sounder for the knob of the key. The station equipment also includes a Dictaphone which has been the basis of many interesting experiments. Not only is broadcasted music "canned" but the unlicensed Ford coil in the next block is shown what an awful racket he kicks up. (This ought to be a regular feature at radio club meetings.—Ed.)

The results obtained with this low-powered transmitter have been remarkable. The C.W. has been heard in Alaska and the Canal Zone, and in 34 states, as far east as Orono, Maine, and Washington, D.C. Traffic has been handled with Can. 4CB, 7ZJ, 6XAD, 5XU, 4FT, 8VY, and 8AGZ. On 275 meters the antenna current is 5.5 amperes on C.W. and 3.0 on phone. On phone, traffic has been handled with 7YA, Can. 4CB, 5XU, 6ZA, and 9WQ. The best DX on phone was to 9WQ at Carthage, Ill., on which occasion phone was used at both stations. The above results were obtained with normal plate current and plate voltage of 550 volts. A 200-watt set will be in operation for this season. The operators at 9XAQ last year were Robert Owen (RO), Wallace Cassell (WC), and Herbert Anderson (HA), pre-war 1DK.



6AWP, Santa Ana, Cal.

6AWP is owned and operated by Everett W. Thatcher, known on the air last year as 8GX. The station is located at 407 W. First St., Santa Ana, California.

The antenna system at 6AWP consists of a four-strand inverted L type aerial

with wires spaced four feet apart. A mast 75 feet in height supports one end and a 50-footer the other end. The lead-in is brought down in the form of an 8-inch cage A counterpoise duplicating the antenna and directly underneath has been found to be much better than the usual earth ground.

The C.W. transmitter, which is used entirely at present, consists of two five-watt tubes, both as oscillators in a modified Hartley circuit. High voltage is obtained thru an Acme 200-watt transformer and the popular lead and aluminum electrolytic rectifier using a saturated solution of borax. Ten such jars are used (as shown in the photo) and no trouble has been experienced from overheating or crystalization. This system delivers about 500-volts which is filtered by two 1-mfd. condensers connected on each side of an Acme single-coil choke. When the tubes are oscillating at maximum efficiency the plate current is 95 to 100-milliamperes and the antenna current 1.7 amperes on 200 meters.

The receiver is a Z-Nith Regenerator with a two-stage audio frequency amplifier and Western Electric phones.

6AWP has been frequently heard over 2000 miles. Reports have been received from Cleveland, Ohio; Key West, Fla.; Yukatat, Alaska; and Wailuku, T.H. Consistent work is carried on with stations up to 1500 miles distant and thru schedules a great many messages have been handled during the past season.

8VY, Kalamazoo, Mich,

Station 8VY, belonging to F. M. Louwaert and F. N. Wright, is located at 1227 N. Burdick St., Kalamazoo, Mich., and is well known to a large number of amateurs. The C. W. signals of 8VY have been reported QSA in every district, on both coasts, Canada, Alaska, and ships at sea.

Believing that 10-watts didn't make quite enough noise, 8VY joined forces with 8CJU and together they put in a 50-watt bottle with high hopes of adding another soon. Almost everything else in the set has been made by the owners. Separate transformers are used for the filament and plate circuits, the plate transformer delivering 1100 volts. The rectifier is composed of twenty jars with aluminum and lead plates and "twenty-mule-team" borax giving lots of "kick" to the signals. The full allotment of necessary meters of Jewell manufacture are also included in the transmitter.

The antenna is a four-wire cage hung over an eight-wire counterpoise, and used for both transmitting and receiving.

The receiving set is of standard short-wave regenerative design but with spider-web coils substituted for the vario-coupler. Stations from all parts of the country have been heard.

As proof of the good DX this station has been doing, during the last operating season 1595 cards reporting the signals of 8VY have been received, 531 stations worked, and a large quantity of relay traffic handled.

THE OPERATING DEPARTMENT

(Continued from page 61)

"old spks" but only goes to prove that everybody flops for C.W. sooner or later.

WINNIPEG DIVISION
J. A. Gjelhaug, Mgr.

J. E. Maynard has been appointed assistant division manager for Saskatchewan and 4BV has been appointed district superintendent in his place. 4BV is reaching out in great shape, he claims he has been heard in Hawaii, thus reaching the ambition of most of the amateurs up here. 4BV says he will take traffic for Alberta as he works 9AC regularly. It looks as if we have a substantial and dependable route to the coast for this winter. 4CB or 4BV, 9AC, 9BD. 4AO of Moose Jaw is working on a small C.W. set. An amateur radio convention will be held in Saskatchewan on Thanksgiving Day. 4GB is beginning to do relaying and will only oe going week-end nights. 4FN of Saskatoon will be open for relay traffic this winter. 4CP will be going on ½ k.w. spark. The Saskatoon Radio Club will have C.W. and phone this winter and will handle relay traffic. Many others in cities to the east are building sets for the winter, and it only remains for the Manotoba district to complete connections to

(Concluded on page 65)

The following societies were affiliated with the A.R.R.L. September 15th: North Jersey Radio Association, Newark, N J. (President, W. C. Cooper; Secretary, Chas. E. Huffman). Central Florida Radio Club, Winter Park, Fla. (President, C. J. Holdorf; Secretary, H. E. Cole). Sharon Radio Club, Sharon, Mass, (President, John P. Olson; Secretary, Donald Hewin).

Waukesha Radio Amateur Club

New officers for the W.R.A C. were elected September 20th as follows: Walter Fitting, president; Robert Lathrop, vice-president; Robert Golding, secretary; Newton Willis, treasurer and Wm. Cronch, Sgt. at Arms. Meetings are being held every Wednesday at which time interesting lectures are given. The club operates station 9BDD.

The following local traffic regulations have been adopted by the club:

7:00 A.M. to 4:30 P.M.—free air
12:15 P.M. to 1:30 P.M.—QRX for WHA
4:30 P.M. to 7:00 P.M.—Local work
7:00 P.M. to 8:55 P.M.—Reception only
8:55 P.M. to 9:10 P.M.—QRX for NAA
9:10 P.M. to 7:00 A.M.—DX traffic

Des Moines Radio Association

The Radio Log is the official organ of the D M R.A. and contains news of interest to its members. It's a snappy little paper and it should keep the club treasury well above water.

Philadelphia Amateur Radio Association

The P.A R.A held its first meeting of the fall on Thursday, September 21, 1922, at 1521 Columbia Avenue, which will be the permanent quarters in the future. The association was reorganized and new officers were elected, also a new constitution was adopted. The Board of Governors was elected as follows: L. M. Knoll, chairman; R Kantrow, C G. Benzing. H Blacker. J. Mooney, E. V. Eckert and J. Rau. The following officers were elected: L M. Knoll, president; J. S. Marsh vice-president: W. B. Martin, secretary: H C Brooks, treasurer; and J. W. Forsyth, correspondence secretary.

A very good plan for helping the amateurs to keep out of trouble from interfering with the broadcasting stations was suggested and all members agreed to help this plan along by making it a section of the constitution of the association. Plans were laid for a very active amateur winter in Philadelphia.

The P.A.R A. would like to suggest to all persons, before making a complaint to government officials about interference from Philadelphia amateurs, to send in the complaint, backed by proof, to the Philadelphia Amateur Radio Association who will take up the complaint with the accused amateur. This will avoid many mistakes and trouble for all hands.

The association has changed its meeting dates to the first and third Thursdays of each month.

Harrisburg Radio Club

The H.R.A. has adopted the following traffic rules:

1. In order to give due consideration to the man who listens only to the radio telephone broadcasts, all amateurs operating transmitters will refrain from using same during a period from 7:30 P.M. until 10:00 P.M.
2. Licensed spark, C.W., or fone sets will have the air from 10:00 P.M. to 10:15 P.M. These stations will be arranged alphabetically by the Harrisburg Radio Club and the said transmitters will QST the number of messages they have to transmit. This is for the purpose of having them lined up on the evening's relays.
3. The period from 10:15 P.M. to 10:45 P.M. is for all spark coils only. During this time no rock crusher, C.W., or fone will answer if called. This is to give the spark coils the time to work each other without interference.
4. The period from 10:45 P.M. to 2:00 A.M. will be for the high powered stations only. Spark coils will absolutely stop sending at this time unless said coil wishes to talk with a high powered station.
5. The period from 2:00 A.M. until the succeeding afternoon at 4:00 P.M. will be turned over to every transmitter; in other words, free air.
6. From 4:00 P.M. until 6:00 P.M. the spark coils will be given an opportunity for local work (refer to article No. 3).
7. From 6:00 P.M. until 7:30 P.M. will be for high powered stations who wish to transmit to local amateurs, or any other work.

8. This shall apply for Sunday as well as week days.

Dakota Division A.R.R.L. Convention

The first Dakota Division Convention was held at Minneapolis on September 7th and 8th. The first day was devoted to registration at the Headquarters at the West Hotel, with a tour of the local stations in the afternoon. Business and technical sessions took place at the Engineering Building of the University of Minnesota. The following are the papers read during the several sessions.

Radio Frequency Amplification—D. C. Wallace, 9DR
Data on C.W. Operation—A. P. Upton, U. of M.
Transformer Design for C.W.—Prof. M. E. Todd, U. of M.
A.C. Rectification for C.W.—H. R. Skifter, 9YAJ

The convention closed with a banquet on the night of September 8th.

Milwaukee Amateurs' Radio Club

The M.A.R.C., constituting the local section of the A.R.R.L., has resumed its activities after the summer lull. The annual election of members to the Board of Direction has been held and C. N. Crapo, District Superintendent, elected chairman, assisted by six other able amateurs. The Board appointed as officers: H. E. Wareing, president; E. T. Howell, vice-president; H. G. Fawcett, secretary; and various committee chairmen.

The first lecture of the season was entitled, "The Vacuum Tube as a Radio Detector and Amplifier," and was given by E. R. Stoekle, Ph D, Instructor in Radio, University of Wisconsin.

Technical Publication, Relay, Interference, and Membership committees will each be responsible for certain meetings of the month.

This organization has been in existence since January, 1917, and meetings are held in the Milwaukee Public Museum, Trustees' Room, at 7:30 every Thursday evening. A perpetual invitation is extended to the public.

Greenpoint Radio Assn.

The Greenpoint Radio Association has again opened for the season and plans are being made to obtain local quarters for the club where the DeForest receiving set can be installed. The club is being reorganized and a drive for members instituted. Membership is open to all who wish to have a broader knowledge of radio. Anyone may call any Friday evening at 79 Eagle St., or write to Sec. H. W. Gerlach, 113 Oak St., Brooklyn, N. Y. All communications will receive prompt attention.

THE ROANOKE

(Concluded from page 45)

is criss-crossed by a maze of daylight communication routes, and every noon and all day Sundays the air is busy. Such an injection of the ol' A.R.R.L. pep hasn't been witnessed in many a day. Brother Gravely's boys have simply decided that they were going to make a name for themselves and they have got busy, built the stations, operated them, and have succeeded. Gentlemen of the Roanoke, to-day you lead the country, and we will say this: there's nothing we would so much like to do as to saw off from this job for a few months and move right down in your division and handle traffic with you. You are the kind of fellows we like to know.

Mr. Gravely, we congratulate you and your able assistants, sir. You have added a page to A.R.R.L. history.

K.B.W.

THE OPERATING DEPARTMENT

(Concluded from page 64)

Ontario. Let's have an All-Canada-Relay-Route this winter.

4CE has now been appointed assistant division manager for Manitoba and 4BG still holds the job as district superintendent. With these two "live-wires" at the wheel and the rest of the gang doing their best, we look for some good reports from there. A coast to coast All-Canada-Relay-Route is what we are after boys, and when we all put our shoulder to the wheel we can make her go.

No messages have been handled through 4EZ this month mostly due to the short transmitting range of the present spark set which is used at this station. Good work has been done though, through the summer months, as regular service has been kept up with 4DO, Straithclair, Manitoba, a distance of 150 miles, using only three Ford spark coils for transmission, all day time work. 4EZ will open a reliable route from 4CB and 4BV east to Winnipeg. Prompt service is expected to be rendered from 4EZ this winter when the tube set is in operation, as there are four brothers in charge who are all capable of handling the code up to thirty words per.

In the August columns of this department mention was made of the appointment of Sheldon G. Hagen as Amateur Deputy Radio Inspector, to supervise amateur activities in Seattle and vicinity. This report was abstracted from the columns of a Seattle newspaper, but Radio Inspector O. R. Redfern has requested that we deny it, explaining that no such appointments have been made nor can be made until the Department of Commerce, which is now considering the matter, issues the proper authority to the Inspectors. We regret our inaccuracy.

It is with deep regret that we learn of the death of Glenn Phillips, 2BJF, on August 9th. He was only nineteen years of age and built and operated 2BRB, one of the best 2nd district stations with his friend Edward Glaser. Phillips had a reputation as not fearing any kind of "juice," being able to hang onto a 1000-volt line like it was only 110. His death came about thru a peculiar accident. While in bathing a high speed motor boat got out of control and Phillips was struck by the propeller, being severely injured He was rushed to the hospital and everything done to save his life but blood poisoning set in and he passed on. CUL, 2BJF.

Wonder if 4GL realizes what he is responsible for. Some nights we hear more fast and rotten sending in ten minutes than we used to hear in a full evening before the war.

In the radio-frequency amplification circuits shown in the leading article in September *QST*, results can be improved by connecting a small fixed mica bypassing condenser (about .0005 mfd.) between the arm of the stabilizing potentiometer and one side of the "A" battery.

With the adjournment of Congress, consideration of the radio bills now pending goes over until Congress convenes again in December.

The Department of Commerce announces the preparation of new lists of radio stations. A list of commercial and government stations, including broadcasting stations, complete to June 30th, will be ready about Oct. 30th, and the amateur list about the same time or a few weeks later. X, Y, and Z stations will be in both publications. The price of the lists is 15 cents each (stamps not accepted), and the address is the Superintendent of Documents, Government Printing Office, Washington, D. C.

The T. M. had a Boiled Owl Party on Saturday night, Sept. 30th, and it was a big success. Starting at 10:30 P M the gang came on with a bang and honestly it was like old times. We completely forgot that there was such a thing as broadcasts to worry us and everybody had a lot of fun. The traffic total was surely boosted that night.

At 1AW the T.M. and Ye Ed carried on with "HP" and saw the sun considerably "over the hill" whereupon Y. E. flopped into the basket but "FS" was still pounding brass at 9:40 A.M. October 1st after about twelve hours of it. Hi! 1AW and 1BGF copied every district that night, and no doubt many others did too. 6KA was QRK at 6 o'clock E.S.T., in full daylight, and 7ZO had been heard all night. (Did you notice that both are C.W.?)

9ZN has I.C.W.! Whodathunkit? Recently ZN's new set has been tearing up the ether along both coasts in good fashion, altho it is reported poorer than the spark in the states adjoining Illinois The set is a 500-watter, with 600 cycles on the plate; anterna current on 200 meters, 11 amperes. 9ZN has not abandoned spark and is retaining both the 60-cycle sync and the 500-cycle sparks, which he contends are far preferable for indiscriminate traffic handling. The I.C.W. set will be used only for long-distance schedule work.

Fine business, Matty. You ought to hear it out here. We're only sorry to hear you say that you'll never use straight D C. C.W., because, OM, we honestly believe it would be still better that way.

Common Savings

"How much am I bid for my spark set? SOLD!!!"

L. Dutton is now Asst. Radio Inspector for the 9th district.

It doesn't take much of a typographical error to give a fellow a massage by radio.

Q Signals Brought Up to Date

Nail this on the wall of your shack if you don't know them.

QRM—I missed the last part; you were sending too fast.
QRN—Ditto.
QSR—I will take the msg but I don't guarantee delivery.
QTA—Repeat the msg and don't send so sloppy this time.
QRS—[Obsolete].
QSA—Your sigs are loud enough to hear without straining my ears.

—9BRE.

Detroit lost one of its pioneer amateurs by the death of Earl Merrow, 8UJ. The absence of his sine on the air is keenly felt among Detroit and DX men, and our sympathy is with his parents.

Old Betsy Is a Chopper Now

When ere I push my sending key the broadcast hounds are sore. With pitch forks and with search warrants they clamor at my door. They say I am a worthless pest, a nuisance and a bore.

Each evening finds them on the job from seven until two, and if I try to clear my hook, by heck they're in a stew. "The governor shall hear of this," "An outrage, I declare," "He made me miss a lecture on the home life of the hare." I dare not show my countenance in public places now; a bootlegger's a gentleman compared with me, they vow.

So farewell, Betsy, you are through, you're shoved clear off the lot. The broadcast gang has got our goat, but stop us they will NOT. A 50-watter clears my hook at seven, eight or nine. The yaps all think it's static, and the gang all say it's fine.

—Contributed.

2CKT was overheard asking 2BGW where he could get some Beverage wire for his new antenna.

As proof that *QST* is going to the dogs, we have only to state that "Beef," as Floyd Phelps, Asst. Ed., "stepped off" on September 19th. His lady love, formerly Miss Alice Parsons, also hails from Minneapolis. This leaves Charlie Service as the only single (and sensible?) one of the Headquarters gang, but (confidentially) only the other day we saw him hide a badge bearing the inscription, "Flapper Inspector."

8BIQ says that connecting a small phone condenser across the binding posts P_1 and S_1 or P_2 and S_1 on the first audio-frequency amplifying transformer will reduce tube noises and static and "tones up" phone concerts.

Wouldn't It Be Wonderful—

If everybody was 2,000 miles from 2FP?
If Reinartz would invent a *perfect* tuner that couldn't be improved?
If 2TS wasn't flapper-crazy?
If some folks wouldn't send while rocking in a rocking chair?
If 4GL would speed up?
If visitors didn't ask so many d. f. questions?
If *QST* would fit inside our note book at school.
If some of the gang would oil their keys instead of their hair?
If everyone had a private secretary to arrange their "Calls Heard" lists?
If everybody had a fist like 2TS?
If we never had to sleep?

Read 'em and Weep!

8BKE has been heard by 6EN, 6ZG, 6ZZ, 6BJT, 6AQT, 7JS, 7AAB, on one fifty-watter, worked 6XAD, and hears 6EN, 6KA, 7QD, 7LU and 7ZO.

8CZN, in Cleveland during Sept. heard on one tube, 6CP, 6EA, 6KA, 6TV, 6BOE, 6DA, 6JD, and 6XAD. The last four were heard on a small indoor aerial. 6EA used five watts when heard

8AB (U. S., *not* French) logged 6KA, 6JD, 6BSA and 6XAD during September.

8AM on 100 watts has been heard south of the equator in the Pacific ocean.

8ZZ has been heard 320 miles west of Oregon.

7LU covers most of the U. S. with his 15 watts.

2BSC on one five-watter has worked 1CHJ, 1BUA, 3CG, 3OT, and 9AVA (St. Paul, Minn.) which is better than he ever did on spark.

2CEI with an amplifier tube fed from a spark coil has worked many stations in daylight up to 100 miles. Input, 4 watts.

4LP, using one 5-watter, has been heard in 39 states, Canada, and has worked Cleveland, Ohio, in daylight, with best DX to Ellendale, N. D., and 5NK, all with antenna current 1½ to 2 amps.

5QI, Fort Worth, Texas, worked 7LU on phone using 5-watts and absorption modulation.

And last but not least, 6XAD, during some hot nights heard 8GP, 5HK, 9CDV, 2KF, 9BHD, 9FK, 3OT, 9DMH, 9DTE, 8AQF, 5UO, and has handled traffic with 4BF at St Petersburg, Fla., with two 50-watters in the transmitter and one receiving tube. Whole flocks of eastern stations have reported hearing 6XAD lately.

Calls Heard

HEARD DURING SEPTEMBER
Unless Otherwise Specified

Instructions to reporters:

(1) Typewrite or neatly print the calls "double spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of an 8½" x 11" sheet.

(2) Arrange alphabetically thru each district, from 1 to 9, and then Canada, with no break between the districts, using commas to separate calls and parentheses around calls of stations also worked—as in examples below.

(3) The period covered by the report shall be so stated and shall be approximately from the first of one month to the first of the following month. All lists must be received by us the 8th of the following month for publication in the next *QST*.

(4) In order to distinguish between spark and C.W. stations, list spark stations from 1 to 9 in the usual manner and then make a second paragraph in identical form listing the C.W. stations. Commercial calls will not be published.

Now that everybody knows how to do it, let's have a better grade of lists with some real DX and fewer nearby calls. However, be absolutely sure of the calls you log and report.

Heard by 6EX from New York to San Diego (1 tube)

Sept. 11 (120 miles south of New York) Spark: 2EW, 8BDA, 9UH, 9BYA. C.W.: 1BBW, 1CHJ, 5KC, 8VQ, 8VY, 8BGG, 9NU, 9NX, 9BBF, 9DKY. Sept. 12 (850 mi. S. of N.Y.) Spk.: 1CDM, 2EW, 8BDA, 9ZN. C.W. 1FB, 2ALN, 4BF, 4FT, 5ES, 5KC, 8AQO, 8CMI, 9II, 9ZV?, 9APS, 9AWN. Sept. 13 (615 mi. S. of N.Y.) C.W.: 8AB, 8WL, 8WR, 8AQO, 9II, 9NX. (768 mi. S. N.Y.) C.W.: 8AAU, 4JK, 4NV. Sept. 14 (815 mi. S. N.Y.) Spk.: 1CNI, 2AD, 2OM, 4BS, 8BDA, 9ZN. C.W.: 1FB, 1BBS, 1BQA, 2BML, 2BSC, 3FS, 3OD, 8TA, 8ALA, 4BS, 4EA, 4NT, 8OK, 8AIO, 8AQO, 8BLA, 8CDZ, 8CJH, 8CUR, 9OX, 9AJH, 9DYN. Sept. 15 (1050 mi. S. N.Y.) Spk.: 2OM, 8BDA, 9ZN. C.W.: 1AJP, 3NU, 3ALN, 3BLF, 4FT, 4NT, 4ST, 4TU, 5ES, 5WC, 5ZA, 8VQ, 8VY, 8WR, 8AIM, 9II. Sept. 16 (1500 mi. S. N.Y.) C.W.: 4BF, 9IU. Sept. 17 (1750 mi. S. N.Y.) C.W.: 4BF. Sept. 18 (At anchor, Cristobal, Canal Zone) C.W.: 4BF, 5EQ, 5ZT. Sept. 19 (Off Cape Malai), Pacific Coast, Spk.: 2OM?, 9ZN. C.W.: 1AJP, 4BF, 4GH, 8AFD. Sept. 24 (1789 mi. from San Diego) C.W.: 2FP, 4BQ, 5BE, 5PX, 8WR. (Several spks. in but lightning storm makes it impossible to copy any spk. sigs.) Sept. 25 (1450 mi. from San Diego) C.W.: 5DI, 6JD. (1200 mi. from San Diego) Spk.: 5HD. C.W.: 5KC, 5QI, 9YX, 9AWM. Sept. 26 (1200 mi. from San Diego) C.W.: 2FP, 5ST, 6BES. Sept. 27 (1000 mi. from San Diego) Spk.: 6KE, 8BDA, 8CMI, 9RW, 9AMK, 9DGW. C.W.: 2FP, 2GK, 6ZF, 6AJH, 6BES, 8BOX, 8CGX, 9ZN, 9ZAF. Sept. 28 (770 mi. from San Diego) Spk.: 6AAU. C.W.: 5CY, 5VY, 5ZA, 6CP, 6ZF, 6AHR, 6AVD, 6BEG, 6BJQ, 6BOE, 9ZAF. Sept. 29 (455 mi. from San Diego) Spk.: 6AO, 6QR, 8BDA. C.W.: 2FP, 5ZA, 6EN, 6ZF, 6BJY, 8BXR, 9DX, 9AWM, 9DPL, 9ZAF. (275 mi. from San Diego) Spk.: 6AQU, 8ZE, 9PN, 9DHI. C.W.: 5ZE, 9AMB, 9DTM. Oct. 4th (Alongside dock at San Pedro, Cal.) C.W.: 4LX, 5XD, 5ZA, 7TQ, 9PS, 9ANQ, 9AWM, 9CNS, 9DSM.

7BJ, Aboard WSR

Sept. 3 (At Chignik Alaska) C.W.: 6KA, 6BOE, 6ARB, 6BMN, 6ZX, 6FF, 6TH, Can. 9AC, Spk.: 7BK. Sept. 4 (15 mi. from Chignik) C.W.: 6KA, 6ZS, 6ZX. Spk.: 6AHF, 6AJH, 7IW, Can. 9BD. Sept. 5 (1450 mi. from NPE) C.W.: (still daylight) 9AVZ, 6ZX, 7ZO, 6NX, 6ARB, 6ZS, 6ZF, 6BOE, 6BPU, 6BQC. Spk.: 6CC, 6ACR, 6AJH, 6AHF, 7UF, 6ALD, 6AUU, Can. 9BD. Sept. 6 (1300 mi. from NPE) C.W.: 6BQC, 6BEG, 6FH. Spk.: 7UF, 6ACR, 6AHF. Sept. 7 (1180 mi. from NPE) C.W.: 6BOE, 7IY, 6ZX, 6ZF, 6BJQ. Spk.: 7UF, 6UP. Sept. 8 (1025 mi. from NPE) C.W.: 6ZF, 6KA, 6BOE, 7MF, 6AAT, 6BQC, 6ZB, 6EN, 6BEG. Spk.: 7UF, 7ABS, 6AHF, 6ACR, 6VX, 6QR, Can. 9BD. Sept. 9 (720 mi. from NPE) C.W.: 6CU, 6CP, Can. 9AC & 9BD. Spk.: 6AJH, 7ZK, 6ACR, 6AQU, 7UF. Sept. 10 (610 mi. from NPE) C.W.: 5PX, 6ABX, 6ZS, 7IY, 7AEA, 9AYS, 9BBF, 9BUG, 9DPL, 9DVI, Can. 9AC. Spk.: 6ACR, 6AQU, 6AJH, 6ZQ, 6AMM, 6AAK, 7NW, 7BZ, 7ZK, Can. 3EC & 9BD. Sept. 11 (575 mi., early A.M.) C.W.: 5BE, 5DI, 5SF, 6BJY, 6BQG, 6GX, 9AYS, 9DPL. No Sparks. Sept. 11 (530 mi. from NPE, P.M.) C.W.: 4BF, 6BJ, 6KR, 6KA, 6ASJ, 6BJQ, 6BQG, 9DVI, 9BHD, 9BBF, 9AUS, 9BBJ, 9AWM, 9PS, 9BSG, 9YAJ, 9AJS, 7AD, 7NJ, 7EQ, 7LU, Can. 9AC. Sept. 12 (410 mi. from NPE) C.W.: 5RE, 5DI, 5PX, 5ZA, 6BJQ, 7JW, 7LU, 8AH, 9ARZ, 9BED, 9CEJ? funny fist, 9LZ, 9PI, 9NX, Can. 4BV. Sept. 13 (320 mi. from NPE) C.W.: 4BF, 5EK, 5PX, 5VA, 5ZA, 5ZAV, 6's too numerous, 8BO, 8ZZ, 8CUR, 9APS, 9AON, 9NX, 9DX, 9DQ, 9EI, 8CNS, 9DPL. Sept. 14 (192 mi. from NPE) C.W.: 5ZA, 9AON, 9DBS, Can. 4BV bad QRN. Sept. 15 (170 mi. from NPE) C.W.: 5BE, 5UO. All above extract from Log. Write if interested.

Can. 4DY, Winnipeg, Man.

Spark: 7WG, 7ZU, 7ZV, 8ANU, 8ZY, 9ARG, 9ATV, 9AUA, 9AYW, 9AZA, 9AZF, 9BMN, 9BWS, 9DFX, 9CTW.

C.W.: 1CY, 4BQ, 5LB, 5NV, 5ZA, 5ZG, 5ZH, 6ZM, 8AB, 8ACH, 8AFY, 8AIM, 8AMM, 8ASV, 8AXN, 8BCY, 8BFX, 8BO, 8BVR, 8BWA, 8CDE, 8CMY, 8CUR, 8IB, 8KG, 8QK, 8UE, 8XJ, 8ZX, 9AAP, 9AJH, 9ALW, 9AMI, 9AMU, 9ANQ, 9AOG, 9AON, 9AOU, 9APW, 9AQR, 9AQM, 9ARZ, 9ASD, 9ASN, 9AUA, 9AWM, 9AYS, 9BBF, 9BCH, 9BCP, 9BED, 9BEY, 9BFG, 9BGH, 9BHD, 9BJV, 9BJY, 9BKP, 9BSG, 9BZI 9CFI, 9CGD, 9CMK, 9COA, 9CPB, 9CTW, 9DBL, 9DCT, 9DGE, 9DGM, 9DHB, 9DJB, 9DJM, 9DKY, 9DPL, 9DSM, 9DYN, 9DZG, 9DXN, 9DR, 9GL, 9II, 9IY, 9KP, 9LZ, 9MP, 9NU, 9NX, 9QF, 9QR, 9UC, 9UU, 9XAC, 9YAJ, 9YX, 9ZAF. Canuc—3BF, 4BV, 4GB.

Canadian 3OH, Toronto

C.W: 1ABY, 1AGI, 1AJE, 1AJP, 1ANQ, 1ARY, 1AZL,1BRC,1BWJ,1CHJ,1FB,1GV,1PY,1QP, 2AER, 2AFP, 2AUZ, 2AWF, 2AWS, 2AYV, 2BAY, 2BRB, 2BSC, 2BUM, 2CFI, 2CHG, 2FP, 2GK, 2QF, 2RY, 2SN, 2UD, 2WB, 3AAO, 3AAY, 3ACJ, 3ACR, 3ALN, 3AQH, 3AQR, 3AUU, 3BG, 3BGT, 3BHM,

8BIJ, 8BLF, 8BLU, 8BNU, 8BRA, 8BTY, 8BVA, 8BZ, 8CC 8FS, 8IL, 8OT, 8TJ, 8TN, 8VW, 8ZO, 4BX, 4EA, 4EB, 4GH, 4GK, 4GS, 4GX, 4JK, 4KF, 4LJ, 4NT, 5DI, 5EK, 5ES, 5FV, 5JL, 5KC, 5NV, 5PX, 5QI, 5SM, 5UK, 6CP, 6XP, 8AB, 8ACH, 8ADR, 8AFD, 8AIM, 8ALF, 8ALT, 8ANB, 8CQF, 8AQQ, 8ATU, 8AWJ, 8AXN, 8AZF, 8BDO, 8DEB, 8BFM, 8BFX, 8BJV, 8BKE, 8BO 8BOZ, 8BPL, 8BPU, 8BRM, 8BRT, 8BSC, 8BSF, 8BTR, 8BVR, 8BVT, 8BWA, 8BXT, 8BYF, BZY, 8CAZ, 8CBX, 8CFP, 8CGX, 8CIX, 8CJH, 8CKO, 8CNI, 8CQX, 8CUR, 8CXW, 8FT, 8IJ, 8LF, 8OW, 8PD, 8SB, 8UE, 8UK, 8VY, 8WR, 8XE, 8YE, 8ZAE, 8ZZ, 9AAP, 9AFN, 9AIY, 9AIZ, 9AJH, 9ALP, 9AOG, 9AON, 9AOU, 9APS, 9APW, 9ARR, 9ARZ, 9ASU, 9AWR, 9AWM, 9BCB, 9BDS, 9BED, 9BEH, 9BRL, 9BPV, 9BYA, 9BZI, 9CJA, 9CKM, 9CMK, 9CTR, 9CXO, 9DAH, 9DGE, 9DKY, 9DPL, 9DQU, 9DR, 9DUQ, 9DVW, 9DZB, 9EI, 9FM, 9II, 9IZ 9JR, 9KP, 9MQ, 9PS, 9UC, 9UU, 9UZ, 9VZ, 9YAJ.

Spark—1BCF, 1BGM, 1BOQ, 1BRL, 1CNI, 2AJE, 2AD 2BJO, 2BKS 2FP, 2KK, 2ND, 2NF, 2QN, 2RM, 2WB, 3ACY, 3AWF, 3MB, 3RW, 5SM, 5XA, 8AOF, 8AIZ, 8AJT, 8AWU, 8AZF, 8BDA, 8BEF, 8BEP, 8BFM, 8BIB, 8BRL, 8BXC, 8CEJ, 8CMI, 8OP, 8CPM, 8CSD, 8CYU, 8EO, 8EW, 8TK, 8TT, 8UC, 8UD, 8UP, 8VE, 8VH, 8VQ, 8WE, 8YN, 8ZE, 8ZY, 9AFK, 9AGG, 9AIR, 9ABM, 9ACL, 9ACN, 9AMQ, 9AMT, 9ARG, 9AZA, 9BWN, 9BWS, 9COX, 9CP, 9DTN, 9DWM, 9DWX, 9DZY, 9FK, 9IZ, 9KI, 9LF, 9MQ, 9OX, 9PD, 9PN, 9RG, 9TL, 9TV, 9TX, 9UH, 9UZ, 9VZ, 9YM, 9ZN.

1FW, Bridgeport, Ct
(2-step r.f. and Brass Bed)

1ACS, 1AJU, 1BUA, 1JT, 1QN, 2AD spk., 2AFB, 2AJE spk., 2AWS, 2AXK, 2BJO, 2BQE, 2BRB 2BRC, 2CFB, 2CIM, 2CIZ, 2CJF spk. and 2QM, 2RB, 2RY, 2SZ, 2TH, 2TS, 3AC, 3AFB, CW, 2DIS 2FC, 2GK, 2HK, 2HW, 2IG, 2KDK, 2NZ, 3ALN, 3ALS, 3BC, 3BHM, 3BIJ, 3RW, 3XAI, 4BX, 4BY, 4GH, 4HW, 4NV, 8AFM, 8AIG, 8ALA, 8AZD, 8BFX, 8BVR, 8BVT, 8BVY, 8CEI, 8CFM, 8CIA, 8CLD, 8CT, 8CVZ, 8LT, 8OM, 8QK, 8SB, 8SP, 8UK, 8XAB, 8ZAE, 8ZZ, 9AAP, 9AIG, 9AWF, 9BED, 9BDS, 9CGK, 9DZY, 9II, 9IJ, 9UU.

1GV, Providence R. I. (1 tube)

1AM, (1AR), 1FB, (1PT), (1YK), (1ZE), (1ACU), 1AGH, (1AJL), 1AJP, 1AJU, (1ALZ), 1ASF, (1AWD), (1AWD), (1AWO), (1AZL), (1AZW), (1BBS), (1BKQ), 1BQD, (1BQT), (1BRQ), (1BWJ) 1CAJ, (1CCZ), (1CDO) (1CFI), 1CKR, 1CMK, 1CMP, (1CPN), 1CWS, 1CWP, 2BG, 2GK, (2KL), (2KP), (2KU, 2RM, 2RY, 2VA, 2ACD, (2AFP), (2AJA), 2ANM, 2AWF, 2AWS, 2AWZ, 2AYV, 2AZC, (2BDU), 2BGM, 2BKT, 2BMS, 2BOI, (2BQD), 2BQG, (2BRB), (2BRC), 2BRZ, (2BTW) (2BUM), 2CBG, 2CFB, 2CNZ, 2CQZ, (3AC), (3BG), 3BX 3BZ, 3CC, 3DC, (3FS), (3GK), 3IL, 3IW, 3KQ, (3MK), 3OT, (3PZ), 3SH, 3VW, 3ZZ, 3AAY, 3AFB, (3AJD), (3ANJ), (3ASY), 3BIJ (3BIT), 3BJY, 3BLF, (3BNU), 3BRW, (3BTJ), (3BVC), (3CDK), (3CXZ), (3XAI), 4BF 4BQ, (4BX), 4EA, 4EB, 4EL, (4FT) 4GH, 4GK, (4LJ) 4NT, 5BE, (5FV), 5KC, 5PX, 5VA, 8AB 8FT (8IB), 8IJ, (8KG), 8MZ, 8OW, 8SB, 8UE, 8UK, (8VY), 8XE, (8ZE), (8ADT), 8AFD, 8AFY, 8AIM, 8AFY 8AIM, 8AIO, (8AKP), (8ALF), 8ANB, 8AQF, 8AQO, 8ASL, 8ASV, 8AXC, 8AXN, 8BDB 8BDU, 8BGG, 8BMM 8BNJ, 8BRL, 8BRM, 8BSS, (8BTR) 8BTR, 8VR, 8BVT, 8BWA, 8BWK, 8CAZ, 8CDZ, (8CEI), 8CGU, (8CGX), 8CIX, (8CJY), (8CKO), 8CMI, 8CLD, (8CON), (CTN), 8DAK, 8ZAE 9EI, 9II, (9KP), 9UH, (9UU), 9ZN, 9ACS 9AMT, (9AOG), (9APS), 9AWF, 9AWM (9BED), 9BJV, 9BVP, (9DGE), 9DPL, 9DRK, 9YAJ.

1CCZ, Wianno, Mass.

C.W.: 1AJP, 1ASF, (1BBS), (1BBW), (1BEO), (1BKO) (1BTR), 1CDO, (1CFI), (1CKR), 1CMP, 1CNM, (1CPZ), 1FB, (1GM), 1HK, (1SC), (2AER), 2AFP 2AGC, (2AJA), (2ANM), 2AOG, (2AUZ), 2AVE, (2AWF), (2AWS), 2AYF, 2AYV, (2AZC), 2AZY, 2BBB, 2BDG, 2BDU, 2BFZ, 2BG, (2BJO), 2BLM 2BLP, 2BML, 2BMR, 2BNZ, 2BOI, (2BQH), (2BQU), (2BRB), 2BRC, (2BTW), (2BUA), 2BUM 2BYO, 2CBC 2CBG, (2CBW), 2CCD, 2CES, (2CFB) 2CGJ, 2CHG, 2CHM, 2CKL, 2CLJ, (2CMS), 2COA, 2COX, 2CQZ, 2CRU, 2EL (2FC), (2FP), 2GK 2HI, 2HW, 2KL, 2KP, 2NZ, 2RB, (2RM), 2TS, (2UD), (2VA), 2ZL, 3AAX, (3ADX), (3AEV), (3AGC), 3AIS, 3AIZ, 3AJD, 3ALN, (3ANJ), 3AQR, (3ATG), 3AUU, (3BGT), (3BIT), 3BLF, (3BNU), 3BOB, (3BRW), 3BTY 3BVA, (3BZ), 3CA, (3CAN), 3CDG, (3CG), (3CXZ) (3DM) (3FS), 3GK, 3HD, 3HL 3HG, (3IW), 3LH, 3LR, (3MK), (3OT), 3PZ, 3SH, (3SM), 3SN, (3TJ), (3TN), (3VW), 3ZZ, (4BP), (4BQ), (4BX), 4BY, 4DC, 4DL, (4EA), 4EL, (4FT), (4GK), 4JY, (4KT), 4LJ, 4MK, (4NT), (5DA), 5EK, (5ES), (5FV), 5GC, (5KC), (5LJ), 5PX, 6KA, (6TV), 7IY (7KX), (8ACF), (8ADH), (8ADT), 8AES, (3AFD), (8AFY), 8AHA, 8AHR, 8AIM, 8AIO, 8ALF, 8ALT, 8AMM, (8AMQ), 8ANB, 8ANZ, 8AQF, 8ATO, 8ATU, (8AVL), (8AWP), 8AXC, 8AXN, 8BDB, 8BDU, 8BFM, 8BFX, 8BGQ, 8BHO, 8BJE, 8BKB, 8BKN, 8BNJ, 8BNY, (8BPL), 8BRM (8BRW), 8BTR, 8BVT, 8BWA, 8BXH, 8BZY, (8CAZ), (8CDZ), 8CEI, 8CGA, 8CGM, 8CGN, 8CGP, (8CID), 8CJH, 8CJY, 8CKV, 8CLD, (8CMI), (8CMM), 8CNP, (8CPX), 8CUR 8CXT, 8CXT, 8DC, 8FT 8IB, 8KG, 8OW, 8SP, 8TB, 8UE, 8UK, (8UP), 8WR, 8ZAE, 8ZZ, 9AAP, 9AGG, 9AIU, 9AIY 9AJP 9ANS, 9AON, 9APD, (9APS), (9ARR) (9ARZ), 9AWM, 9BHD, (9BVP), 9BIT, 9DAX, (DCB), 9EI, (9II), 9JA, (9KP), (9ML), (9OX) 9PS, (9UH), (9UU), Canadians 3CO, (3JK), 9AL.

2AVE, Jamaica, L. I., N. Y. (1 tube)

C.W.: (1FB), 1GV, 1IL, 1IV, (1JT) 1QP, (1PT), (1QV), 1XU, 1YK, 1ZE, 1AFH, (1AGH), (1AJP), (1AJU), 1ARY, (1ASF), 1AWB, 1AYQ, (1AZL), 1BDV, (1BEO), 1BGF, 1BKQ, 1BNJ, 1BNT, 1BQI, (1BSC), 1BUA, 1BWJ, 1CGO, 1CJA, 1CPN, 1CVS, (2RY), (2WB), (2ACD), (2ADV), (2AEQ), (2AJW), (2AZA), (2AZC), (2AW3), (2BBB), (2BBL), (2BOK), 2BCW), (2BDM), (2BHA), (2BLM), (2BNC), (2BNL), (2BOI), (2BRB), (2BSC), (2BTW), (2BUA), (2BVD), (2BYC), (2BYR), (2CCU), (2CEC), (2CEI), (2CEN), (2CGY), (2CIM), (2CJE), (2CLU), (2CNH), (2COA), (2CPP), (2CPU), (2CRU), (2XNA), (2XNB), 3AC, 3AN, 3BG, 3BX, 3BZ, 3CC, 3CG, 3FR, 3FS, 3GK, 3HD, 3HG, 3IW, 3KL, 3MB, 3MK, 3MO, 3OE, 3OT, 3PZ, 3QV, 3RE, 3RV, 3VW, 3VX, 3ZZ, 3AAX, 3ADT, 3ADX, 3AEV, 3AFB, 3IS, 3ALN, 3ANZ, 3AQR, 3APR, 3BFS, 3BGT, 3BHL, 3BHM, 3BIG, 3BYJ, (3BLU), 3BMN, 3BNU, 3BOB, 3BRW, 3BVA, 3BVC, 3BWT, 8CIM, 4BF, 4BQ, 4BX, 4DC, (4EA), 4FT, 4GH, 4JK, 4LJ, (4NT), 4NV, 5ER, 5FV, 5ZA, 6KA, 6XAD, 8AB, 8AX, 8BO, 8CI, 8FT, 8KG, (8HJ), 8IB, 8OE, 8SB, (8SP), 8UP, 8VY, 8WR, 8XE, 8YN, 8ZV, 8ZZ, 8ADH, 8ADT, 8AFC, 8AFY, 8AGR, 8AIM, 8AIO, 8AJT, 8ALF, 8ANB, 8AOB, 8AQO, 8ASL, 8ATU, 8AVL, 8AWT, 8AXB, 8AXC, 8AXN, 8BDU, 8BCY, 8BEO, 8BFL, 8BFM, 8BHO, 8BIQ, 8BKB, 8BKI, 8BLX, 8BMM, 8BOZ, 8BPL, 8BRM, 8BRQ, 8BRT, (8BUX), 8BVR, 8BVT 8BWA, (8BWK), 8CAU, 8CDZ, 8CEF, 8CGB, 8CGP, 8CGU, 8CGV, 8CIX, 8CJH, 8CJY, 8CKM, (8CKO), 8CMM, 8CMY, 8CNW, (8CON) 8CPX, 8CRB, 8CTN 8CUR, 8CVY, 8CXW, 8ZAE, 8ZAF, 9CP, 9DR, 9EI, 9II, 9IO, 9UH, 9UU, 9WA, 9WS, 9ZL, 9ZN, 9AAP, 9AAV, 9AJP, 9AOG, 9AON, 9APS, 9APW, 9ARK, 9AWM, 9AYH, 9AYS, 9BCB, 9BED, 9BJV, 9BTT, 9BVP, 9BSG, 9BWV, 9CTR, 9DGE 9DPL, 9DQU, 9DZY, 9KKJ, Can. 9AL, (BY4).

Spark: 1ACB, (1AJP), (1AVA), (1BOQ), (2GA), (2LX), (2OM), (2SQ), (2AKH), (2BBI), (2BJO), (2BKS), (2BQB), (2CIZ), (2CQO), 3CK, 3OS, 3HS, 3RW, 3ACY, (3AWF), 8ACF, 8AFG, 8AJT, 8AXX, 8BDA, 8BEP, 8EO, 8EW, 8'L, 8KY, (8QE), 8RQ, 8UC, 8VQ, 9AGG, 9AIR, 9CP, 9DWM, 9ZN, Can. 3FO.

C.W.: 1ABS, 1ABY, 1ACU, (1AJL), 1AJP, 1AOU, 1ASJ, 1AUN, 1AXU, 1AYG, 1AZL, 1AZW, 1BBS, (1BDI), 1BJN, 1BKQ, (1BNT), 1BQI, 1BRQ, 1BWD, 1CAJ, (1CCZ), (1CGO), (CHJ), 1CK, 1CKR 1CMK, 1CPN, 1CVS, 1EE, 1ES, 1FB, 1HK, 1IL,

1FT, 1PY, 1QN, 1QP, (2SC), (1SD), 1UJ, 1YK, 1ZE, 2ACD, 2AFP, 2AJA 2AVE, 2AYF, 2AZC, 2BBB, 2BDM, (2BQG) (2BRC), 2BSC, 2BTW, 2BUA, 2BUE, 2BYC, 2CBG, 2CBT, 2CEM, 2CIM, 2CJE, 2CNZ, 2DX, 2EL, 2FC, 2FP, 2MU, 2RB, 2SQ, 2TS, 2VA, 2WB, 3ABW, 3AC, 3ADT, 3ADX, 3AHN, 3AQH, (3AQX), 3AUU, 3AUW, 3BE, 3BEY, 3BG, (3BIJ), 3BIR, 3BJF, 3BMN, 3BMS 3BNU, 3BRW, 3BTY, 3BUQ, 3BVA, 3BVL, 3BX, 3BZ, 3CDG,3CG,3ER,3FR,3FS,3GC,3GK, 3HG, 3HL, 3IL (3OE), 3OT, 3SM, 3TA, 3TJ, 3VW, 4BQ, 4DL, (4EA), 4GH, 4HW, 4JK 4KC, 4NT 4OI, 5EK, (5ER), 5ES 5HK (5HL), 4NV, 5SM, 5ZA, 6XAD, 8ACH, (8ADH), 8AFD, 8AFY, 8AGR, 8AGO, 8AIG, 8AIM, (8AMM), 8AMS, 8AOB, 8AQF, 8ASV, (8ATU), 8AVL, 8AWM, 8AXB, 8AXN, 8AYH, 8BFH, 8BFM 8BGL 8BIQ, 8BKE, 8BKU 8BLT, (8BMK), 8BNJ 8BNU, 8BPH, (8BRM), 8BRQ, 8BRT, 8BTL, 8BTR, 8BVR, 8BWA, 8BXH, 8BXT, 8CAA, 8CBC, 8CDZ, 8CEI, 8CGN, 8CGU, 8CGX, 8CJH, 8CLD, 8CMY, 8CNP, (8CNW), 8CQL, 8CQX, 8CUS, 8CVE, 8ER, 8FT, 8IB, 8KG, 8OW, 8QK, (8SB), 8SP, 8UE, 8UP, 8WR, 8XE, 8ZAF, 8ZAG, 8ZQ, 8ZV, 8ZZ, 9AFN, 9AIY, 9AJH, 9APS, (9ARK), 9AUA, 9AWF, 9AWM, 9AYS, 9BAK, 9BCB, 9BDS, 9BHQ, 9CAH, 9CBA, 9CGK, 9CLN, 9DGQ, (9DPL), 9DQU, 9DTJ, 9DUG, 9DYN, 9EI, 9EJ, 9II, 9IO, 9LQ, 9UC, 9VK, 9VZ, 9WS, 9XAC, 9XL, 9ZAA, Can (3BG), (3BV).

3CA, Roanoke, Va. (All C.W.)

1ACG 1AJP, 1AZW, 1BBS, 1CCZ, 1CJH, 1CPN, (1CQW), 1QN, 1RD, 2AER, 2AFP, 2AGC, 2AYV, 2BQB, 2BRB, 2BRC 2CBC, 2CBG, 2CBJ, 2CJE, 2DAW, 2EL, 2NZ, 2WB, 3AFB, 3AJD,3ALN, (3APR), 3AQB, 3AQR, 3AUU, 3BG, 3BGT, (3BIJ), 3BLF, 3BNU, 3BRW, 3BVA, (3BVL), 3BV, 3FS, (3HL), 3IW 3MB, 3OT, 3QV, 3SM, (3TJ), 3VW, 3ZV, 3ZZ, (4BX), 4BY, 4DC, 4DS, (4EA), 4EB, 4EH, 4FO (4FT) 4GH, (4GK), 4GX, (4HW) 4II 4JK, 4JY, (4LJ), 4NT, 4NV, 4ZF, 5EG, 5ER, 5FV, 5HL, (5KC), 5LX, 5UK, 5XA, 5ZA,8AB,8ACH,8AFD,8AIM, 8AKP, 8ALF, 8ALF, 8ANB, 8AQF 8ASV, 8ATU (8AUE), 8AWP, (8AWZ), 8AX, 8AXB, 8AXN, 8BCI. 8BDO, 8BDU, 8BFM, 8BGG, 8BHO, (9BJV), 9BMN 8BNJ, 8BNT, 8BOZ, 8BPL, 8BPU 8BRM, (8BRT), 8BUM, 8BUN, 8BUX, 8BVP, 8BVR, 8BUT, 8BWA, 8CAY, 8CDZ, 8CEI, 8CGP, 8CI, 8CJY, 8CKM, 8CNJ, 8COY, 8CUR, 8CUS, 8CZC, 8DV, 8HJ, 8HM, 8IB, 8JU, 8KG, 8LT 8OW, 8PT, (8QK), (8SB), 8UE, 8UP 8XE, 8XN, 8ZAE, 8ZAF, 8ZZ, 9AFN, 9AFT, 9AJH 9AOU, 9APH, 9APR, 9APS, 9ARZ, 9AUU, 9BHD,9BJY,9CMK,9DPL, 9QUU, 9DXN,9 DYN, 9DZY,9GL,9IJH,9LJ,9NU,9NU, 9OX, 9QB, 9UU, Canadians 3BV, 9AL.

On "Super," one tube, no aerial, ground or loop: 1FB, 2NZ, 3BHJ, 3LR 4BX, 4FT, 4GH, 5KC, 5EK, 8BUM, 8BV, 8DAK, 8ZZ, 9APS, 9BED 9BVP, 9KP, (9LQ), 9UU, 9UY. With loop:2COL, 3AAQ, 3BVA, 4EA, 4NV, 8ACF, 8BFM, 8BVR, 8CJH, 9ARR 9AUA.

Daylight: (3APR), (3BZ), (3HL), 4GK, 4ID, 5EK, 8BDU.

3TF, Ruxton, Md. (1 tube)

Spark: 1BPZ, 2AIM, 2AJE, 2ARB 2OA, 2PF, 2OM, 3AN, 3AM, 3BMO, (3BRA), (3SF), 4BL, 5XA, 8ACF, 8AFG 8AJT, 8BBO, 8BEP, 8BDA, 8BRL, 8CH, 8COA, 8EB, 8EO, 8EW, 8KY, 8UC, 8ZY, 9AGR, 9AIR, 9AMK, 9ARK, 9AZA, 9BRS, 9CF, 9DEN, 9DWM, 9MC, 9TL 9ZN.

C.W.: 1ABY, 1AGI, 1AJP, 1AJU, 1AR, 1ASF, 1AUN, 1BEO, 1BGF, 1BUA, 1CEC, 1CGO, 1CHJ, 1CPN, 1DV, 1HK, 1PY, 1XP 1ZE, 2AER, 2AFP, 2AWF, 2AWS, 2AZC, 2BBR 2BQU. 2BYC, 2CBC, 2CJE, 2COL, 2CQZ, 2EL, 2FZ, 2GK, 2DX, 2HW, 2IG, 2TS 2TT, 2RY, 2VA, 3AAY, 3AC, 3AHK, 3AHN, 3AHP ,3AKA. 3ALN, 3ANZ, 3APR, 3AQR, 3BHL, 3BLU, (3BN), 3BNU, (3BSJ), (3BWI), 3CAG, 3CG, 3FS, 3GV, 3IW, 3PZ, 3TJ, 3TN 3WF, 3XAA, 3ZZ, 4BQ, 4BY, 4CQ, 4CX, 4DC, 4EB, 4EN, 4EL, 4GH, 4HW, 4ID, 4JY, 4KC, 4KU, 4LZ, 4NT, 4NV, 4NX. 5EK, 5FV, 5KC, 5PX, 5SK, 5XAD, 8AB, 8ACG, 8ADH, 8ADT, 9AFB, 8AFD, 8AFT, 8AFY fone, 8AGO, 8AHA, 8AIM, 8AKP, 8ALF, 8ALT, 8AOB, 8ANB, 8ATV, 8AVL, 8AWM, 8AWZ, 8AXB 8AXN, 8AZH, 8BCY, 8BDB, 8BDO, 8BEO, 8BF, 8BFM, 8BFX, 8BGG, 8BHO, 8BJC, 8BJX, 8BKE, 8BMK, 8BNY, 8BOZ, 8BOQ, 8BPN, 8BQF, 8BRM, 8BRT, 8BSJ, 8BTR 8BVR, 8BVT, 8BWA, 8BWK, 8BUN, 8CAK, 8CAU, 8CDZ, 8CEF, 8CGM, 8CGP, 8CGU, 8CGX, 8CID, 8CIX, 8CJH, 8CJY, 8CJZ 8CKO, 8CNP, 8CNW, 8CON, 8CPX, 8CTN, 8CZC, 8CUU, 8DAK, 8DV, 8HJ, 8JG, 8JU, 8KG, 8ML, 8MZ, 8PT, 8QI, 8SB. 8SF, 8SP, 8UE, 8XE, 8ZAF, 8ZE, 8ZZ, 8ZAE, 9AAP, 9AON, 9ARG, 9BDS, 9BED, 9BSG, 8BTT, 8BUP, 9BZI, 9CCS, 9CFI, 9CGK, 9CIE, 9DLG, 9DPL, 9DQU, 9DXN, 9FK, 9GL, 9IO, 9LQ, 9OX, 9ZN, 9YAJ, Can. 3BV.

3ADI, 659 N. Markoe St., West Phila, Pa.

Spark: 1CNI, 2AJE, 3ASV, 8BR, 8BDA, 9UH.

C.W.: 1GV, 1UJ, 1CNR, 2CM, 2RF, 2VA, 2ACY, 2AVZ, 2AWS 2BMR 2CBG, 2CDG, 2CGJ, 3CO, 3NZ, 3TJ, 3AHN, 3BHM, 4GL, 4GX, 4IZ, 5ES, 5HD, 6KA, 6ZF, 8AB, (8HJ), 8IB, 8MZ, 8RG, 8SE, 8SR, 8UE, 8UP, 8VY, 8XJ, 8ABO, 8ACS, 8ACU, 8AGX, 8AJT, 8AMM, 8ANB, 8ASV, 8ASZ, 8AVL, 8AWF, 8AWZ, 8BDO, 8BFH, 8BFR, 8BPI, 8BPR, 8BPU, 8BVR, 8CEF (8CEI), 8CGN, 8CKO, 8CMY, 8CNW, 8CTP, 9EI, 9II, 9OX, 9UU, 9XF, 9XL, 9AIY, 9AON, 9API, 9APS, 9AXF, 9BJY, 3BRL, 9BTK, 9CNC, 9DGQ.

4HS, Atlanta, Ga. (One tube)

Spark: 1AW, 2EL, 2FP, 2GN, 2OM, 3AOV, 3ARN, (3AWF), 3BVC, 3GO, 4BC, 4EL, 4FB, (4FD) (4GN), (4IE), (4SK), (5BW), 5DI, 5EK, 5ER, 5FJ, (5JF), (5MO), 5TU, (5UC), (5XAJ), 5XAC, 5XU, 5ZAS, 5ZL, 8AFD, 8AIB ,8AIT, 8AIZ, 8ANB, (8AWU), (8AXB), 8AXN, (8AZF), (8BBU), (8BDA) 8BDB, (8BDV), 8BEP. 8BEW, 8BFM, (8BO), (8BXC), 8BXS, 8BYO, 8CKV, 8CO, 8CYU, 8EB, 8EOD, 8FT, 8KJ, 8RQ, (8UC), 8VR, (8WZ), 8YN, (8ZE), 8ZO, 9AAW 9AAP, 9AFK, 9AIR, 9AJB, (9AMK) 9AOJ, 9AOR, 9APR, 9APS, (9AQA), 9AZA, 9AZF, 9BMN, (9BWS), (9CP), 9DAW, 9DIIZ (9DWM), 9DWF, (9DWX), 9DXN, 9DZE, (9DZY), (9FK), (9GX), (9LF), 9MC, 9OX, 9PE, 9PN, 9PG, 9PD, 9RR, 9TL, (9UH), (9ZN).

C.W.: 2FP, 3BVI, 3ZZ, 4BF, 4BQ, 4BX, 4BY, 4CX, 4DC, 4FA, (4EB), 4EN, 4EL, 4FS, 4FT, 4GE, 4GK, (4GX), 4HZ, 4IV, 4JK, 4KC, 4KI, 4LJ, 4MN, 4NI, 4NT, 4OD, 5AAR, 5BAA, 5EG, 5FV, 5HB, 5HL, 5UK, 8BDB, 8BFM, 8BKE, 8SP, 8UC, 8ZZ, 9ABV, 9ABY, 9IO, 9LQ, 9APS, 9AWF, 9ZN!!!

4IZ, Tampa, Fla. (One tube)

C.W.: 1ARA, 1RL, 4AE, 4BB, 4BD, 4BQ, 4BV, 4BX, 4BY, 4EA, 4EB, 4EH, 4EL, 4FT 4FH, 4FV, 4GH, 4HW, 4KC, 4KU, 4LA, 4LH, 4LJ, 4LW, 4NP, 4NV, 4OD, 4OI, 5BI, 5EH 5FV, 5HL, 5KC, 5PQ, 6EE, 8BDU, 8IB, 8SB, 8SP, 8ZZ, 9AL, 9AON, 9APS, 9ARR, 9UU, Can. 4CB.

Spark: 4BC, 4BI, 4FD, 5XA.

4FT, Wilmington, N. C.

(1AJP), (1AM), (1AZW), 1BBS, (1BBW), (1BEO), 1BGF, (1BKQ), (1BQI), (1BRQ), 1BUA, (1CCZ), 1CFE, (1CLI), (1CTW), (1FB), (1GV), (1QN), (1QP) (1QV), (2AFP), (2AJA), 2ALF, 2AMA, 2ANO, 2AV, (2AYV), (2BDU), 2BQD, 2BQU. (2BRB), 2BRC, 2CBG, (2CES), (2CFB), (2CMS), (2EL), (2FP), (2GK), 2IG, (2KL), (2NZ), (2TS) (2VA), 3AAO, 3AC, (3AEV), (3AFB), (3AQR), (3AUU), 3BA, (3BHM), (3BIJ), (3BIT), 3BJY, (3BLF) (3BMN), (3BNU), 3BOB, (3BRC), (3BTY), (3BUC), (3BUT), (3BVA), (3BVL), (3BZ), (3CA), (3CAN), 8CBM, (3CC), (3FS), (3IW), (3PZ), (3QV), (3RF), (3VW), (3WB), (3ZW), 3ZZ (4BF), (4BO), (4BV), (4DC), 4DS, (4EA), (4EB), (4EH), (4EL), (4EN), (4GH), 4GS, 4GX, (4HW), (4JK), (4JY), (4KT), (4LJ), (4NT), (4NV), (4OI), 5EG, (5EK), 5ER, (5ES), (5FV) 5HB, (5HL), 5KC, 5NV, (5OA), (5RH), (8ACH), 8AES, (8AFD), (8AHR), (8AIG), (8AIM), (8AIO), (8AJT), 8ALF, 8ALT, (8AMM), 8AMS, 8ANB. (8AOB), 8AQF, (8ASV), 8ASZ, (8AVL), (8AWN), (8AWZ), (8AXC), (8BDB), (8BDO), 8BDU, 8BF, (8BFM), (8BFT), 8BFX, 8BGG, (8BHO), (8BJC), (8BJK), (8BJV), (8BJX), (8BKN), 8BKU, 8BNT (8BO), 8BOZ, 8BPL, 8BQF, (8BRM) 8BRT, 8BSS, 8BTR, 8BUN, 8BUX, (8BVT), (8BWA), 8BZY, (8CAZ), (8CBX), 8CDZ,

(8OFF), (8OEI), (8OEU), 8OGP, 8OGX, (8OJY), (8OKO), 8OMY, (8OUR), 8OUS, (8DAK), (8FT), 8HJ, (8IB), (8KG), (8LF), 8OE, 8OW, 8QG, (8SP) 8UE, (8UK), 8VQ, (8VY), (8WE), 8ZA, 8ZAE, 8ZL, (9AAP), 9AIQ, (9AJH), 9AON, (9APS), 9ARR, 9AWF, 9BCB, (9BDS), 9BED, (9BEH), 9BHD, 9BHI, (9CP), 9DCG, 9DTJ, 9EI, (9II), 9IO, (9JG), (9LQ), (9OX), 9PS, (9UC), 9UH, (9UU).

5XAC, Conway, Arkansas

C.W.: 4BQ, 4GH, 4KC, (4MB), (5DI), 5DO 5DW, (5ED), 5EG, (5EK), 5FV, 5HB, (5IE), (5JB), (5KC), 5LA, 5LB, (5NS), 5NV, (5PX), (5QI), (5QS), (5RJ), (5SF), 5SO, (5SM), (5UK), (5UO), 5VA, (5XAB), (5XAD), (5XV), 5ZA, (5ZAV), 5ZZ, 5ZH, (5ZG), 6ABJ, 6KA, 7LU, (8AOI), (8BVA), 8UE, (8VY), (8ZE), (8ZAF), 8ZZ, 9AAU, (9AMO), (9ABV), (9ANQ), (9AOG), 9AON, 9AOU, (9APW), (9APS), (9ARK), 9ARR, (9AUA), 9AWM, (9AYM), (9AYS), (9BDS), (9BED), (9BGH), 9BSG, (9BZI), (9BXT), 9DJS, (9COI), (9DNT), (9DHB), (9DR), (9DSG), 9DXD, (9DUG), 9EL, 9II, 9NU, (9OX), (9PW), (9YAJ), 9XAC, 9ZAF.

Spark: 2FP, (3AHK), 4BI, (4HX), (5ABY), (5AEZ), (5BW), (5CR), (5EA), 5FI, (5FL), 5HQ, (5HZ), (5JF), (5MO), (5NS), 5OI, (5QI), (5QS), (5RO), (5RH), (5SM), 5TC, 5TG, (5TM), (5TP), (5TU), (5UC), 5UD, (5WE), (5WF), (5WW), (5XA), (5XB), (5XAB), (5XAD), 5XAI, (5ZAE), (5ZAW), (5ZL), (8AWU), (8AL), (8BDA), (8CMI), 8UC, (8KJ), (8ZY), 9AEG, (9AFK), (9AIU), (9AIR), (9ARG), (9ACL), (9AYW), (9ARX), (9AZA), (9ANO), 9BAB, (9BMN), (9BDR), (9BKK), (9BWS), (9BXC), (9BTZ), (9CA), 9CKP, 9DCW, (9DMJ), (9DQQ), (9D8D), (9DZY) 9DXC, (9FK), (9KA), 9LF, 9MC, (9OX), 9PA, (9PE), (9RR), 9WT, 9XT, 9YB, (9YM), 9ZN, (9ZV).

5DI, T. S. Depew, 2209 Azle Ave., Ft. Worth, Texas

C.W.: (4EB), 4EZ, 4KF, 4ZF, 5AC 5BM, 5CY, 5DW, (5EH), (5EK), (5EL), (5ES), (5HV), 5IX, (5JB), 5JW, 5KC, 5ME, 5NS, 5RR, 5RX, (5QS), (5SM), (5UY), 5AAW, 5AEJ, 5ACF, 6CP, (6JD), 6KA, (6AVD), (6AWU), (6AWT), 6BQE, (6BSA), 7LU, (8IB), 8SP, (8SB), 8UI, 8VY, (8ZZ), 8AIM, (8ADT), (8AKP), 8ALL, 8ANB, 8AUK, 8AXB, (8AXN), 8BCY, 8BKE, 8BRR, 8BTL, 8BTR, 8CKK, 8GQX, 8DIF, (9EI), 9FM, 9II, 9LL, 9OE, (9OX), 9UU, (9ZL on fone), (9ABU), 9AES, 9AJP, 9AJS, (9ALY), (9AMB), 9ANQ, 9ANS, 9AOU, 9API, 9APS, 9APW, 9AQL, (9AQM), 9AQQ, (9ARR), (9ARZ), 9AUA, (9AUS) 9AVN, 9AWN, 9AYS, 9BBF, (9BCF), 9BDS, (9BED), 9BJU, 8BJV, 9BOA, (9BSQ), (9BTT), (9BWK), (9BXT), (9CFI) 9CJI, 9CJJ, 9CTR, 9DAH, (9DAM), 9DBL, (9DQU on fone), (9DSM), (9DXD), 9DXT, 9DZQ, (9XAC), (9ZAA), (9ZAF), 9IF

5ADL, 601 Asia St., Baton Rouge, La. (1 tube)

C.W.: 1AJP, 2FP, 3BVC, 3BZ, 3LR, 3MK, 3ZZ, 4AU, 4BF, 4BQ, 4BY, 4DC, 4EA, 4EB, 4EH, 4EL, 4FT, 4GH, 4GK, 4HW, 4ID, 4JK, 4JY, 4KF, 4KU, 4LJ, 4ZF, 5AAM, 5ABA, 5ABM, 5ACF 5ADE, 5AE, 5BE, BM, 5BQ, 5CY, 5DG 5DI, 5DW, 5DY, 5ED, 5EK, 5ER, 5ES, 5FV, 5HB, 5HL, 5IG, 5IM, 5IR, 5IX, 5JL, 5JM, 5KC, 5LB 5MA, 5ME, 5MG, 5ML, 5NV, 5PX, 5QI, 5QS, 5RJ, 5SF, 5SK, 5SM, 5SR, 5UK, 5UN, 5UQ, 5VA, 5VO, 5VY, 5XAD, 5XAE, 5XV, 5XY, 5ZA, 5ZH, 8AB, 8AFD, 8AFY, 8AIO, 8ANB, 8AQO, 8AWZ, 8AXB, 8AXC, 8AYC, 8AZH, 8AZO, 8BCY, 8BDO, 8BDU, 8BFM, 8BFX, 8BGQ, 8BHD, 8BKE, 8BPL, 8BRQ, 8BVR, 8BWA, 8BZY, 8CDZ, 8CEI, 8CF, 8CGM, 8CGX, 8CLD, 8CMI, 8CUR, 8CYT, 8DAK, 8FT, 8KG 8SB 8SP, 8UK, 8UZ, 8VQ, 8VY, 8XJ, 8ZAF, 8ZZ, 9AAP, 9AAU, 9ABV, 9ACI, 9AFN, 9AJH, 9AJP 8AMB, 9AML 9ANQ, 9AON, 9AOU, 9APS, 9AQM, 9AQR, 9ARK, 9ARR, 9ARZ, 9ASD, 9ATU, 9AUA, 9AUS, 9AVM, 9AWF, 9AWM, 9AYS, 9BBF, 9BCB, 9BCF, 9BDS, 9BED, 9BEY, 9BGH, 9BHD, 9BHI, 9BHN, 9BJY, 9BKE, 9BKP, 9BLO, 9BMN, 9BEL, 9BSG, 9BVP, 9BXT 9BZI, 9BZZ, 9CCM, 9CCS, 9CCV, 9CBI, 9CFY, 9CGK, 9CI, 9CJJ, 9CMK, 9CP, 9CPB, 9DCR, 9DGQ, 9DHB, 9DJB, 9DJQ, 9DKY, 9DPL, 9DQU, 9DR, 9DSD, 9DSM, 9DTJ, 9DUN, 9DWK, 9DXD, 9DXN, 9DYN, 9DZQ, 9DZY, 9FM, 9II, 9IO, 9KP, 9LQ, 9LZ, 9NU, 9NX, 9OX, 9PA, 9PS, 9UC, 9UU, 9WA, 9YAJ, 9ZAA, 9ZAF, 9ZZ, Can. 9XAC.

Spark: 4BI, 4PD, 5AAT, 5AO, 5BW, 5EI, 5HZ, 5JF, 5MO, 5OI, 5QS, 5RF, 5TM, 5TU, 5UC, 5XA, 5XAC, 5XAD, 5XB, 5ZAC, 5ZAI, 5ZC, 5ZL, 8BDA, 8BYO, 9AMK, 9DHZ, 9DJB 9DMJ, 9DWM, 9DZY, 9JX, 9LF, 9MC, 9OR, 9YAK, 9YM, 9ZN.

6BVT, (portable) 6200-ft. elevation on Laguna Mt., (61 miles from San Diego, Calif.)

C.W.: 5ZA, 5PL, 5QI, 5DI, 6BRK, 6AOZ, 6AT, 6TW, 6KA, 6BJY, 6ZB, 6ZX, 6APW, 6BPZ, 6AQA, 6RU, 6BJU, 6BOE, 6BFF, 6BJX, 6AHH, 7LU, 9PI, 9ABV, 9AMB, 9BP, 9ZN, 9CJJ, 9AJT, 9COS, 9DUG.

6AOR, Berkeley, Calif. (1 Tube)

C.W.: 5DI, 5JL, 5QI, 5ZA, 6BF, (6CU), (6EA), 6EB, (6FT), (6GX), 6GY, 6JD, 6EN, 6KA, 6AEH, 6ABX, (6AJH), 6ALU 6ANP, 6APW, 6AQW, 6ATC, 6BCY, 6BEC, 6BEG, 6BEQ, 6BIR, 6BKO, 6BJY, 6BLU, (6BPZ), 6BQF, 6BQP, 6BQZ, 6BUM, (6BRK), 6BVQ, 6ZG, 6XAD, 6XAS, 7DB, 7IR, 7IY, 7LU, 7MF, 7NA, 7NF, 7OE, 7OT, 7QW, 7SC, 7SG, 7TQ, 7ACK, 7AEA, 7AFW, 7AGX 7ZB, 7ZU, 8IB 8WR, 8BCY vy QSA, QRA?, 9CB, 9DR, 9WD, 9AJA, 9ADS, 9AMB, 9AYU, 9AWP, 9AWM, 9COJ, 9DTM, 9ZN.

6AOW, 131 Sierra St., Riverside, Calif. (Every District)

C.W.: 1ZE, 1CVJ, 2AKJ, 2ZL, 4BF, 4BX, 4GV, 5BE, 5DI, 5KC, 5NB, 5NS, 5PX, 5QI, 5RK, 5XY, 5ZA, 5ZG, 5ZAV, 6AW, 6BJ, 6CC, 6CP, 6CU, 6EA, 6EB, 6EC, 6EN, 6FH, 6FT, 6GE, 6GX, 6GD, 6IU, 6JD, 6KA, 6KU, 6LK, 6LV, 6NX, 6OH, 6RD, 6RR, 6TW, 6UW, 6WR, 6XR, 6ZJ, 6ZA, 6ZB, 6ZE, 6ZF, 6ZG, 6ZS, 6ZX, 6AAQ, 6AAT, 6ABX, 6AED, 6AEH, 6AGP, 6AGW, 6AHQ, 6AIF, 6AIO, 6AIV, 6AJF, 6AJH, 6ALU, 6AOE, 6AOT, 6AOZ, 6APW, 6AQQ, 6AQW, 6ARB, 6ARC, 6ARD, 6ATG, 6ATQ, 6ATU, 6AVD 6AVU, 6AVV, 6AWG, 6AWP, 6AWT, 6XAD, 6XAS, 6BBC, 6BBV, 6BCD, 6BCJ, 6BCR, 6BCV, 6BEG, 6BEQ, 6BES, 6BFE, 6BIR, 6BJQ, 6BJR, 6BJX, 6BJY, 6BKO, 6BLA, 6BMD, 6BMP, 6BOC, 6BOD 6BOO, 6BPF, 6BPZ, 6BQC, 6BQD, 6BQF, 6BQG, 6BQP, 6BQQ, 6BQZ, 6BRD, 6BRE, 6BRG, 6BRK, 6BUM, 6BZG, 7DP, 7LU, 7LY, 7MF, 7NA, 7NY, 7OZ, 7QD, 7QW, 7SC, 7SY, 7TN, 7XC, 7XG, 7YJ, 7ZB, 7ZO, 7ZU, 7AEA, 7AEG, 8WR, 8ZZ, 8ACI, 8ANU, 8AQD, 8ASV, 8BCY, 8BFM, 8BKE, 8BXS, 8BZY, 9EI 9FM, 9IN, 9NX, 9PI, 9UU, 9ZM, 9ABU, 9AEQ, 9AJA, 9AJW, 9AMB, 9AMI, 9ANF, 9APS, 9APU, 9APW, 9ARZ, 9AWM, 9AYS, 9XAC, 9XAQ, 9ZAF, 9BBF, 9BJV, 9BSG 9BXU, 9BZZ, 9CFY, 9CNI, 9CNS, 9COW, 9CXC, 9DAE, 9DPI, 9DTB, 9DTC, 9DPL, 9DTM, Canadians 4BV, 5CS, 9AC.

Spark: 5ZH, 6AO 6AR, 6CC, 6DP, 6FH, 6GF, 6GI, 6GR, 6GT, 6HC, 6IC, 6IF, 6IB, 6KC, 6KE, 6KL, 6KM, 6OD, 6OL, 6QK, 6QR, 6QY 6TU, 6UP 6VA, 6VX, 6XU, 6ZQ, 6ZU, 6AAK, 6ABU, 6ARW, 6ACR, 6ADL, 6AEY 6AEZ, 6AGK, 6AGT, 6AHC, 6AHF, 6AHP, 6AHQ, 6AHU, 6AIU, 6AIH, 6AJU, 6AKL, 6AKT, 6ALA, 6ALD, 6ALV, 6AMK, 6AMN, 6AMW, 6AOR, 6APL, 6APV, 6AQS, 6AQU, 6ARI, 6ARK, 6ARS 6ASC, 6ATC, 6ATF, 6ATU, 6ATV, 6AVB, 6AVV, 6AWH, 6AWX, 6BAB, 6BAE, 6BAJ, 6BBV, 6BIC, 6BJG, 6BJU, 6BNV, 6BPU, 6BQD, 7FI, 7FQ, 7JG, 7JW, 7MF, 7OH, 7OT, 7TJ, 7VF, 7WG, 7YA, 7ZS, 7ZU, 7AEA, 7ABS, CL-8.

6RR, 415 N. Gower St., Los Angeles, Calif.

C.W.: 2PR, 4BF, 4BV, 5FV, 5IL, 5KC, 5QI, 5QU, 5XY, (5ZA), 6ZH, 5XAK, 6AK, (6AR), 6FH, 6GR, 6GX, 6IK, 6KU, 6NX, 6OH, 6PG, (6RD), 6UF, (6VZ), 6AAT, 6ABX 6AJH, 6AHF, 6AIY, 6AKL, 6AOF, 6AQD, 6ARB, 6ARS, 6ATQ, 6AWT, 6BCD, 6BCK, (6BCJ), 6BCR, 6BIC, 6BIK, 6BIR, 6BJQ, (6BJY), 6BNV 6BOE, 6BRD, 6BSA, 6BUM, 6BWE, 6XH, 6HJ, 6XT 6ZB, (6ZF), 6ZS, (6ZX), 6ZAC, 7BS, 7DP, 7HS, 7JW, 7IC, 7IW 7LU, 7MF, 7NJ, 7OZ, 7SC, 7TN, 7AEH 7AFT, 7AFW, 7AHW, 7AIU, 7XC, 7XI, 7ZB, 7ZJ, 7ZO, 8WB, 8UR, 8WR, 8ATP, 8ABR 8AMG, 8BVT, 8XJ, 9DR, 9GK, 9UA, 9UU, 9WD, 9ABV, 9AGH, 9AJS,

9AMB, 9AMS, 9AOG, 9AON, 9AOT, 9APW, 9AUA, 9AWM, 9AWN, 9AYS, 9AYU, 9ATA, 9BED, 9BIV, 9BXA, 9DAE, 9DKB, 9DRK, 9DSM, 9DTE, 9DVR, 9XAQ, 9ZAC, 9ZAF, 9YAJ, 9AVZ, 9DTM, 9BCB, 9ANG, 9II, Canadians 9BD, 9AC, 4BV.

On Loop with 8 steps R. F. Amplification, week of Sept 25th: 5KC, 5ZA, 5XY, 6AAF, 6APL, 6AVU, 6BFE, 6ZS, 7BS, 7OZ, 9AMB, 9AMS, 9BJV, 9UA, 9AGH, 9ZAF.

7ABB, Everetta, Wash., (Over 1000 miles)

4BQ, 4EB, 4FT, 4GS, (4KF), (4KT), (5AAR), 5BE, 5HB, 5JW, 5KC, 5LA, 5NW, 5PX, 5QI, 5SM, (5XU), 5ZA, 5ZH, 8AB, 8ACH, 8ASV, 8ATU 8BF, 8BKE, 8BRL, 8BWA, 8BXH, 8CFI, 8FT, 8IB, 8OW, 8UE, 8WR, 9AAW, 9AEQ, 9AJS, 9AJA, 9AKB, 9ALT, 9AMB, 9AMT, 9AOG, 9AON, 9APS, 9APW, 9ARG, 9ARZ, 9AUA, 9AVZ, 9AWM, 9AYS, 9BBF, 9BCB, 9BED, 9BJV, 9BSG, 9BXA, 9BZI, 9CP, 9CFI, 9CFY, 9CUI, 9DAX, 9DBL, 9DKY, 9DPL, 9DQE, 9DTE, 9DB, 9DSM, 9DZQ, 9ED, 9GK, 9II, 9LZ, 9NX, 9PI, 9PN, 9UU, 9WD, 9XAC, (9YAJ), 9ZAC, 9ZAF.

7IY, Vashon, Wash.

Spark: 8BAH, 8CMI, 8ZY, 9ATV, 9AXA, 9AZA, 9BTX, 9CYW, 9DMJ, 9DNC, 9DZY, 9MC, 9PN, 9BSM.

C.W.: 2FP, 2FM, 2ZE, 4BF, 4BQ, 4CR, 4EB, 4GA, 4GB, 4GN, 4KK, 4LP, 5EK, 5ER, 5DI, 5DY, 5HB, 5KC, 5JL, 5LA, 5PX, 5QI, 5QW, 5RH, 5RJ, 5SM, 5UE, 5UN, 5UO, 5XY, 5ZA, 8AFD, 8ASV, 8AFY, 8AQF, 8AQO, 8ACH, 8ATU, 8AXN, 8BEP, 8BDU, 8BFM, 8BCY, 8BFL, 8BWA, 8BFX, 8BRL, 8BNJ, 8CMI, 8CXN, 8HWA, 8IB, 8KG, 8OW, 8HRQ, 8BD, 8RT, 8SB, 8UK, 8UE, 8UC, 8ZZ, 9AGS, 9AYS, 9APW, 9ARR, 9ARZ, 9AWH, 9AUA, 9AON, 9AWM, 9AXV, 9AMB, 9AVZ, 9AWT, 9AGP, 9ABV, 9AOU, 9AMI, 9ANQ, 9APS 9AJP, 9AJH, 9ACH, 9AQS, 9AAP, 9ATN, 9AHM, 9AIK, 9BBF, 9BTT, 9BFG, 9BQB, 9BCP, 9BED, 9BGH, 9BEY, 9BXA, 9BHD, 9BJV 9BSG, 9BKG, 9BCB, 9BCM, 9CFI, 9CMR, 9DCK, 9DXN, 9DUI, 9DTM, 9DPL, 9DSM, 9DZQ, 9DKY, 9DR, 9DJQ, 9DHL, 9DTE, 9NU, 9II, 9RU, 9TM, 9TP, 9UU, 9XAC, 9ZAF, 9YAJ, 9ZAQ.

8BCY, Grand Rapids, Mich. (All Districts)

1FB, 1JT, 1RU, 1UH, 1AGH, 1ASF, 1BKQ, 1BUA, 1CGO, 2FP, 2FS, 2GK, 2HW, 2IW, 2NZ, 2TJ 2UD, 2AFB, 2AUW, 2AWF, 2BEH, 2BNU, 2BUK, 2CBW, 2BUC, 2ZL, 3BV 3CA, 3HL, 3LR, 3TJ, 3AFB, 3AQR, 3AUU, 3BGT, 3BLU, 3BRW, 4BQ, 4BX, 4CG, 4DC 4EB, 4EH, 4EL, 4FT, 4GK, 4ID, 4JK, 4KF, 4KU, 5DI, 5EK, 5ER, 5ES, 5FV, 5JL, 5JW, 5KC 5MB, 5PX, 5SK, 5SM, 5AAM, 5XA, 5XW, 5ZA, 6CP, 6KA, 6PD, 6TF, 6TN, 6BEG, 6BOE, 7ZO, 8AB, 8AN, 8AX, 8BO, 8CF, 8CI, 8EA, 8FT, 8GA, 8HJ, 8IB, 8IW, 8JU, 8KG, 8NV, 8OI 8OJ, 8OW, 8PM, 8PT, 8SB, 8SE, 8SL, 8SP, 8TO, 8UC, 8UE, 8UK, 8VQ, 8VY, 8WA, 8WI, 8WK, 8WR, 8WV, 8AAZ, 8ACH, 8ACO, 8ARG, 8AFD, 8AFK, 8AFV, 8AGO, 8AHA, 8AHR, 8AIM, 8AIT, 8AJP 8AJX, 8ALF, 8ALT, 8AAM, 8AMQ, 8ANB, 8AON, 8APT, 8APW, 8AQF, 8AQU, 8ARO, 8ASV, 8ATU, 8AUA, 8AUY, 8AWP (fone), 8AWT, 8AWZ, 8AXB, 8AXC, 8AXN, 8AZA, 8AZF, 8AZG, 8BAQ, 8BCF 8BDB, 8BDO, 8BDU, 8BDV, 8BEF, 8BEP, 8BFM, 8BFX, 8BGL, 8BJC, 8BJX, 8BKE, 8BKI, 8BLT, 8BNJ, 8BNU, 8BNY, 8BOZ, 8BPL, 8BRC, 8BRF, 8BRL, 8BRM, 8BRQ, 8BUC, 8BUM, 8BUX, 8BVR, 8BVT, 8BWA, 8BXA, 8BXF, 8BXH, 8BXT, 8BYA, 8BYF, 8BZR, 8CAK, 8CAU, 8CAY, 8CAZ, 8CDL, 8CDZ, 8CEF, 8CEI, 8CFD, 8CGM, 8CGN, 8CGP, 8CGX, 8CIA, 8CJH, 8CJX, 8CJY, 8CKO, 8XE 8ZN, 8ZZ, 8ZAF, 9AB, 9CR, 9DR, 9EI, 9FM, 9FZ, 9GL, 9IO, 9KI, 9KM, 9LQ, 9LZ, 9NX, 9DX, 9PJ 9PN, 9PS, 9RT, 9UC, 9UH, 9UN, 9US, 9WA, 9WC, 9WR, 9WT, 9AAP, 9ABV, 9ACS, 9AFN, 9AIP, 9AIU, 9AIX, 9AJH, 9AJP, 9ALW 9AMI, 9AMQ, 9ANQ, 9AOG, 9AOL, 9AON, 9AOU, 9APS, 9APW, 9AQR, 9ARR, 9ARZ, 9ASD, 9ASZ, 9AUA, 9AUL, 9AWA, 9AWF, 9AWM, 9AXF, 9AYA, 9AYS, 9AZD 9BAA, 9BAF, 9BBF, 9BCF, 9BCG, 9BCT, 9BDB, 9BDS, 9BEH, 9BEY, 9BGW, 9BHD, 9BHI, 9BJV, 9BKP, 9BKW, 9BLC 9BMN, 9BNU, 9BQW, 9BRL, 9BSG, 9BSZ, 9DAH, 9DBM, 9DCA, 9DCR, 9DCT 9DCU, 9DDK, 9DDY, 9DEK, 9DFB, 9DGQ, 9DVT, 9DVW, 9DWX, 9DXN, 9DJQ, 9DKY, 9DQU, 9DSW, 9DZQ, 9XL 9XAC.

8ZY, Defiance, Ohio (Every district)

Spark: (1AW), 1BOQ, 1CNI, 1GB, 2AJE, (2AD), (2ARY), 2BUE, 2WB, (FP), 2GK, 2OM, 2XAJ, (Can. 3BP), Can. 3GN Can. 3BV, 3AHR 3ACY, 3AWF, 3GL, (3GZ), 4BI, 4BX, 4CG, 4GN, 5BW, 5BE, 5EI, 5JF, 5JX, (5MO), 5XA, 5XB, 5XW, (5XAC), (5ZAW), (5ZL), 8ALF, 8AGP, 8ARS, 8ARD, 8AXB, 8AFG, 8AFK, 8ACY, (8AIT), (8AIZ), (8BVX), (8BDA), (8BEP), 8BRL, 8BQA, (8BRY), 8BXQ, 8BXC, 8BTJ, 8BXH, (8CTI), (8CMI), (8CDS), 8CDT, 8CYU, 8OCB, 8EK (8EW), (8EO), 8CP, 8FT, 8IL, 8LH, (8TK), (8UC), 8WU, 8VE, (8VQ), 9ATV, 9AEP, 9ARG, 9ASK, 9AYS, 9ARR, 9AIR, 9AQE, 9AGG, 9AOJ, 9ANT, 9AUU, 9AQR, 9AIK, 9APW, 9AWR, (9AYW), (9AXU), (9AU), (9AZA), (9AFH), (9AZF), (9ABM), (9AMQ), (9AIP), (9AZE), (9ARG), (9BZZ), 9BSD, 9BTX, 9BNC, (9BMN), (9BSZ),(9BXC),(9BIQ),(9BWS), (9BXC), (9BZE) (9BHZ), (9CP), (9CS), 9CTW, 9DWX, 9DZQ, 9DPB, 9DGW, 9DP, 9DRW, 9DCW, 9DYZ, 9DPW, 9MA, 9DKB, 9DGZ, 9DXK, 9DWW, 9DTN, 9DCT, (9DSD), (9DZY), (9DMJ), (9DKQ), (9DXT), (9DWM), (9FK), (9GC), 9GX, (9JE), (9PN), 9PD, 9QR(9RR), (9TL), (9TV), 9UU9 9VL, 9WX, 9YB, (9YM), (9ZN), (8ZU), 8ZC, 9ZX, 9XT, (WHB), (DL), (DZ).

C.W.: 1AJP, 1BKQ, 1BQD, 1CVS, 2AJW, 2AUZ, 2AVE, 2AZY, 2BFS, 2BNZ, 2BRC, 2BQD, 2CBW, (2FP), 2GK, 2KU, 2NZ, 2ZL, 3ANQ, 3AUU, 3BLF, 3BMN, 3BIJ, Can. 3BP, 3CBM 3CLP, 3BO, 3FS, 3HD, 3OE, 3RE, 3RP, 3ZO, 3ZZ, 4BF, 4BNU, 4BQ, Can. 4BV, 4BX, 4DM, 4EB, 4EH, 4GH, 4KF, 4OI, 5BE, 5BX, 5CY, 5DI, 5EK, 5EM, 5EE, 5FV, 5JL, 5KC, 5QI, 5QS, 5RM, 5SK, 5UK, 5UD, 5XAD, 5XV, 5ZA, 5ZG, 5ZAV, 6ZH, 6BSA, 6KA, 6KN, 6XJ, 6XAD, 6ZF, 6ZG, 7AD (8AFY and phone) 8AFB, 8AIO, 8ANH, 8AXE, 8APT, 8AQF, 8AWP fone, 8ATU, 8AA, 8ADZ, 8ASV, 8AKP, 8AXB, 8AWZ, 8AIM, 8AW7 (8BYC), 8BJL, 8BJC, 8BJX, 8BKY, 8BCK, 8BCX, 8BKE, 8BDO, 8BQZ, 8BQF, 8BUS, 8BXC, 8BWA, 8BI, 8BOQ, 8BXH, 8BVR, 8BO, 8BRH, 8BFM, 8BFM, 8BUX, 8BXH, 8BRW, (8CJH), 8CUE, 8CJX, 8CAJ, 8CAG, 8CZC, 8CAY, 8CWB, 8COM, 8CKO, 8CYT, 8CQM, 8CUM, 8CBC, 8CDZ, 8CYU, 8CMM, (9CBR), 8CJO, 8CN, 8CV, 8CNI, 8CMI, 8DW, 8DZ, 8ER, (8FT), 8FL, 8IJ, 8JQ, 8QP, 8UK, 8UP, 8UE, 8VZ, 8WR, (8XJ), 8YD, 8ZZ, 8ZE 8ZH, 8ZAF, 8ZAG, 8APW, 8ARW, 8ANQ, 8AP8, 8AON, 8AEQ, 8AFN, 9AAP, 9AOG, 9AYS, 9ABV, 9AQ, 9ARR, 9AOG fone, 9AJH, 9AW, 9ANP, 9AVA, 9ACI, 9AXC, 9AKB, 9AWF, (9AIY), 9AVV, 9AWM, 9ACS, 9BSG, 9BOT, 9BED, 9BJV, 9BJY, 9BHD, 9BOS, 9BVP, 9BZI, 9BZZ, 9BYZ, 9BCB, 9BHC, 9BTT, 9CP, (9CBA), 9CVW, 9CNV, 9CJA, 9DSD, 9DUG, 9DAX, 9DKY, 9DKB, 9DQU, 9DGE, 9DPL, 9DZW, 9DR, 9DBL, 9DCR, 9DZY, 9DJQ, 9DCF, 9DJO, 9DCP, 9KY, 9FM, (9FK), 9GE, 9GL, 9HK, (9II), 9IO, (9KP), 9NX, (9PS), 9UC, 9UU, 9WA, 9YX, 9YAJ and fone, 9ZAA, 9ZAR, 9ZL, (9ZN).

9ZAF, Denver, Colo.

Spark: 5EI, 5EN, 5JP, 5QS, 5XA, 6EV, 6KE 6VA, (6AJH), 7ZD, (7ZU), 8BDA, 8EK, 9II, 9NX (9RR), 9ZN, 9AJD, 9AMK, 9AUK, 9AYW, 8BDH, 9BKN, 9BSZ, 9BXM, 9BZC, 9BXK, 9CTW, 9CWT, 9DQK, 9DXC, 9YAK.

C.W.: 2FP, 4BF, 5BE, (5DW), (5DI), 5DY, 5EK 5IR, (5JL), 5JB, 5KB, 5KC, (5LB), 5NB, 5NY 5PS, 5PX, (5QI), 5RJ, 5SF, (5SM), 5TU, 5UK, 5UN, 5VA, 5VO, 5XB, 5XV, 5XY, 5YQ, 5ZA, 5ZG, 5ABA, 5ABY, 5ZAP, 5ZAV, 5ZAW, 6BF, (6CP), 6CU, (6EA), (6EB), 6EN, (6FH), (6FT), 6GE, (6JD), 6KA, 6NX, 6RR, (6XJ), 6XP, 6XA, (6ZB) 6ZF, (6ZG), (6ZS), (6ZX), 6ABX, (6AGP), 6AJH, (6ALU), 6AMD, 6AOA, (6APW), (6AQW), 6ARB 6ASJ, 6ATQ, 6AWB, (6AWT), 6BBC, 6BCR, 6BES (6BES), 6BFG, 6BHQ, (6BJQ), (6BJY), (6BMD), (6BOA), 6BPL, 6BPQ, (6BPZ), (6BQC), 6BQF, 6BQK, 6BQZ, 6BRK, (6BSA), 6BSW, 6BXT, (6XAD), 7HS, (7LU), 7QD, (7YA), (8ZB), 7ZG, 7AEA, (7AFW), 8AB, 8IB, 8WR, 8XE, 8ANB, 8AQS, 8AWV, 8AZB, (8AZD), 8BCY, 8BXA, 8BUX, 8CKX, 8CJH, 9DZ, 9DC, 9CK, 8CP, (9DR), 9EW, (9FK), 9FM, 9FV, 9HI, 9HW, 9II, 9KP, 9MP, 9OX,

9PA,9PS,9QF,(9UU),9XL, 9YW, 9ZG, 9ZL, 9ZZ, 9AAP, 9ABN, (9ABV), 9AEP, 9AFN, 9AFW, 9AGR, 9AJP, 9AJX, 9AMI, 9AMS, 9AMU, 9ANF, 9ANQ, 9ANS, 9AOG, 9AOL, 9AON, 9APS, (9APW), (9AQM), 9AQZ, 9ARR, 9ARZ, 9AUA, 9AUS, 9AVS, 9AWM, 9AYS, 9BAF, 9BAV, 9BBF, 9BBS, (9BCF), 9BCY, 9BDI, 9BDS, 9BED, 9BEP, 9BFG, 9BGH, 9BHD, 9BIW, 9BJA, 9BJM, 9BJV, 9BKB, 9BKP, 9BKR, 9BLC, 9BMD, 9BMN, 9BOA, 9BPY, 9BSG, 9BTT, 9BVP, 9BXM, 9BXT, 9BYA, 9BZI, 9CAD, 9CAO, 9CCS, 9CFI, 9CJJ, 9CKM, 9CNS, 9COI, 9CPB, 9CTR, 9CTW, 9CUG, 9CWJ, 9DCF, 9DCU, 9DET, (9DQB), 9DGM, 9DJY, 9DKL, 9DKQ, 9DKY, 9DNT, 9DOF, (9DPL), 9DQE, 9DQM, 9DQU, 9DSM, 9DUG, 9DXD, 9DXN, 9DYQ, 9DYZ, 9DZI, 9DZQ, 9DZU, (9YAJ), 9ZAA, Canadian (4BV), 9AC, AD7, Phone: 6QI, 6ZG, 6AK, (6XJ), (7YA), 9YAJ.

9YAJ, Dept. of Physics, St. Olaf College Northfield, Minn

Spark: (5JF), 5MO, 5TP, 5TU, (5XAC), 5ZAW, 8AFQ, 8BDA 8BXC, 8SP, (9AMK), 9AOJ, 9AQE, 9ARQ, 9ARX, 9ATV, 9AU, 9AXU, 9AYW, 9AZA, 9AZF, (9BMN), 9BSZ, 9BTX, 9BWS, (9BXC), 9DGW, 9DNC, 9DOT, 9JX, 9LF 9MC, (9RR), 9XT, (9YB), 9ZC, (9ZN).

C.W.: (1AJP), 1ARY, 1YK, 1FB, (2BNZ), 2FP, (2GK), 2AWF, (3AQR), 3BLF, 3BP Can., 3EB, (3GK) Can., (3KO), 3BV Can., 3BNU, (3MK), 3OT, (3VW), 4BF, 4BQ, (4BV) Can., 4CR, 4GB Can., 4KF, 5BE, (5DI), 5DW, 5DO, 5DY, 5FK, (5EL), 5JB, (5JL), 5JW, 5KC, 5NV, 5PX, (5QI), 5QS, (5RH), 5RJ, 5SF, 5SG, 5SK, 5SN, 5UN, (5UO), 5VI, 5XA, 5XU, 5XV, 5XY, 5YAC, 5ZA, 5ZAV, 5ZT, 5ZZ fone, 6BOE, 6ASJ, 6BSA, 6CP, 6BSA, 6CP, 6JD, 6KA, (6GR), (7LU), (8AB), 8ABQ, 8ACH, (8ADT), 8AFD, 8AFY, 8AIN, 8AIO, 8AKP, 8ALF, 8ALT, (8ANB), 8APW, 8ATU, 8AWZ, 8AXB, (8AXC), 8AYS, (8AZD), 8AZO, 8BOY, 8BEB, (8BEF), (8BFM), 8BFX, 8BFZ, 8BHO, 8BJC, 8BJX, (8BKE), 8BKI, 8BMM, 8BNJ, 8BO, 8BRL, (8BTL), (8BUC), (8BUX), 8BVR, (8BWA), 8BWK, 8BXC, 8BXH, 8BZY, 8CAU, 8CF, 8CFP, 8CGX, 8CI, 8CJH, (8CKO), 8CUR, 8CAN, (8CMM), 8DZY, 8FT, 8IB, (8IJ), 8OW, 8SB, 8SL, 8UK, 8VY, 8WI, (8WR), 8ZAF, (8ZE), 8ZZ, 9AAP, 9ABV, 9AC Can., 9ACS, (9AD7), (9AEP), 9AFN, 9AGG, 9AHN, 9AIP, 9AIV, 9AIY, 9AJH, 9AJP, 9AL Can., 9ALW, 9AMB, 9ANQ, 9AMQ, 8AOG, 9AON, 9AOU, (9APS), (9APW), 9AQR, 9ARR, 9ARZ, 9ASN, 9ATU, (9AUA), 9AUS, 9AWF, (9AWM), (9AYS), 8BBF, 9BCB, 9BED, 9BEH, 9BGH, 9BHD, 9BHN, (9BIW), (9BJV), 9BKJ, (9BKP), 9BKW, 9BSG, (9BTT), 9BVP, 9BXA, 9BXT, 9BXY, 9BZE, (9BZI), 9CFI, (9CGD), (9CGF), (9CHN), (9CJA), (9CMJ), 9CNH, 9CP, 9CPB, 9CPC, 8CPH, 9CT, 9CTR, (9CTW), 9CVW, (9CTW), 9CVW, (9CJJ), 9DBL, 9DCF, 9DCG, 9DCR, (9DCU), 9DFX, (9DGE), 9DHB, 9DHZ, 9DJB, (9DKB), (9DKY), 9DMJ, 9DOL, (9DPL), 9DPR, 9DQE, 9DQQ, 9DQU, (9DR), (9DSM), 9DSO, (9DSW), (9DUG), 9DUN, (9DVW), (9DXN), 9DXL, 9DZQ, 9DZW, 9DZY, 9EI, (9EW), 9FK, 9FM, (9IF), (9II), 9IO, 9IY, 9KN, (9KP), 9MY, 9LN,9NX,9OF,9OX,9PA, 9PS, (9PI), (9QE), 9QF, 9QR, (9UC), 9UH, 9UU, 9VE, 9VZ, 9XL fone, (9WS), 9YAE, 9ZA, 9ZAA, (9ZAF), (9ZL), 9ZN, 9ZO, (9ZU).

9AHC, Ellendale, N. Dak. (1 tube)

C.W.: 1BDI, 1XU, 2FP, 2BRC, 2NZ, 3ALN, 3BNU, 3LR, 3OT, 3QV, 3XAI, 3ZZ, 4BF, 4BQ, 4BX, 4FT, 4KP, 5AAR, 5ACF, 5AE, 5AG, 5BE, 5BM, 5CY, 5DI, 5DW, 5EG, 5EK, 5EL, 5FV, 5IR, 5IX, 5JB, 5JL, 5JW, 5KC, 5LB, 5ME, 5ML, 5NB, 5NV, 5PF, 5PO, 5PX, 5QI, 5QS, 5RH, 5RJ, 5SF, 5SK, 5SM, 5UB, 5UK, 5UN, 5UO, 5VA, 5XV, 5ZA, 5ZAV, 5ZG, 5ZH, 5ZZ, 6AAG, 6ABX, 6ALU, 6APW, 6ATQ, 6AVD, 6AW, 6AWT, 6BF, 6BJY, 6BKO, 6BOE, 6BQL, 6BSA, 6BUM, 6BVQ, 6CP, 6CU, 6EB, 6EN, 6GX, 6KA, 6NX, 6RD, 6RR, 6XAD, 6XJ, 7AFW, 7HS, 7LU, 7MF, 7SC 7TH, 8AB, 8ACH, 8ACO, 8AFD, 8AFY, 8AIG, 8AIO, 8AKP, 8ALF, 8AMM, 8APT, 8APY, 8AQF, 8AQO, 8ARD, 8ASV, 8AWT, 8AWZ, 8AXB, 8AXN, 8AZD, 8BAK, 8BCY, 8BDB, 8BFM, 8BFX, 8BGL, 8BGO, 8BJC, 8BJV, 8BKE, 8BMK, 8BNJ, 8BQF, 8BRL, 8BUC, 8BUX, 8BVT, 8BWA, 8BXC, 8BXH, 8BXT, 8BZY, 8CAK, 8CAU, 8CAZ, 8CBC, 8CBX, 8CDZ, 8CF, 8CGP, 8CIA, 8CJH, 8CLD, 8CMM, 8CMY, 8CPX, 8CUR, 8CUS, 8DAK, 8DCY, 8FT, 8IC, 8IJ, 8JU, 8KG, 8OE, 8SB, 8SP, 8UE, 8UK, 8VY, 8XE, 8XJ, 8YD, 8ZAF, 8ZE, 8ZZ; nearly 200 nines including following over 500 miles: 9AAP, 9ABV, 9AFN, 9AIU, 9AIY, 9AJH, 9AKB, 9ALW, 9AMB, 9AMQ, 9ANQ, 9AOG, 9AON, 9APS, 9AQM, 9AQR, 9ARK, 9ARR, 9ASD, 8ASU, 9AUS, 9AVN, 9AWF, 9AYB, 9AYH, 9BAZ, 9BDS, 9BED, 9BEH, 9BHD, 9BHN, 9BIW, 9BIZ, 9BKM, 9BLO, 8BQW, 9BUN, 9BVP, 9BXA, 9BYA, 9BYF, 9BZZ 9CAC, 9CAO, 9CCS, 9CEB, 9CFI, 9CFY, 9CGD, 9CGN, 9CJA, 9CKM, 9CLN, 9CNS, 9COI, 9CP, 9CPC, 9CST, 9CTW, 9CUC, 9CUO, 8CVI, 9CVO, 9DCR, 9DDY, 9DFB, 9DGQ, 9DHB, 9DJB, 9DJQ, 9DNJ, 9DPJ, 9DPL, 9DRR, 9DSD, 9DTE, 9DTJ, 9DTM, 9DUG, 8DUN, 9DXN, 9DZB, 9DZU, 9DZY, 9EI, 9EJ, 9FM, 9FV, 9GL, 9II, 9IO, 9KP, 9LQ, 9LZ, 9NU, 9NX, 9OX, 9PA, 9PF, 9PS, 9PW, 9QR, 9UC, 8UU, 9VK, 9WA, 9XAC, 9XL, 9XM, 9ZAF, 9ZE, 9ZN!!!!!, CY1, WUBA. Canadian: 3BP, 3KO QRA?, 4BV, 4GB QRA?, 9AC QRA?, 9AL.

Fone: 5ZZ, 9ASF, 9BEY, 9BQW, 9CUC, 9PI, 9YA.

Spark: 5AQ, 5EI, 5MO, 5NS, 5QS, 5TC, 5TU, 5UD, 5UE, 5XAC, 5ZAW, 7WG, 7ZG, 7ZU, 8ARD, 8BDA, 8EB, 8PU, 8UC, 8ZY; nines over 500 miles: 9ACL, 9AFK, 9AHZ, 9AIP, 9AIR, 9AMK, 9AMQ, 9AOJ, 9AQE, 9ARG, 9ARX, 9AU, 9AZE, 9BMN, 9BWS, 9CA, 9CP, 9CTW, 9DCW, 9DEL, 9DHZ, 9DMJ, 9DSD, 9DUG, 9DZY, 9GC, 9JX, 9KA, 9LF, 9MC, 9OX, 9RR, 9TV, 9YB, 9YM, 9ZN, 9ZV. Every district heard in 40 minutes.

9ZN's "FJ", 5723 Winthrop Ave., Chicago, Ill.

Spark: 1AW, 1GM, 1CNI, 2BY, 2FP, 2OM, 2AER, 2BJO, 2DCY, 3AWF, 8UD, 4BI, 4FD, 4GN, 4HX, 4KC, 5BW, 5FJ, 5JF, 5MO, 5TU, 5XA, 5XAC, 7ZU, 8AIZ,8ARZ,8AS,8ARD,8AFG,8AFK, 8AWU, 8ATQ, 8AL, 8ACF, 8AZF, 8AYI, 8BXC, 8BDA, 8BEP, 8BIB, 8BRL, 8BYO, 8CYU, 8CSD, 8CP, 8EB, 8EW, 8FT, 8KJ, 8NZ, 8UC, 8ZY, 9APR, 9AZF, 9AMT, 9ARX, 9AIR, 9AZE, 9AIP, 9AGG, 9ARG, 9AYW, 9AZA, 9AUA, 9ATV, 9AFW, 9AXU, 9AJB, 8BMN, 9BXT, 9BKK, 9BDF, 9BSZ, 9BXC, 9BTX, 9DWM, 9DXT, 9DTN, 9DZY, 9DCW, 9DUG, 9DMJ, 9DJB, 9FK, 9LF, 9MC, 9PD 9RR, 9TL, 9UH, 9VZ, 9YB, 9YM, 9ZV.

C.W. on loop: 1AJP, 1AHM, 1AM, 1AWB, 1ASF, 1ABD, 1AZL, 1BDI, 1BGF, 1BKQ, 1BWJ, 1CCZ, 1FB, 1ON, 1XP, 2AMZ, 2AZY, 2BRC, 2BMR, 2BRB, 2BNZ, 2BSC, 2BTW, 2EL, 2FP, 2GK, 2NZ, 2RB, 2VA, 3AQR, 3AEV, 3APR, 3AIS, 3ALN, 3BGT, 3BVL, 3BMG, 3BUC, 3BIJ, 3BNU, 3BVA, 3BLU, 3CA, 3FS, 3LR, 3MK, 3OT, 3SK, 3VW, 3XAI, 3ZZ, 4AU, 4BQ, 4BY, 4BX, 4CA, 4DP, 4EL, 4FE, 4FT, 4GH, 4GK, 4GX, 4JX, 4JY, 4NV, 5AUL, 5BE, 5CY, 5DI, 5EK, 5ER, 5JL, 5QS, 5SM, 5SF, 5UK, 5UO, 5ZA, 6ABX, 6ASJ, 6AWT, 6CP, 6CU, 6JD, 6KA, 6XAD, 7LU, 7ZO, 8ACS, 8AXB, 8ANB, 8AXN, 8AFD, 8AN, 8AWM, 8ATU, 8ASM, 8APN, 8AQO, 8APT, 8AZR, 8APW, 8AQF, 8AGO, 8ATV, 8AIO, 8ABV, 8AOL, 8ADT, 8ALF, 8AER, 8AHR, 8AWP, 8AXC, 8ARD, 8ARZ, 8AMM, 8AZD, 8AB, (French ? hi), 8BFM, 8BWA, 8BXH, 8BKN, 8BRQ, 8BEF, 8BKI, 8BTL, 8CGM, 8BDU, 8BDB, 8BKE, 8BJX, 8BUC, 8BHO, 8BTR, 8BSY, 8BAH, 8BFQ, 8BWK, 8RDB, 8BOQ, 8BRQ, 8BXT, 8BMM, 8BVR, 8BWK, 8CJH, 8CKO, 8CMY, 8CEI, 8CUR, 8CBG, 8CJY, 8CTP, 8CAK, 8CRZ, 8CKM, 8CFP, 8CAU, 8CF, 8CAK, 8CGX, 8CVE, 8CLD, 8CTK 8CON, 8CDZ, 8DAK, 8FS, 8FT, 8HJ, 8IB, 8KG, 8SB, 8UE, 8UK, 8VY, 8WR. 8XE, 8ZAF, 8ZAE, 8ZE, 8ZZ, 9ABV, 9AQM, 9AYS, 9AVZ, 9AAP, 9AJP, 9AIV, 9APS, 9APW, 9AUS, 9ARZ, 9AON, 9AFT, 9AQE, 9ARR, 9AMO, 9AOG 9AAU, 9ASD, 9AWF, 9MI, 9AJB, 9ASJ, 9AWM, 9AFN, 9ACS, 9ARG, 8BGH, 9BSG, 9BAF, 9BDS, 9BCF, 9CYA, 9BEH, 9BZI, 9BTT, 9BWK, 9BBE, 9BJV, 9BBF, 9BED, 9BXT, 9BXY, 9BWP, 9BHD 9CAH, 9CEK, 9CGN, 9CFI, 9CPM, 9CFW, 9CEB, 9CJT, 9CXW, 9CJA, 9DR, 9DSD, 9DKY, 9DPL, 9DJO, 9DEK, 9DCR, 9DTJ, 9DZQ, 9DNT, 9DUG, 9DQU, 9DVW, 9DZW, 9DBK, 9DTM, 9DJQ, 9DSM, 9DUN, 9DGE, 9EI, 9EJ, 9EW, 9FK, 9HK, 9IO, 9II, 9LQ, 9NU, 9OF, 9OX, 9PF, 9PS, 9RR, 9UC, 9UH, 9WA, 9XAC 9XL, 9YAJ, 9ZAF, 9ZL, 9ZV, Canadians 4BV, 3CO, 3KO.

Radio Communications by the Amateurs

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

"Who Will Save the A.R.R.L.?"

Atlanta, Ga.

Editor, *QST:*

I have just read with disgust the article in "Radio News" about us amateurs. The insinuations which this bird makes are an insult to the whole A.R.R.L. and if you fellows at Headquarters don't start something, such bunk as that will soak in some of these fellows' heads and then there will be a scrap. I was "all het up" when I read the parts about you and the whole gang there at Hartford, and I want to make a motion right now that any A.R.R.L. member that tries in this contest ought to be tarred and feathered and hung suspended from the top of the Washington Monument.

Let 'em have it, because the whole gang here is with you.

Best 73's

H. L. Reid, 4KU.

What Some Think

Ithaca, N. Y.

Editor, *QST:*

I've had a great load on my chest for quite some time and when a radio man is in such a condition, there is only one thing to do. Get it off!

It grieves me greatly, as a before-the-war ham, to see the present crop of crystal, tuning-coil, broadcast listeners refer to themselves as "amateurs." Why, man alive, they aren't any more amateurs than a Siberian weasel. They aren't interested in *radio*. They simply use radio as a means to get their pretty (?) music. Do people who have victrolas refer to themselves as "Musical Reproduction Engineers"?

The editor of a radio magazine, which used to be for amateurs, seems to differ with me. He calls the radiolette crowd "amateurs." It was the old amateur boys who built and supported his magazine when it was young, but now that he's got a larger audience for his enlightening (?) editorials, he tried to *straddle* the issue, like a fourth-rate politician, and call all people who use radio, for any reason, amateurs. He's after the almighty dollar, just like the rest of his race. (T.O.M., send for the K K.K.)

These broadcast fish will never be amateurs. They'll tire of over-modulated music. Some Wednesday night this winter, tune in BG5, a Signal Corps station in Ithaca. Shades of a 1902 phonograph with a cracked record and worn needle! Music!!?!

I certainly have to laugh over some of these ambitious money-making schemes, which are results of the sudden radiolita-broadcast catastrophe. Some bird in town here has started a radio course. I swear that 6 months ago, he didn't know a lightning-switch from a grid-leak. "We've got the dope," he advertises. He's bought a load of junk, mostly loud-speakers, and has "gone in deep" as his agricultural son informed me. He gives free evening concerts, FREE! His aerial is PARALLEL to the street car tracks, 10 yards away, and when a car goes by, well, hold tight, Mildred, it's only an "amateur's" radio set.

Just as marriage is a cause of divorce, poor concerts will ruin broadcasting.

Yours for light wine and dark beer,

John Paul.

[Editor's Note: A day hardly goes by without a letter such as the above being received at our office. We all admit that lots of things we have seen and heard lately give us a supreme pain in the ground connection. The chief offenders are those who have heard of the big money in radio and who, with little or no experience, pose as experts or try to gain publicity thru astounding statements. If a broadcast listener is building a set and needs help and advice we should by all means do what we can for him as he is almost an amateur (except for a wrong start) and the amateur co-operative spirit should be shown him. But these know-it-alls,—!!]

Righto!

Worcester, Mass.

Editor, *QST:*

Recently I have noticed among some amateurs the "razzy" attitude towards the r.f.l. (radiofone listener). I am not one of them, in fact I got the bug or disease back in 1912 and have had it ever since, even with Uncle Sam and later as operator at 1XZ. What I would like to bring out is that if we continue our present attitude it will tend to draw these r.f.l. men away from affiliation with the A.R.R.L., some of whom in time would probably be bona fide

hams, "even as you and I." They will get the idea that they belong to a different species of bug, and co-operation with them will be made much harder, if not impossible.

Wouldn't it be better all around if we tolerate them and show them how much more fun it is to learn the code and to actually communicate with hams hundreds of miles away, than to just sit and listen to a dozen peanut roasters within the radius of a few hundred miles?

It seems to me that we ought not sit back and fold our arms with the "thank God we are not as they" attitude. Let us get out and "rush" worthy r.f.l.'s for our A.R.R.L. It is a good chance to win a prize for subscriptions to *QST* too.

With best wishes,

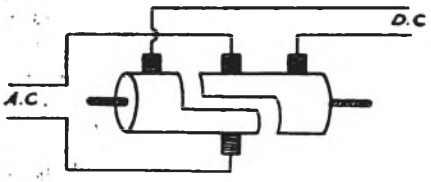
A. W. Parkes

A Sync Rectifier

S. S. Redondo,
San Diego, Cal.

Editor, *QST*:

Here's a sketch of a high voltage synchronous rectifier, which, having gone into disuse owing to its inability to handle larger currents, should find favor among those operating C.W. sets.



The principle of operation is exactly the same as in 6ZZ's layout, the only difference being in the mechanical design.

Hoping this gadjet may be of some use, I remain,

Cordially,
Ben. B. Skeete.

A Sample

Milwaukee, Wis.

Editor, *QST*:

Last winter and spring I was a confirmed broadcast hound, but since then I have mastered the code somewhat at the age of twenty-five, operate the above station, and believe me, get ten times the enjoyment after having joined the ranks of the hams. I can thank broadcasting that it indirectly got me with the real bunch.

One of my friends approached me about subscribing to *QST* because he was out for a prize. I am already a subscriber, but like it so well, that I subscribed for another year in advance and also ordered a subscription for my young brother.

Yours in the name of amateur radio,
E. T. Howell, 9CVI.

Awrf!

Dire Mr. Editaire:

Igo dosa beega M.I.T. schoola Cambridge Mass. U.S.A. anda somteengs heesa heppen dere dosa day verrai funnay. My eengiisha teechaire he say, "Geev me da quartaire anda I buya da papaire for you." I geeva heem da quartaire anda he geev me wan beeg radio papaire an say "Looka heem ovarire anda discouse somteengs aboot heem inside." For longa tim I lika buya dosa papaire but I no lika pay so mooch money for justa covaire. I belonga me da gooda papaire—she's a calla da *QST*—I lika heem dam fin. Well, bimeby I looka heem ovaire dosa beega papaire witha dosa prittay covaire, anda I finda he's a full a watumacalla da bull. Onlay wan theeng I finda I lika da read. He's calla da "Brickbat Glacé" on da page 453. Da nexta lasta pairagrapha espescailment. He's my cements exactlay—I bin theenka dosa sems theeng myselph longa tim. So I writa beeg discouse bout dosa "Brickbat Glacé" anda mi teechaire he's a say, "Atsa gooda wun." He's a maka mi feela gooda wen I theenka I belonga dosa *QST* anda dosa A.R.R.L. I nevaire, nevaire reada again dosa beega bull papaire.

I see sumteengs wun tim in mi *QST* she's a say, "Taka you pen in hand," so I hev write lettaire to you.

Hopa you family es good, mooch oblidge.
Tony Spaghetti.

More on Break-In

Toronto, Ont.

Editor, *QST*:

Perhaps you will permit one of your newest members to say a word or two anent the subject of "Break-In" or Duplexing systems of reception. I was much interested and impressed by an article in the October number of *QST* by "BeeP" on the above subject. The good old "wave trap" offers one of the best solutions to the trouble of the receiving antenna absorbing too much energy which should be producing the sigs at the receiving end of the circuit.

Some time ago the writer succeeded in obtaining with the minimum of experimental work, a quite good duplex for phone work by means of the simple arrangement of connecting the receiver to the aerial and ground terminals of the transmitter thru a wave trap. The transmitter employed was a 5-watter working on 261 metres. The antenna current was of the order of 0.75 amperes. Reception of short waves up to 251 metres was excellent, there being but a small weakening of the received signals from another 'phone set of similar power working on that wave in the city here.

For the "wave-trap," use was made of a wavemeter with a coil of 25 turns of No. 16 gauge D.C.C. wire on a form 3½-inches in diameter, and a variable condenser of 0.001 mfd. capacity maximum of a *good*

standard make. The excellence of the condenser is a matter of prime importance, as is also the resistance of the coil, which should be as low as possible. It is recommended that the coil be made of some such material as copper gas-line piping.

The tuning of the circuit is most easily done by means of the T.C. milliammeter placed in series with the receiver primary and tuning the trap so that minimum current is obtained. The transmitter should, of course, be operated at reduced power while this is being done. Another method which is rougher consists in tuning the circuit so that the antenna ammeter of the transmitter shows no falling off when the wave trap is connected.

One further note,—the tuning of the primary of the receiver is rather "funny" when the wave trap is in the circuit; but a reasonable amount of persistence will show how to deal with this.

Yours sincerely,
R. A. H. Galbraith,
Canadian 9AJ.

Saved at Last!

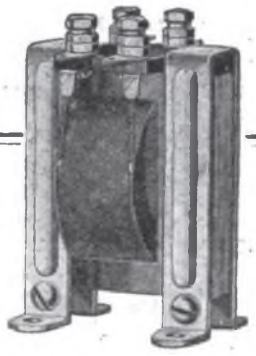
Oct. 16, 1922

Editor. *QST:*

We have noticed
That a certain magazine
Has published an article
With a grand big prize
Of 500 berries
For some poor boob
Who will sit down and write
A Little Story of 1000 words
With a heading entitled
"Who will save the amateur."
We can't but wonder why
This radio editor
Has offered so much
For this kind of a story
When it has always been
His claim to be
The only friend
That the amateur had
And the only one who
Took his part whenever
He was being imposed upon.
And we'd like to say
That all amateurs know
There is only one way
To save the amateur
And that is this:
To do away with single circuits
And magazines that have
An editor like him.
I thank you.

Ate Gee Oh.

(Apologies to K.C.B.)



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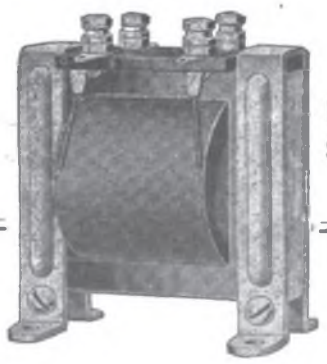

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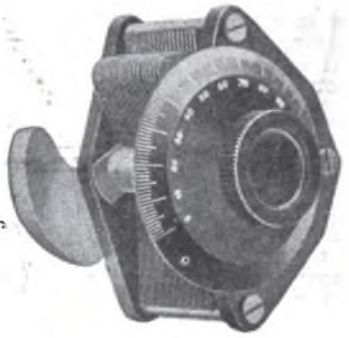

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No. 4	Panel .0005 mf. with dial	4.25
No. 4a	Panel .0005 mf. without dial	3.85
No. 5	Panel .00025 mf. with dial	3.75
No. 5a	Panel .00025 mf. without dial	3.35
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No. 6a	Panel vernier without dial	2.50
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Department QST 3
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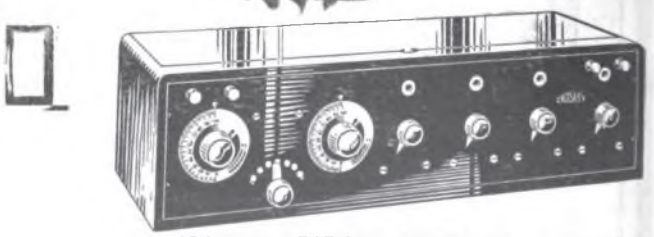
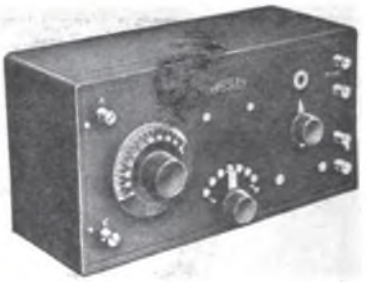


CROSLEY RECEIVER MODEL X. A four tube outfit the same as shown in the above scene. It consists of Tuner, one stage Tuned Radio Frequency Amplification, Detector and Two Stages of Audio Frequency Amplification in a beautiful mahogany finished cabinet. It will bring in distant stations loud and clear. Price without phones, batteries or tubes, $55.00.

CROSLEY

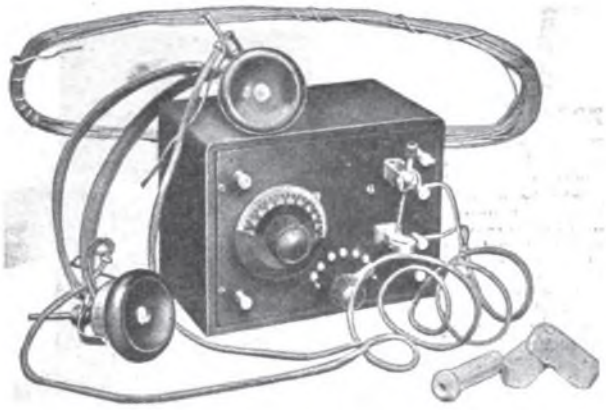
Better---Cost Less

RADIO



HARKO SENIOR MODEL V

Greatly refined and improved gives better results than ever before. We guarantee it to bring in even distant broadcasting stations and believe it to be the most efficient one-tube receiving set on the market. With this unit, Denver has heard Schenectady, N. Y., and many other wonderful distance records have been made. Price without tubes is only $20.00.



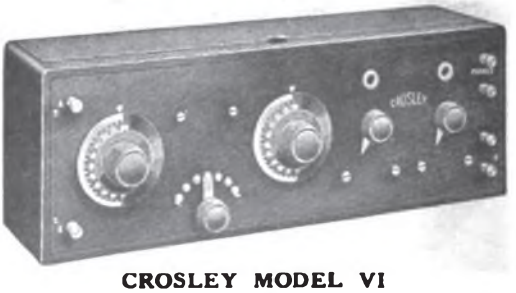
CROSLEY CRYSTAL RECEIVER MODEL I

This outfit complete as shown, is not only very efficient of its type, but is beautiful in finish and appearance, and complete. Later, if desired, additional units can be added, including audion detector, radio frequency amplifier and two stage audio frequency amplifier. Manufactured under the Pickard patents. Price of the set illustrated above complete with instructions is $25.00.

Three Smaller Models Of the Usual Quality Crosley

Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

Send for Catalog.



CROSLEY MODEL VI

A two-tube set similar to the MODEL X shown on the first page. This unit has approximately six times the range and volume of the Harko Senior. It consists of one stage of Radio Frequency Amplification and Audion Detector. It eliminates static to a large extent and distant stations are brought in clear and sharply. Price without tubes, batteries or phones $30.00.

CROSLEY MANUFACTURING CO.

DEPT. QST 3 **CINCINNATI, OHIO**

Tuned Radio Frequency Amplification

CROSLEY
Better---Cost Less
RADIO

The Feature of Our Larger Units

Can be added to practically any set.—

Everyone now recognizes that the Engineering Department of the Crosley Manufacturing Company has solved the solution of the radio frequency problem. Tuned Radio Frequency Amplification, as developed by the Crosley Manufacturing, is unquestionably a wonderful success. It increases the range for receiving outfits to a remarkable degree, and eliminates static and other forms of interference, and yet is simple to tune.

RADIO FREQUENCY TUNED AMPLIFIER—R. F. T. A.

This unit was originally designed to be used in connection with the CROSLEY HARKO SENIOR MODEL V. Hook ups have now been worked out for its efficient use with Westinghouse, Grebe, Clapp-Eastham and many other popular receiving sets, adding one stage of Tuned Radio Frequency Amplification to any of them. Complete instructions showing these hook ups are furnished with each Radio Frequency Tuned Amplifier, or will be sent upon request to anyone free of charge. Price of the Crosley R. F. T. A., as illustrated above in beautiful mahogany finished cabinet is $15.00.

RADIO FREQUENCY AMPLIFYING TUNER—R. F. A. T.

The solution of Radio Frequency Amplification lies in the Crosley Radio Frequency Amplifier Tuner shown above. It takes the place, in a surprisingly successful manner, of a Radio Frequency Transformer. We have prepared a leaflet telling a great deal about this wonderful unit, with instructions for hooking it up in various types of circuits, showing its use not only as a Radio Frequency Amplifier Tuner, but also as an interference and static eliminator or strainer. This leaflet is furnished with each R. F. A. T., or will be mailed to anyone upon request. Price $4.00.

Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

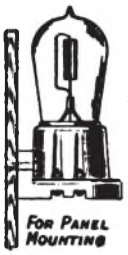
Send for general catalog and leaflets.

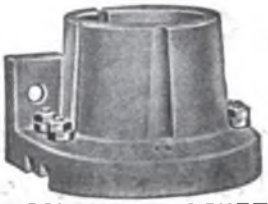
CROSLEY MANUFACTURING CO.

DEPT. QST 3 **CINCINNATI, OHIO**

CROSLEY RADIO PARTS shown on these pages are the personification of economy and efficiency. The fact that they are endorsed and used by the best Radio Men in the country should be sufficient testimonial.

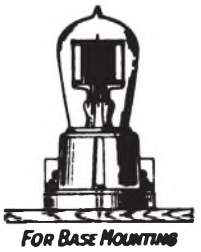
CROSLEY
Better—Cost Less
RADIO





CROSLEY V-T SOCKET

This socket has been pronounced by many radio engineers as the best socket on the market. Ever since its announcement, its success has been phenomenal. Although the success has been largely due to the price, its real popularity is based on its high quality, efficiency, service and practical unbreakability. Patents pending. Beware of imitators.
Made of porcelain for base, or panel mounting.....$0.50



CROSLEY SHELTRAN

Incorporated in the design of the CROSLEY SHELTRAN, are all the characteristics, so essential and necessary to obtain the maximum amplification from the modern vacuum tubes used in radio work. These tubes, with their high amplification constant, operate most effectively at large fluctuations of the grid potential. The CROSLEY SHELTRAN is designed to accomplish these results and tests have shown that the design is correct to insure maximum efficiency. Completely shielded—9 to 1 ratio.

Better—Costs Less—$4.00

CROSLEY VARIO-COUPLER PARTS

The CROSLEY VARIO-COUPLER is made with the same accuracy as the CROSLEY VARIOMETER, and is designed to function perfectly with it. Each Vario-Coupler set consists of a formica tube, rotor and the necessary hardware for complete assembly.

Complete as shown in illustration, ready for assembly—$1.50. Also furnished completely wound and assembled. "Better–Costs Less"—$3.00

CROSLEY BINDING POSTS

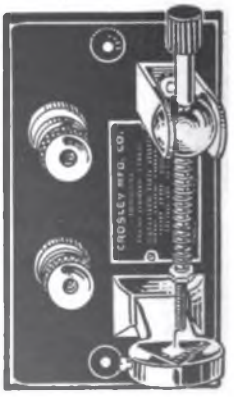
These are made in three sizes — 3/8" diameter, 7/16" diameter and 1/2" diameter. They are all of the same design, however, as shown in the illustration.
No. 1..... 5¢ each
No. 2..... 7½¢ each
No. 3.....10¢ each

CROSLEY MAGFON

No Radio station is complete without this MAGFON. A built-in horn amplifies signals, voice or music. With it head phones are unnecessary except on weak signals. Any make of watch case receiver can be used with the CROSLEY MAGFON by simply inserting it in the back of the cabinet. Mahogany finished $10.00.

CROSLEY CRYSTAL DETECTOR STAND

This unit is especially well constructed neatly mounted on black base covered on the bottom with green felt. All parts are bright nickel finish, complete with mounted crystals, binding posts, etc., manufactured under the following patents: "Patented January 21, 1908; November 17, 1908; June 15, 1909; September 7, 1909; July 21, 1914; September 8, 1914; November 24, 1914; April 27, 1915; January 23, 1917. Licensed for amateur, experimental or entertainment purposes only. Any other use will constitute an infringement. —$1.60.



Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

Send for Catalog.

CROSLEY MANUFACTURING CO.

DEPT. QST 3 **CINCINNATI, OHIO**

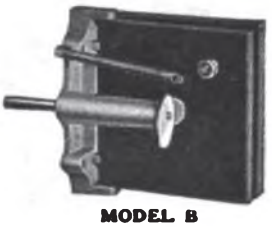
CROSLEY

Better—Cost Less

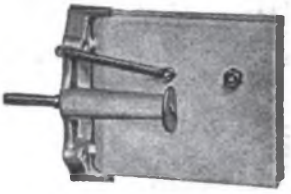
RADIO

CROSLEY RADIO PARTS are manufactured from the best materials money can buy and are the acme of quality. We draw your especial attention to the CROSLEY patent BOOK-TYPE VARIABLE CONDENSER which impartial tests show to have less resistance than any other condenser on the market.

MODEL A



MODEL B

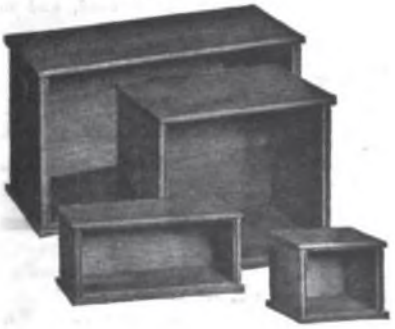


MODEL C

CROSLEY VARIABLE CONDENSERS

The CROSLEY VARIABLE CONDENSERS are unquestionably one of the most radical improvements in radio during the past few years. By using it, louder signals are obtained as it not only is simple and easy to tune, but also has less internal resistance and no body capacity effect.

Model A, .0005 Mfd. (Wood Frame).....$1.25
Model B, as illustrated, .0005 Mfd.....$1.75
Model C, .001 Mfd. (Porcelain Plates).....$2.25



CROSLEY RADIO CABINETS

Realizing the demand for stock cabinets for those who build their own sets, we have developed a line of cabinets that are neat in design, attractive in appearance and finish, and of the best workmanship.

The Crosley Radio Cabinets are made of hardwood Adam brown mahogany finish.

Live dealers handle them—prices and sizes in our catalogue.

CROSLEY RHEOSTAT

Note the new Crosley Rheostat with ball bearing contact, patent pending.

This rheostat permits exceptionally accurate and delicate variations of the filament current. With it, the best possible results are received from expensive vacuum tubes.

Unique construction allows the CROSLEY RHEOSTAT to be mounted on a panel of any thickness up to and including ⅝ inch. A special grade of non-corrosive wire forms the resistance and results in highly efficient service.

This rheostat is much more attractive, works better and is easier to assemble than the old Crosley Rheostat. It is better in every way and yet the price is the same.....60¢

CROSLEY KNOB AND DIAL

Attractive and inexpensive CROSLEY KNOBS and DIALS are extremely well made for all required purposes. The dials are made of solid hard rubber 2½ in. diameter, with the letters and figures moulded into them and white enameled.

Furnished Standard for ¼" shaft or ⅛" shaft, optional—$0.40.

CROSLEY TAP SWITCH

The unique construction of CROSLEY TAP SWITCHES assures a constant tension and eliminates all possibility of the switch loosening and developing a faulty contact on the taps. A stationary washer of our own design has a soldering lug which makes possible a bus wire connection. All CROSLEY TAP SWITCHES are furnished with a newly designed tapered knob and nickel-plated switch arm and bushing.

Price each complete.....30 cents

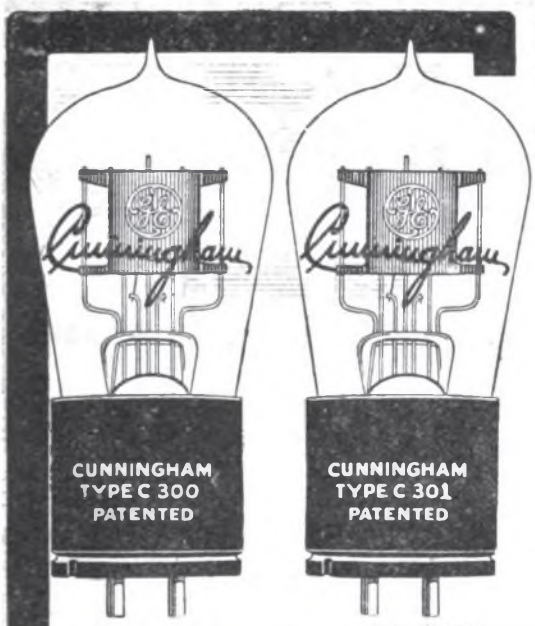
Switch Taps for the above made of brass, nickel-plated and complete with brass nut, 2½ cents each.

Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

Send for Catalog

CROSLEY MANUFACTURING CO.

DEPT. QST 3 **CINCINNATI, OHIO**



Super-Sensitive DETECTOR

Distortionless AMPLIFIER

Nationally recognized standards for all types of

RADIO RECEIVING SETS

TYPE C-300 GAS CONTENT DETECTOR	Amplifies as it Detects	TYPE C-301 HIGH VACUUM AMPLIFIER
$5.00		$6.50

CUNNINGHAM VACUUM TUBES

The trade marke GE is the guarantee of these quality tubes. Each tube is built to most rigid specifications.

PATENT NOTICE

Cunningham tubes are covered by patents dated 11-7-05, 1-15-07, 2-18-08 and others issued and pending. Licensed only for amateur or experimental uses in radio communication. Any other use will be an infringement.

Written indelibly in the annals of radio progress is the record of Cunningham service in placing before the public, vacuum tubes of the highest conceivable standard.

The rapid expansion of radio telephony, now one of the world's foremost utilities, was made possible by the wonderful development of the vacuum tube.

The CUNNINGHAM SUPER-SENSITIVE DETECTOR and DISTORTIONLESS AMPLIFIER TUBES, designed and built in the great laboratories of the General Electric Company, are now nationally recognized as standards for all types of receiving sets.

E. T. Cunningham

Home Office:
248 FIRST STREET
SAN FRANCISCO, CALIF.

Eastern Representative:
154 WEST LAKE ST.,
CHICAGO, ILLINOIS

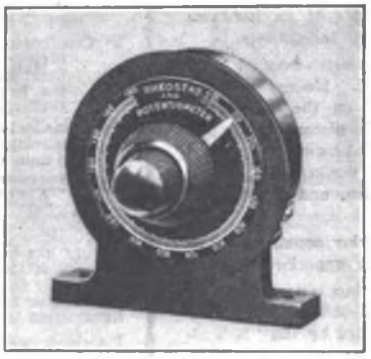
THE "POT-RHEO

A combined Potentiometer and Rheostat for $3.00

THE development of radio has now created a need for both a potentiometer and a rheostat in vacuum tube circuits, not only for the operation of gaseous detector tubes, but for radio frequency amplification.

The Acme Apparatus Company has successfully developed the "Pot-Rheo" which is a most effectual combination of a 200 ohm potentiometer and a 4 ohm rheostat in one mounting.

The "Pot-Rheo" not only reduces space in either panel or table type set, but through a by-pass condenser provided by the insulation between the concentric shafts which supplies a radio frequency path to the filament it eliminates the necessity of high frequency currents passing through the potentiometer winding back to the filament—a distinct improvement. Separate controls are furnished in convenient proximity You'll like the "Pot-Rheo" when you see its neat appearance—you won't give it up once you've tried it out. It's an essential.



THE "POT-RHEO"
Price $3.00 East of Rocky Mts.

The Acme Apparatus Company also make radio and audio frequency transformers, amplifier and detector units, the Acmefone and the famous Acme Kleerspeaker. This company is also the foremost manufacturer of (C. W.) continuous wave transmitting apparatus. Any reliable radio or electrical dealer has Acme Apparatus or can secure it for you at twenty-four hours notice. The Acme Apparatus Co., Cambridge, Mass., U. S. A. New York Sales Office Broadway.

ACME

for amplification

A photograph showing the heart of the Manhattan Radio Headset—the coils and the magnet.

It's What's Inside the Receiver Case That Counts

REMOVE the cover of a Manhattan Radio Headset. Note the large horse-shoe magnet. It is made of Tungsten Steel—the most expensive material for permanent magnets, and the best because of its hardness and property of retaining magnetism indefinitely.

In the center of the case is the electro-magnet with its pole pieces made of Silicon Steel. Energy received from a wireless message is exerted on the diaphragm through the pole pieces. If the pole pieces absorb any of this energy, the pull on the diaphragm is less and the performance of the Headset weakened. Silicon Steel pole pieces cut down energy loss, and give strong signals.

These are two points in the interior construction of Manhattan Headsets which make for superiority.

Look for the Manhatan Headset box on your radio dealer's shelf. It's illustrated below. All genuine Manhattan Radio Headsets may be identified by the "M-Seal-Flash" on the back of each receiver case. It's your guarantee of quality.

MANHATTAN ELECTRICAL SUPPLY CO. INC.

Makers of the famous Red Seal Dry Batteries

New York	Chicago	St. Louis
17 Park Place	114 So. Wells St.	1106 Pine St.

San Francisco
604 Mission St.

Next month we will tell you more about the "heart of the Manhattan Headset."

No. 2051
3000 Ohms
$7.00

No. 2500
2000 Ohms
$6.00

HOMCHARGE your RADIO BATTERY for A NICKEL

No muss, trouble, dirt—no moving of batteries—loss of time—no technical or professional knowledge needed. May be used right in your living room.

THE

RADIO HOMCHARGER DE LUXE

charges your "A" or "B" battery over night and is the only rectifier on the market combining the following essential HOMCHARGING features:

1—Simplicity itself—attach to any lamp socket and connect battery.

2—Self-polarizing. Battery may be connected either way and will always charge.

3—Fully automatic in operation—gives taper charge—cannot overcharge or injure your battery.

4—Safe. All parts entirely enclosed. No danger from fire. APPROVED BY UNDERWRITERS EVERYWHERE.

5—Constructed of the best material—genuine Bakelite Panel, Jewell Ammeter, closed Core Silicon Steel Transformer. No castings used, only the best stampings throughout. UNQUALIFIEDLY GUARANTEED.

6—No delicate bulbs to break or burn out. Only one moving and two wearing parts, replaceable as a unit, at small cost.

AN ORNAMENT FOR YOUR LIVING ROOM

Beauty has been combined with utility in the NEW RADIO HOMCHARGER DE LUXE. The body is beautifully finished in mahogany and gold. Equipped with rubber feet, it cannot mar polished surfaces. It harmonizes with the finest living room.

Furnished complete. No extras to buy. Price, **$18.50** at all good dealers, or shipped prepaid upon receipt of purchase price.

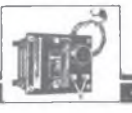
Booklet illustrating the NEW RADIO HOMCHARGER DE LUXE in actual colors is FREE for the asking. Send for your copy today

DEALERS—JOBBERS: Over 150,000 HOMCHARGERS will be sold this fall and winter. Send for "HOMCHARGER Business Builders" and Discounts and see how you can get your share of this business.

The Automatic Electrical Devices Company

127 West Third St. - CINCINNATI, O.

Largest Manufacturers of Vibrating Rectifiers in the World



TYPE A FOR WALL MOUNTING — OVER 50,000 IN USE

Send For Folder 4471-A

It tells an important story about Radio Instruments

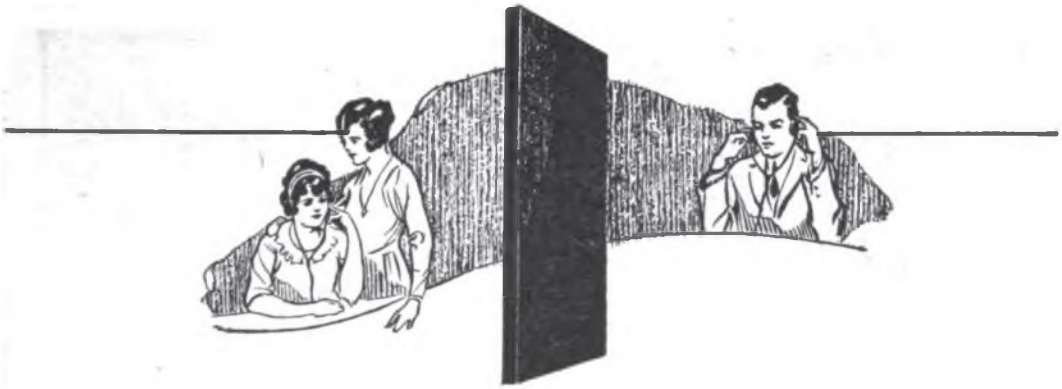
Type BX Voltmeter | Type CX Ammeter | Type BX Radiation Ammeter

W
WESTINGHOUSE ELECTRIC

Every Radio Receiving Set should have its proper equipment of measuring instruments; an Ammeter for determining the filament current; a Voltmeter to tell the condition of the battery.

Westinghouse
Electric & Manufacturing Co.
Newark Works: Newark, N. J.

Westinghouse



Buy FORMICA *Radio Panels*

Because they look better.

Because they work more easily.

Because they have the highest dielectric strength.

Because they defy moisture, and do not warp.

Because their uniformity is remarkable.

Because they are approved by the navy and signal corps.

Because radio men everywhere have come to prefer them.

Your dealer has Formica or can get it. We can refer him to a wholesale stock in his locality. Our own large capacity makes immediate delivery possible.

DEALERS: A stock of Formica carries with it important advertising and sales cooperation. The demand for Formica quickly clears your shelves.

THE FORMICA INSULATION COMPANY

4620 Spring Grove Ave.

Cincinnati, Ohio

SALES OFFICES

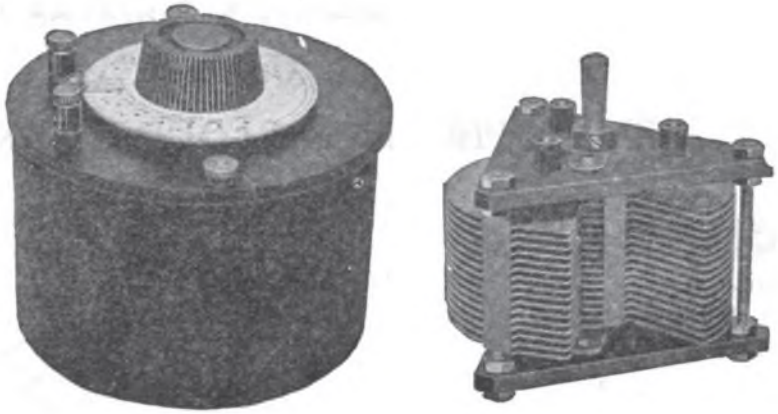
50 Church Street..New York, N. Y.
9 South Clinton St....Chicago, Ill.
415 Ohio Building....Toledo, Ohio
414 Finance Bldg...Cleveland, Ohio
1042 Granite Bldg..Rochester, N. Y.
313 Title Building..Baltimore, Md.
422 First Avenue...Pittsburgh, Pa.
1210 Arch Street.Philadelphia, Pa.
Sheldon Bldg...San Francisco, Cal.

FORMICA

A Laminated Phenolic Condensation Product

SHEETS TUBES RODS

A CORRECTLY DESIGNED CONDENSER



TYPE 247 CONDENSER

The long experience of the GENERAL RADIO CO. in designing and building high grade radio apparatus for laboratory use has enabled us to design this low loss condenser for the citizen radio field. This condenser is of laboratory quality, yet sells at a price within reach of the experimenter. Its losses are less than one fourth of those of the ordinary condenser on the market.

Consider some of its features:

CAPACITY SCALE: In addition to the regular scale divided into 100 equal divisions, the dial is also graduated in micromicrofarads, thus showing the capacity at any setting.

LOW DIELECTRIC LOSS: Hard rubber is the only solid dielectric used. The quantity used is small and so placed that the dielectric losses are kept a minimum. This is very important in obtaining sharpness of tuning and is commonly overlooked in condenser construction.

BRASS PLATES SOLDERED TOGETHER: Resistance is reduced and kept constant. The rigidity of the brass and adequate spacing minimizes the danger of short circuiting.

SPECIAL SPRING BEARINGS: Tension always the same. Good contact insured.

THRUST ALL IN ONE BEARING: No short circuiting if the distance between bearings becomes changed.

LOW ZERO CAPACITY: Makes a wide wavelength range possible.

METAL CASE GROUNDED TO ROTARY PLATES: The condenser is shielded, reducing the capacity effects of the hands, while tuning.

Type 247A—.001 M. F. Mounted, Shielded.....Price, $6.00
Type 247B—.001 M. F. Unmounted, with Counterweight..Price, 3.75
Type 247E—.0005 M. F. Mounted, Shielded.....Price, 5.50
Type 247F—0005 M. F. Unmounted, with Counterweight..Price, 3.25

This condenser is but an example. We manufacture a complete line of the finest radio instruments and parts.

SEND FOR FREE RADIO BULLETIN 911Q

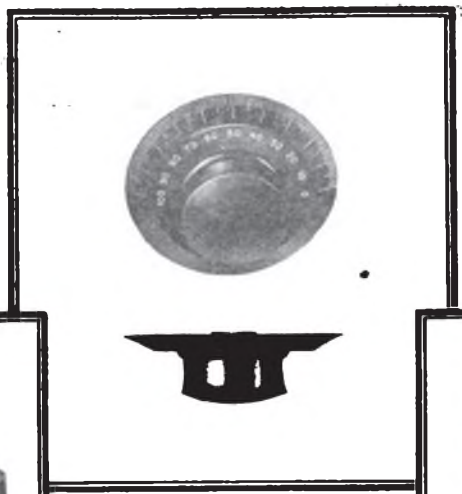
GENERAL RADIO COMPANY

Massachusetts Avenue and Windsor Street,
Cambridge, 39, Massachusetts

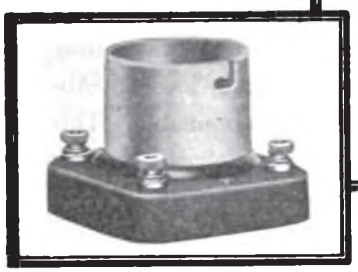
Standardize on General Radio Company Equipment Throughout.

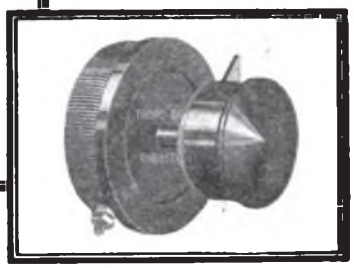
Do not confuse the products of the GENERAL RADIO CO. with those of other concerns using the words "General Radio." The General Radio Co. has been manufacturing radio and scientific instruments for many years. It has no affiliation with any other company.

The Thoro-bred Dial Type CR-5. This "raised axis" keeps the edges of the dial ¼" from your panel at all times, effecting easy operation and no scraping of panels. Combining all features essential to perfect operation without friction and other difficultics. One of the indispensable trio. Price 90¢.



The Thoro-bred Rheostat. Type R-90. Has a resistance of five ohms. No vernier adjustments necessary. Adaptable for either table or panel mounting. Silver plated, highly polished. One of indispensable trio. Price $1.10.





Thoro-bred Tube Socket Type S-12. Base of molded Bakelite which unlike ordinary shellac compositions used, reduces leakage to a minimum. Price $1.00.

The Indispensable Trio

THE Thoro-bred Rheostat, Dial and Vacuum Tube Socket are an indispensable trio for every tube set. Without these three you will not know the best results your receiving set can give. Here's why.

The Thoro-bred Rheostat **enables you to secure the maximum detector action through its extremely close adjustment of the filament control. It has a resistance of five ohms, which eliminates the use of a vernier adjustment, since the resistance of one of its turns of wire on the resistive element is so small that the effect is not noticeable on the tube. All metal points are silver plated. It is adaptable for either table or panel mounting. Molded parts are of Bakelite. Knob is supplied with pointer and is of the same design as the dial. Patent applied for. Price $1.10.**

The Thoro-bred Tube Socket **is the second of this indispensable trio. The tube insert is of brass, heavy nickel plated with high polish. The base is of moulded Bakelite, making it possible to withstand high heat. The leakage from the grid to the filament is reduced to a minimum. Bakelite used in the Thoro-bred Socket does not absorb the moisture or cause the leakage as in other sockets employing the common shellac composition. It gives a better appearance and holds the original finish. Price $1.00.**

The Thoro-bred Dial **was the first genuine Bakelite dial to be offered with both Clock-wise and Counter-Clock-wise Readings. This dial was also the first to introduce the popular *"raised axis"* which eliminates all panel scraping and friction and permits easy operation. The Brass insert employed—does away with any wobbliness that might otherwise develop. Patent applied for. Price 90c. The indispensable trio can be obtained at your nearest dealer. If, for some reason he is not already supplied, send us his name, and your money direct.**

THE MARSHALL - GERKEN COMPANY
TOLEDO, OHIO, U. S. A.

Thoro-bred
RADIO PRODUCTS

a New Willard "A" Battery for

A new Willard—at a new low price!

That's the Willard FW Radio "A" Storage Battery.

It has Willard-quality plates, selected wood separators, tested rubber jars, well-built acid-proofed container.

It has specially-designed terminals that do away with clips and insure tight, easily-made connections.

It has a special marking for the positive terminal, so that there's no chance of your hooking up the battery in reverse.

It has patented soft-rubber gaskets around the terminal posts to prevent leakage.

It has a stout roller handle that's easy on your hand.

And remember this—

All Willard Radio Batteries Are Shipped Dry and Fully Charged

This means that you are always certain of a fresh battery—a battery in which there has been no deterioration—and *one you can put to work at once without charging.* All that is required is the adding of the electrolyte (a solution of pure sulphuric acid and water) which takes but a moment.

See the new Willard FW Battery at the nearest Willard Station or at your dealer's.

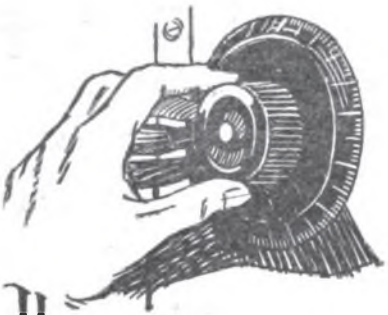
WILLARD STORAGE BATTERY CO.
Cleveland, Ohio
Made in Canada by the
Willard Storage Battery Co. of Canada, Limited, Toronto, Ont.

$13.60
40 ampere-hour capacity

Made in Three Sizes

Capacity and prices of this new battery are as follows: 40 a. h., $13.60; 80 a. h., $17.50; 110 a. h., $22.00. Prices slightly higher west of the Mississippi and in extreme South.

Willard STORAGE BATTERY



How to stop noises when you touch dials

Have you ever noticed in tuning a radio receiving set that when you touch dials, knobs or switches it causes a humming or whistling noise? It is annoying isn't it? These distracting sounds will disappear if you install dials, knobs and other parts made of

RADION

Tests by disinterested laboratories have shown conclusively that RADION is without exception the best material for radio parts and panels because it comes closest to being the perfect insulation.

Have you tried RADION? If not, secure a dial or other part from your dealer today. Take it home and experiment—that's the best way to become convinced of its unusual qualities.

And while at your dealers, ask him to show you a RADION Mahoganite panel. Its beautiful mahogany grain will please you. It won't warp and is easy to work. If your dealer cannot serve you, write us direct for all information giving us his name.

Dealers are invited to write for lists.

American Hard Rubber Company
11 Mercer Street, New York

The Triple Test Transformer

What does it mean to you?

In a market glutted with new radio products, some well made, some poorly and cheaply constructed, a few articles stand out prominently from the rest because the manufacturer employs highly competent engineers, the best of material and skilled workmanship. The RADIO SERVICE LABORATORIES goes a step further and submits each individual transformer to its famous triple test before shipping same to the jobber, dealer and ultimate user.

The Triple Test

First— Test of Windings.
The bobbins when wound and sealed are tested for continuity of winding and for shorts and leaks.

Second—Test of Inductance of Windings.
After assembly of the bobbin within the container a careful test is made of the inductance of the primary and secondary windings and the mutual inductance of the windings to insure the consumer against any wrong connections or hasty, careless construction.

Third—Test for Amplification.
After the iron core is assembled and the transformer sealed, each transformer is given an actual circuit test in a radio amplifier; the gain in signal strength being noted over that of the detector tube alone and required to meet the gain of our standard laboratory model.

The Result

is a Radio Frequency Transformer that increases the strength of Radio signals or waves before they are applied to the detector tube where they are made audible—

"Louder Signals with less noise
Greater Range with same equipment"

RADIO SERVICE LABORATORIES Transformers by actual test are superior to any domestic or foreign make in the market. For sale at any electrical shop or store where Radio supplies are sold. Special circular sent on request by the

Rasla Sales Corporation
National Distributors
Dept. B, 10 East 43d St., N. Y. City

The only completely shielded iron core

We don't think even MR. MARCONI would succeed at it

WE'VE never heard of anyone trying to make a radio outfit without magnet wire.

What nerves are to your body, wire is to the apparatus designed to receive or transmit sound through space.

You can take wire for granted, and buy the cheapest you can find—or you can investigate Acme Wire. You will learn that, even at its slightly higher cost, it is likely to save you money in the end, by reducing manufacturing costs; and certain to enhance your reputation, by *performing* as your customers expect your product to behave.

The Acme Wire Co. makes hundreds of thousands of transformer coils in its own plant. It has learned, in the hard school of actual experience, what kind of wire is best adapted to the needs of the radio manufacturer, and has developed the finer sizes of enameled magnet wire to the highest state of perfection known in the industry.

We invite the inquiries of makers and users of radio apparatus who are interested in better materials and lower final costs.

THE ACME WIRE CO., New Haven, Conn.
NEW YORK CLEVELAND CHICAGO

Acme Wire

"It goes in the space"

Acme Radio Users

Acme Apparatus Co.
Adams Morgan Co.
Atwater Kent Mfg. Co.
Auth Electrical Specialty Co.
Chicago Telephone Supply Co.
Connecticut Telephone & Electric Co.
Chas. Cory & Son, Inc.
Dictograph Products Co.
Eisemann Magneto Co.
Electrical Products Mfg. Co.
Elwood Electric Co.
Federal Telephone & Telegraph Co.
General Radio Co.
A. C. Gilbert Co.
Holtzer Cabot Electric Co.
Kellogg Switchboard & Supply Co.
Manhattan Electrical Supply Co.
Standard Transformer Co.
States Co.
Thordarson Mfg. Co.
Wells Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Acme Wire Products

"Enamelite," plain enameled Magnet Wire; "Cottonite," Cotton-covered Enamelite; "Silkenite," Silk-covered Enamelite; Single and Double Cotton Magnet Wire; Single and Double Silk Magnet Wire. We also have a complete organization for the winding of coils in large production quantities.

Acme Electrical Insulations

Flexible varnished tubing in all sizes and colors; standard or special.

Acme Radio Specialties

Audio Transformer windings.
Radio Frequency windings.
Magnet windings for Head Sets.
Enameled wire — especially the finest sizes, 40-44 B & S gauge, Silk- and cotton-covered magnet wire.
Enameled Aerial wire — single wire and stranded.

Illustrated Catalog will be sent upon request to Purchasing Agents and Engineers.

Static Defeated and Loop Aerials Practical for All

Cotoco

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

BUY by the name Cotoco and you buy Radio supplies that are scientifically and mechanically right. Buy by the name Cotoco and you buy abreast of the latest developments in Radio.

One of the nation's greatest weeklies, in an editorial article, speaks of the "growing popularity of radio frequency." The reason for this nation-wide popularity is that Radio Freqeuency sets alone have weathered the summer whirlpool of static. More than that, the obvious advantages of Loop Aerials are fully enjoyed by those who use this method.

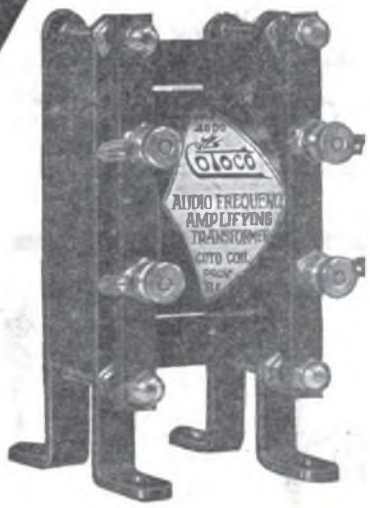
The name Cotoco is to be found on the best amateur and professional Radio Frequency sets throughout the land.

Buy Always

by the name

COTOCO

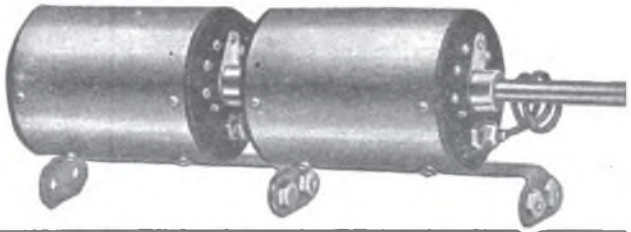
Write For Free Connection Diagrams



COTOCO AMPLIFYING TRANSFORMER FOR AUDIO FREQUENCY

Above is our Audio Frequency Amplifying Transformer. Distortion practically unknown to its users. Whether through headphones or loud speaker, music and speech come through clear and true.

Below is the wonder working transformer that has had so much to do with the growing popularity of Radio Frequency as opposed to the regenerative principle. Many of the most efficient radio sets made this fall and winter will be built around these compact and efficient tapped transformers mounted for two stages (as illustrated) or three stages of Amplification.



Connection Diagrams are Wrapped

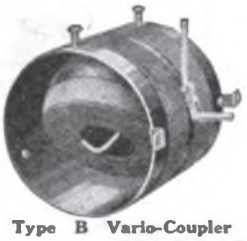
with every Cotoco Amplifying Transformer for Radio Frequency for both two and three stages of Amplification.

If your dealer cannot supply you, send us his name

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

DAYTON RADIO PRODUCTS

Are the most complete and most accurate of any Radio apparatus made by one Company in America.



Type B Vario-Coupler

Dayton Phone Receiving Set

Moulded Bakelite Variometer

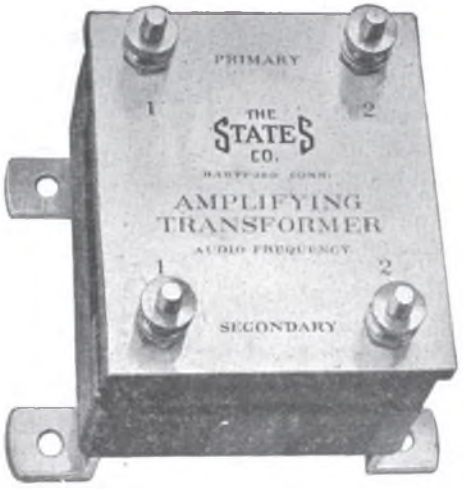
VARIABLE CONDENSERS IN 4 SIZES

	List Price
Type 9 P. C. S. Square and Round Plate .0003 Mf.	$3.00
Type 17 P. C. S. Square and Round Plate .0005 Mf.	3.60
Type 31 P. C. S. Square and Round Plate .001 Mf.	4.50
Type 45 P. C. S. Square and Round Plate .0015 Mf.	5.30
Type 17 P. C. S. Condensers with Vernier attached	4.40
Type 31 P. C. S. Condensers with Vernier attached	5.30
Type A Variometer Moulded Bakelite	6.75
Type A Vario-Coupler Moulded Bakelite	7.00
Type B Variometer Bakelite Tube Type	4.25
Type B Vario-Coupler Bakelite Tube Type	4.75
Type C Vario-Coupler Bakelite Tube Type	3.75
Rheostats	1.10
Panel Switches 8 Points	.90
Phone Jacks	.65
Genuine Bakelite Knobs and Dials 3"	.75
Insulating Rubber Tubing 10 ft. Package	.45
Radio Phone Receiving Sets	75.00

Jobbers and Manufacturers write for Catalog and Discounts.

THE A-C ELECTRICAL MFG. CO., DAYTON, OHIO

MAKERS OF ELECTRICAL DEVICES FOR OVER 20 YEARS



Cat. No. 20001

SURPRISING results are secured with this A. F. Amplifier. Turns Ratio 1 to 3. **PRICE $5.00**

Jobbers and Dealers Discounts

THE STATES CO.

72½ Francis Ave., Hartford, Conn.

BRACH

VACUUM LIGHTNING ARRESTER

Should Be Featured In Every Dealer's Stock

This is the arrester that sells on its merits, therefore sells itself. No one will question its dependability as a protector for radio from lightning and static interference. The Brach Arrester is built up to a standard, not down to a price. Dealers make friends by selling it.

Outdoor Type

Indoor Type

It Is Listed By the Underwriters' Laboratories.

Trade Supplied by Best Jobbers

L. S. BRACH MFG. CO.

129 Sussex Ave., Newark, N. J.

16 Years Specialists In Lightning Protective Apparatus.
Also Makers of Solderail—Best for Soldering Radio Connections.

Coast Representatives—Pacific States Electric Co., San Francisco, Los Angeles, Oakland, Seattle, Portland, Spokane.

WESTINGHOUSE

RADIO "A" and "B" BATTERIES

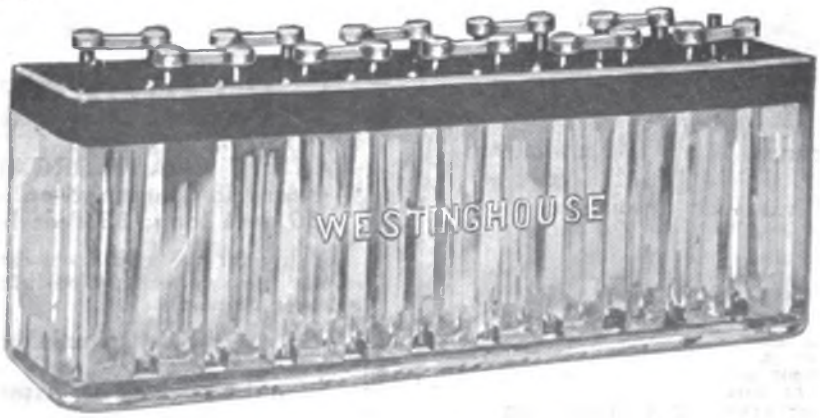
Westinghouse has a new Radio "B" Battery

that is a marvel for long, steady, dependable, noiseless service. Compactly built, with the 2-volt elements visibly arranged in a one-piece, eleven-compartment glass container. Lasts indefinitely; easily recharged. Get it from your radio dealer or the nearest Westinhouse Battery Service Station.

There are also two other types of Westinghouse "B" Batteries; and ten types of "A" Batteries, ranging from 27 to 162 ampere hours' capacity and in 4, 6 and 8 volts. There's a correct type for your set.

Westinghouse Union Battery Company
Swissvale, Pa.

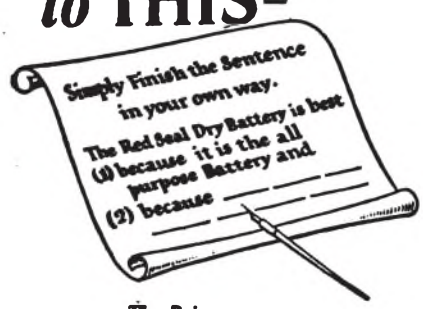
"B" Battery
22-MG-2



Built by Westinghouse—
you know it's *right.*

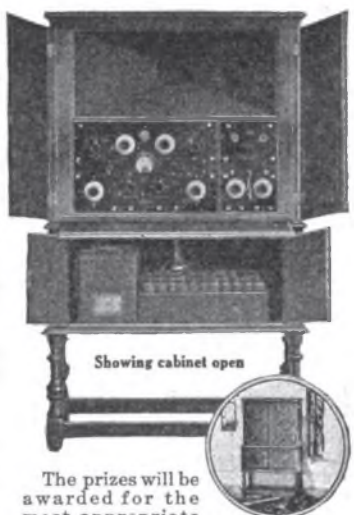
Starts Nov. 1st Red Seal Battery Contest Closes Nov. 15th

For the Best Answer to THIS—



You Win THIS $725.00 Complete Radio Set-Free

Hears broadcasted concerts 400 to 600 miles away; receives wireless telegraph from Europe, South America, from ships on the high seas, etc.



The Prizes

It is appropriate that the Manhattan Electrical Supply Company should be the first to offer such Radio Sets as these. This company was one of the pioneers in selling radio, as well as being the manufacturer of Red Seal Dry Batteries used so successfully in connection with radio sets.

First Prize—$725.00
Complete Kennedy Radio Set

This Cabinet Type complete Radio Receiving Set is one of the finest and most up-to-date receiving sets yet produced. The cabinet is walnut and stands 58 inches high. Range from 400 to 600 miles for wireless telephone and 2,000 to 3,000 miles for wireless telegraph. Contained within the cabinet are all batteries, "Radio Homcharger de Luxe" battery charger and Magnavox loud speaker with special horn. Installed free, in the home of the winner.

Second Prize—$408.50
Complete Westinghouse Radio Set

It consists of the Westinghouse R. C. Receiving Set and Western Electric Loud Speaker, "Tungar" Battery Charger, Storage Battery, "B" Batteries, Set of Manhattan 3,000 ohm Headphones, 3 vacuum tubes, 2 telephone plugs and complete antenna equipment. Installed free in the home of the winner.

Third Prize—$256.50 Complete
Grebe Radio Set

A complete receiving outfit made up of the well known Grebe C. R.—9 Regenerative Receiver with Two Stage Amplifier, Magnavox Loud Speaker, Storage Battery, "Radio Homcharger de Luxe" battery charger "B" Batteries, set of Manhattan 2,000 ohm Headphones, 3 vacuum tubes, 2 telephone plugs and complete antenna equipment. Installed free in the home of the winner.

50 Other Prizes

To each of 50 other contestants whose answers are meritorious will be given one of the famous Manhattan 2,000 ohm Radio Headsets. These headsets have great sensitiveness and high amplifying qualities.

How to Enter the Contest

Simply follow the instructions on the Contest Blanks given away by stores all over the U. S. A. Nov. 1 to Nov. 15. You will recognize these stores by the Red Seal Window Display pictured below.

Look for this Window Display in Dealers' Windows Nov. 1 to Nov. 15, It identifies Dealers who will give you free Contest Entry Blanks.

The prizes will be awarded for the most appropriate answers completing *in your own way*, in not more than ten words the following sentence:

The Red Seal Dry Battery is best—
1. because it is the all-purpose battery, and
2. because.....

Important:—Only those answers written on the official Contest Blanks will be considered. Mail as many answers as you like to: Red Seal Battery Contest, Manhattan Electrical Supply Co., Inc., 17 Park Place, New York City.

The Judges

The winners will be selected by the following Judges: Mr. Llew Soule, Editor of "*Hardware Age*," New York; Mr. Howard A. Lewis, Manager of "*Electrical Merchandising*," New York, and Mr. Joseph A. Richards, President, Joseph Richards Co., Inc., Advertising Agents, New York.

Announcement of Winners

The names of the winners will be published in the ***Saturday Evening Post*** as soon as possible after the contest closes.

In case two or more persons submit winning answers, prizes identical in character with those offered will be given to each successful contestant.

Important to Dealers

Duplicates of these 53 prizes are to be given to dealers having the BEST CONTEST WINDOWS. Write us at once for full information and free window display material if you haven't already done so.

MANHATTAN
ELECTRICAL SUPPLY CO., INC. NEW YORK
Makers of the Famous Red Seal Dry Batteries and Manhattan Head Sets

MODEL RZ RADAK RECEIVING SET

Price $100

Cabinets of world's finest woods, handsomely finished. Indestructible black metal dials. Hard rubber composition binding posts. Vernier variable type condensers. Antenna inductance wound on formica tube; plate inductance on moulded ball. Fan blade switch. Clapp-Eastham Type H400 Rheostat. Single circuit regenerative. Licensed under Armstrong U. S. Pat. 1,113,149.

THE POPULAR SET FOR CHRISTMAS GIVING

This will be a Radio Christmas. Thousands of homes will receive their first radio sets. In most of those homes no member of the family will be experienced in radio.

Model RZ Radak Receiving Set is designed to meet precisely this home need. Without technical knowledge or previous experience in radio, anyone can operate this set with astonishing results. Simple to install and even more simple to operate, Model RZ Radak receives and amplifies in one unit. Responds to wave lengths up to 3000 meters and increases the sound hundreds of times. With a loud speaker the volume of sound amazes even the hardened radio professional. Live electrical and radio dealers will feature Model RZ Radak Receiving Set for the holiday trade. If your regular dealer is not yet supplied write us for complete information regarding this and other Radak Sets ranging from $40 up. Radio Equipment Catalog 6c.

Radak

Reg. U. S. Pat. Off.

Reliable Receiving Sets

CLAPP-EASTHAM COMPANY

105 Main Street, Cambridge, Mass.

America's Oldest, Largest Mfrs. of Radio Equipment Exclusively Established 1907

MPM

MILLION POINT MINERAL

The World's Greatest Radio Crystal

M. P. M. is revolutionizing radio. It is supersensitive and is the only crystal which reproduces from every point on its surface. Doubles your radius and greatly increases the audibility. Send 50¢ and the name of your Radio Dealer for two M. P. M. crystals, concert tested and guaranteed.

Dealers: Write today for complete information about M. P. M. and our attractive sales proposition.

M. P. M. SALES COMPANY

Dept. Q. 247 So. Central Los Angeles, Cal.

SPECIALS

MURDOCK PHONES No. 56

2000 OHM $3.98
3000 OHM $4.98

Variometers & Variocouplers

Best Grade Guaranteed

VARIOMETERS LESS DIAL....$3.98
VARIOCOUPLER LESS DIAL...$3.98

Add 60¢ for 3" Dial

Mailing Charges on Each Item 10¢. Send Your Order At Once As There Is Only a Limited Supply Left.

THE RADIO SHOP

BOX 2124

New Brunswick, N. J.

SAVE YOUR BATTERY
SAVE YOUR RUGS
SAVE YOUR TEMPER
SAVE YOUR TIME

With the CHASLYN **Ball Battery Testing** Set you can "read" the exact condition of the acid in your battery instantly by noting which balls sink. No scale to read.

Depth gauge shows how well plates are covered.

Air-control **Stopper** facilitates adding distilled water.

If your dealer does not have the Chaslyn Set, send $1.00 and his name and address. Set will be sent postpaid.

THE CHASLYN CO.

4317 Kenmore Ave.,
Chicago, Ill.

At Last! The Perfect Radio Loud Speaker *for the Home*

THERE is no other Loud Speaker like the DICTOGRAPH—made expressly for home use by the makers of world-famous Dictograph products—standard everywhere for the finest, most accurate and most sensitive sound-transmission and loud-speaking devices. No other organization in existence has the facilities, the skill, the experience of the Dictograph Products Corporation for producing a perfect Loud Speaker.

DICTOGRAPH
Radio LOUD SPEAKER

Years of experience in producing the marvelously sensitive "Acousticon" for the Deaf, the Detective Dictograph and **the Dictograph System of Loud-Speaking Telephones have made possible this wonderful Radio Loud Speaker that reproduces every sound—singing, speaking, instrumental music — in crystal-clear, natural tones, full volume, and FREE FROM DISTORTION AND NOISE.**

The Dictograph Radio Loud Speaker gives perfect results with any vacuum tube receiving set. No alterations; no extra batteries—you simply plug in and listen. The handsome appearance of this quality instrument harmonizes with any home.

Ask for a FREE DEMONSTRATION of the Dictograph Radio Loud Speaker at any reliable radio shop. Get DICTOGRAPH quality and still save money.

Price $20

Complete with 5 ft. flexible cord.
A beautiful instrument! Finely constructed, richly finished. Its handsome appearance harmonizes with any home. Highly burnished, French lacquered, eleven inch spun copper bell horn attached to die cast black enamel tone arm, finished with nickel trimmings. Cabinet 6 x 5 inches base, 4 inches high, of solid, ebony-finished hardwood, mounted upon rubber knobs. Furnished complete with 5 ft. flexible cord. No extra batteries required.

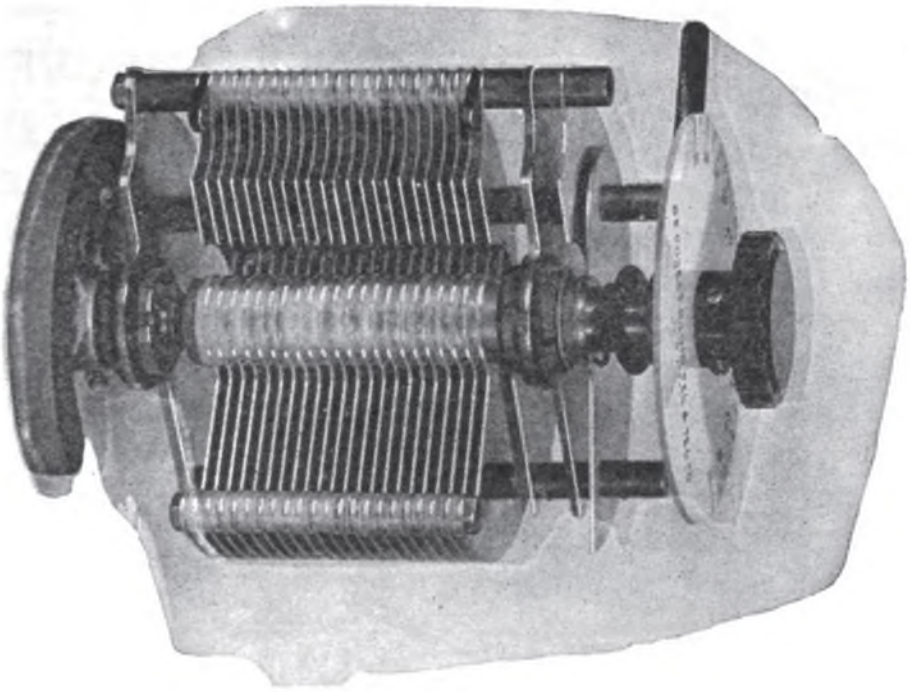
DICTOGRAPH *Radio* HEAD SET
The Best Head Set at any Price

The Dictograph Radio Head Set has established a standard of quality impossible to secure in any other headset. Its use on any receiving set, crystal detector or vacuum tube, improves reception immeasurably.
3000 ohms resistance. The best Head Set in the world. Regularly furnished as Standard Equipment with the Leading Receiving Sets made.

Dealers: Order through your jobber or write for names of authorized distributors.

DICTOGRAPH PRODUCTS CORPORATION

200 West 42d Street, *Branches in all principal cities* **New York City**



THANKS FOR YOUR PATIENCE!

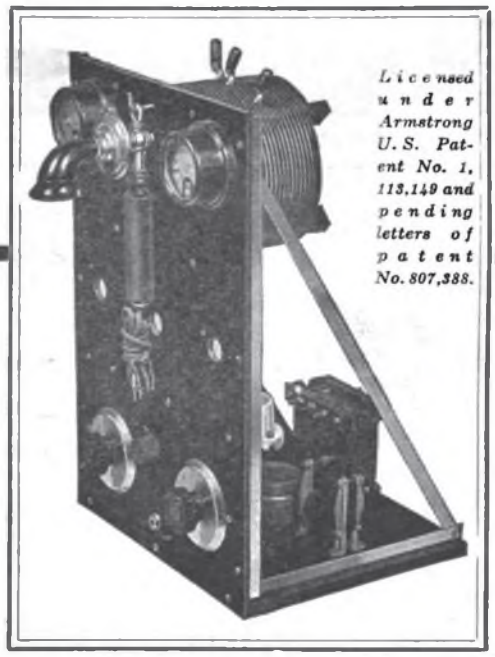
THE radio public was very patient when we were unable to supply De Forest Vernier Condensers, because they knew that all we could make were going into the famous De Forest MR-6 Receiving Sets.

Now, however, you can have the satisfaction of putting genuine De Forest Condensers on that special set you are building. The CV-1003 and CV-1503 Vernier Condensers are now again available. Production has been increased as fast as was possible—always remembering the maintenance of De Forest quality.

It is only necessary to remind you of some of the reasons why these Condensers have been declared perfection by radio experts. The movable plates are heavier than those in any other. The separately controlled Vernier plate gets you "in on the peak" and gives you 20% louder signals. The securely fastened counter weight acts as a balance and permits smooth, accurate operation in any position. Each Condenser is individually tested at 500 volts. The whole construction is a fine example of scientific precision laboratory equipment.

Used with De Forest Honeycomb Duo-Lateral Coils, these Condensers provide tuning equipment unsurpassed for selectivity, sharpness, and all-round efficiency.

DE FOREST RADIO TEL. & TEL. CO., JERSEY CITY, N. J.



Licensed under Armstrong U. S. Patent No. 1,113,149 and pending letters of patent No. 807,388.

The BENWOOD CW Transmitter

Simple, compact, up-to-the-minute construction--incorporating all the improvements made possible by our years of experimenting and it gets results!

1500 Miles With CW!

1100 Miles Voice!

Music Heard 40 Feet From Phones by Stations in 300 to 400 Mile Radius

THESE are actual results obtained by our testing station WEB, using the Benwood CW Transmitter shown herewith. You can get just as good results with it. This high-class set is just the thing for your broadcasting and DX work—using CW, ICW, Modulated Buzzer or Voice Transmission. An ideal set for the local radio club or the more progressive amateur. Think of the range this set will give you! If centrally located, you will be heard in almost every state in the Union. It is manufactured exclusively by and for the Benwood Co. and combines the best in material, workmanship and design.

Radiates 1½ to 3 Amps on Average Antenna

We guarantee that this outfit will radiate 1½ amperes on the average amateur antenna. It will radiate 2 to 3 amperes when used with an antenna whose fundamental wave length is 225 to 275 meters. That is why you can get such wonderful results.

The set comes to you completely assembled with all parts mounted on panel, as shown, and completely wired. You can start sending as soon as you attach to suitable antenna and ground connections and insert tubes. The outfit is complete with motor generator minus tubes, and consists of the following: Panel 12x18x¼, angle supports, hardwood base, 3 tube sockets, 1 power rheostat, 1 80-watt filament trans., 1 modulation trans., 1 CW inductance, 1 hand transmitter, 1 0-3 Radiation meter, 1 0-500 milliammeter, 1 21-plate condenser, 1 43-plate condenser, 1 tapped condenser, 1 L300 choke coil, 1 2000-volt filter condenser, 1 10,000 ohm grid leak, plug and jack connection for microphone buzzer and C.W., 1 600-volt 220 watt motor-generator. Completely wired and boxed for shipment, $350.00 f. o. b. St. Louis, Mo.

CATALOG: Send 10¢ in stamps for the Benwood catalog and price list, also complete catalog and price list of DeForest radio equipment.

DEALERS: We manufacture a complete line of radio apparatus and have stock on hand ready to ship. Write or wire for our attractive proposition. New price list just issued.

The BENWOOD RADIO Co. INC.

"WORLD-WIDE MAIL ORDER SERVICE"

1114 OLIVE STREET ST. LOUIS, MO.

ACT 4 OPERA CARMEN

The New Star in the Radio World

LEADERS use the accepted rules and precedents, by which the majority bind their efforts, only as starting points for higher achievements. Mu-Rad Apparatus, embodying new principles, is the achievement of such a group of leading radio engineers. The very moderate prices of this apparatus make the accomplishment the more noteworthy. Bulletin upon request.

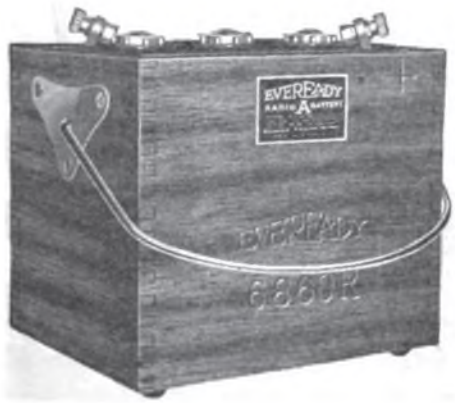
MU-RAD
LABORATORIES
INCORPORATED
ASBURY PARK
NEW JERSEY

FOR BETTER RESULTS

USE

EVEREADY

"A" and "B" BATTERIES



EVEREADY "A" BATTERIES

—hardwood box, mahogany finish
—convenient handle, nickel plated
—rubber feet protect the table
—insulated top prevents short circuits
—Packed vent caps prevent spilling

No. 6860—90 Amp. Hrs.—45 Lbs. $18.00

No. 6880—110 Amp. Hrs.—52 Lbs. $20.00

EVEREADY "B" BATTERIES

No. 766 is the most popular size in use. Contains 15 cells and has a long service life. Equipped with five positive Fahnestock Spring Clip Binding Posts ranging from 16½ to 22½ volts, making it the most desirable type for use with vacuum detector tubes, such as Radiotron, Model UV-200. Dimensions:—Length, 6⅝"; width, 4"; height, 3". Weight, 3 lbs. 7oz. **Price, $3.00**

EVEREADY "B" BATTERIES can also be obtained in the following types:

No. 763

Especially suitable for use where light weight or small space is essential, such as in small portable sets. Contains 15 cells, enclosed in waterproof cardboard box, equipped with two coil wire leads. Initial voltage of 22½ volts. Dimensions:—Length, 3⅜"; width, 2"; height, 2½". Weight, 13 oz.

Price, $1.75

No. 767

Contains 30 cells of the same size as in No. 766 and is therefore approximately twice the dimensions. It has the same voltage taps as the No. 766 and in addition has a 45-volt tap; all Fahnestock Spring Clip connections. The lower range of voltage taps is to be used in connection with the detector tube, and the 45-volt tap for the amplifier tubes.

Price, $5.50

No. 746

Consists of 72 cells equipped with two coil wire leads enclosed in a wooden box, made airtight. It gives 108 volts and is most widely used in conjunction with loud speaking devices, such as the Magnavox. It is especially suitable for theater and auditorium use, or outdoors, where the message must be carried to the longest distance required. Dimensions:—Length, 17"; width, 9"; height, 3½". Weight, 20 lbs.

Price, $15.00

Send today for Descriptive Booklets

NATIONAL CARBON COMPANY, Inc.

Long Island City, N. Y.

Atlanta **Chicago** **Cleveland** **Kansas City**

A WESTON FILAMENT VOLTMETER--

WHY?

Because a Weston Voltmeter costs but little more than ONE Vacuum Tube—and its proper use will save not only that tube from prematurely burning out, but all others you subsequently buy. Its use will double and treble the life of every tube.

Because with a Weston Voltmeter you can always duplicate instantly any voltage required for best results—and your exact tuning is thereafter a simple matter. For accelerated tuning and good reception it is therefore an absolute necessity on every receiving set.

Why not make this money-saving investment right now—before you lose another tube?

Circular J describes this voltmeter fully and also tells you of other important Weston instruments for Radio use. Write for it.

One of several important Weston instruments improving Radio Reception and Transmission.

Weston Electrical Instrument Co.

158 Weston Ave., Newark, N. J.

Makers of Electrical Instruments since 1888

WESTON

"STANDARD" *The World Over*

ELECTRICAL INSTRUMENTS

An Indicating Instrument for Every Individual Need and Industrial Purpose

Interference Eliminated to the Nth Degree

"The Ear of the World" TRADE MARK

Bitter Root Valley, in the Heart of the Rockies, Listens to Pittsburgh, 1,500 Miles Away

ZENITH

TRADE MARK

Long Distance Radio

Licensed and Manufactured under Armstrong U. S. Patent No. 1,113,149 and U. S. Application No. 807,388.

Model 1-R

A complete three-circuit regenerative feed-back tuner, using the "Armstrong Regenerative Circuit," combined with an audion detector. Radically different in construction and accomplishing the following results:

Total elimination of all body capacity by proper concentration of the electro-static and electro-magnetic fields *without* the use of metal shields or screens.

Reduction of high frequency resistance to an absolute minimum, and consequent increase in signal strength and efficiency.

Unusual selectivity and extreme distance range—achieved by radical departure from customary methods of construction. Artistic beauty and refinement as well as efficiency are outstanding features of the ZENITH.

Price $75.00

Sold Through Music Dealers Exclusively

The outstanding feature of the Zenith Long Distance Radio is its **selectivity.**

Not only does the Zenith put you in touch with all important broadcasting stations within a radius of 1,500 miles, but whether the station be near or far, the "voices of the air" come to you through the Zenith "as loud and clear as a good red-seal record." —To all of which the following letter from a Zenith fan in Stevensville, Montana, bears enthusiastic witness:

Stevensville, Montana,
Sept. 21, 1922.

Chicago Radio Laboratory.
Chicago, Illinois.

Gentlemen:

I believe I am going to give you some facts that will astonish even the makers of the wonderful 1-R ZENITH—and please remember that this station is in the Bitter Root Valley, completely surrounded by high mountains.

With my Zenith equipment I have twice picked up KDKA, Pittsburgh, 1,500 miles as the crow flies. Stations received between 7:00 and 12:00 P. M. on the evening of September 12th:

DN4	Colorado National Guard, Denver
KWG	Portland Wireless Telephone Co., Stockton, Cal.
KGG	Hallock & Watson Radio Service, Portland
KFBB	Havre, Montana
KSD	St. Louis Post-Dispatch
CHBC	Calgary, Canada
KZN	Deseret News, Salt Lake City
WOI	Iowa State College, Ames, Ia.
KGB	Tacoma, Washington
KYG	Portland, Oregon
KDZR	Bellingham, Wash.
KFD	Seattle Post-Intelligencer

These results were obtained on my 80-foot aerial. I used two stages of amplification; and sending the music through the Victrola with Zenith phonograph adapter, it was as loud and clear as a good red-seal record.

Above tests were made in the presence of three persons. I can substantiate the above and duplicate the tests before any number of reliable witnesses.

(Signed) ASHLEY C. DIXON.

You will never really **know** what "Radio" is capable of doing until you listen to a Zenith. Let us give you that opportunity. Simply send us the name of your nearest music dealer, and we will either arrange a demonstration at his store or write you promptly where such demonstration may be had. There is no obligation. Write TODAY.

Chicago Radio Laboratory

McCormick Building Chicago, Illinois

Attention—ARRL Members —This Page is YOURS

ASST OPRS
S. E. Dutton—"DN"
P. J. Marco—"FJ"
K. E. Hassel—"SF"
R. F. Laidlaw—"BL"
G. A. Fitzsimmons—"GF"

R. H. G. MATHEWS CHIEF OPR "WO"

ASST OPRS
C. J. Meyers—"CF"
W. Stack—"WS"
M. MacCabe—"XN"
J. Callahan—"JA"
Brennan—"MA"

Radio

9ZN

CHICAGO ILL

November 1922

Fellow ARRL Men:-

I have received so many replies to our broadcasts of October 1st to 5th from 9ZN in regard to the connecting up of our members with various music dealers throughout the country handling radio, and the financial profit has been so great to those whom I have been able to place, that I think it well worth while to place this message before our entire membership through the medium of our official organ, QST.

For years we ARRL men have been doing various kinds of radio work without profit of any kind. We can now make money in the line in which we are all most interested, and thus make our pleasure profitable. Some of the men who have hooked up with radio-music dealers are making $5,000.00 a year or more, and there are many more real positions to be had by our members. Music dealers throughout the United States are either handling or contemplating the handling of high grade radio for home entertainment. They are the logical dealers for this type of apparatus having plenty of finances, good business connections, and excellent show rooms, but naturally do not know how to operate the radio business.

No matter how isolated your home is there is a music dealer in your vicinity who wants and needs you in connection with his radio business. The opportunities for excellent positions are unlimited.

A number of our old timers such as Clayton, 5ZL, of Little Rock, and Quinn, 9ZL, of Neenah, Wisconsin, are already occupying such positions, and I will be more than glad to furnish full details as to how these connections can be made to any of our members who read this and are interested.

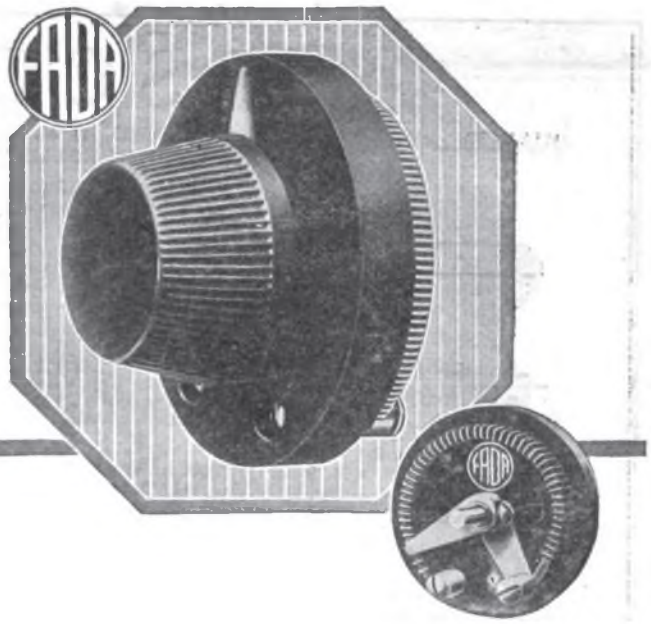
Yours for a successful and profitable connection,

R. H. G. Mathews

R.H.G. Mathews, 9ZN.
332 S. Michigan Ave.

Make Your Pleasure PROFITABLE

A Better Rheostat for 75 Cents



New Grade hard fibre—
Will not absorb moisture
and corrode wires.

Half Million "Radio Fans" Bought Fada Rheostats in 1921

An unquestionable attribute to the merit of Fada rheostats is the universal approval of over half a million satisfied users.

As a parallel to this achievement, Fada announces a new rheostat—a better instrument for less money. This new Fada rheostat, using a special hard fibre resistor strip, represents the peak in rheostat design and finish.

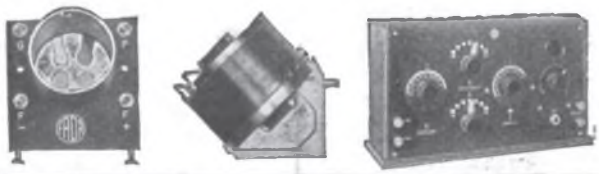
This new fibre strip is specially treated and will not absorb moisture and corrode the wires. A notable advance in rheostat manufacture.

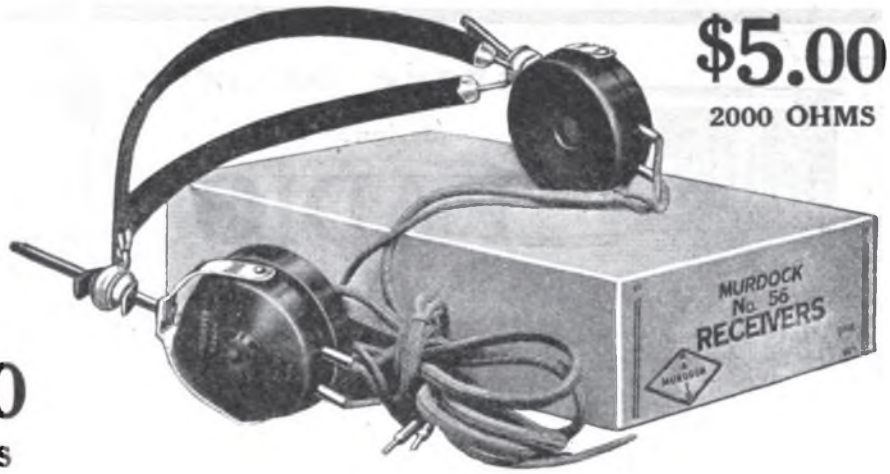
The new Fada rheostat, as a whole, is designed for use by those experts who love to construct and who take great interest in appearance and efficiency of their set.

FRANK A. D. ANDREA

1581-E Jerome Ave., New York City

$1.00 $4.75 $27.00





$5.00
2000 OHMS

$5.50
3000 OHMS

Backed by 17 years of RADIO manufacturing—

Since 1904 Murdock Apparatus has been in constant use by radio experts in many of their most important experiments.

The demonstrated success during these years enables us to positively guarantee the most satisfactory service from MURDOCK HEAD PHONES and other apparatus.

Nearly all the old time "amateurs" are familiar with the high quality of Murdock Apparatus.

SOLD BY DEALERS EVERYWHERE

Sent direct on receipt of remittance if your dealer does not have them.

WM. J. MURDOCK CO.

343 Washington Ave., **Chelsea, Mass.**
1270 Broadway 509 Mission St.
New York San Francisco

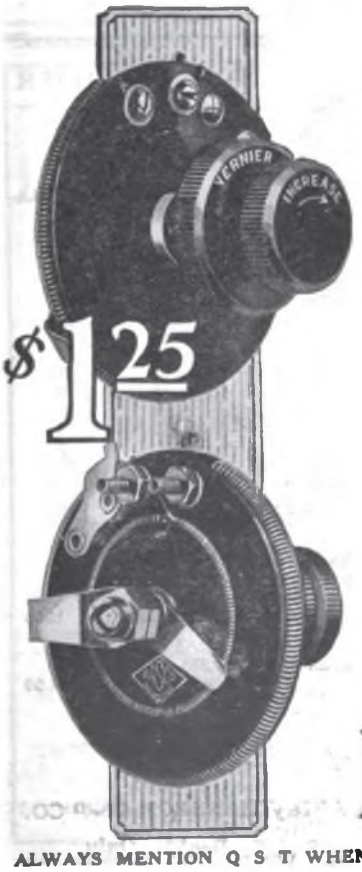
MURDOCK PHONES

STANDARD APPARATUS SINCE 1904

Critical!

It's that Sharp Filament Adjustment that Pulls in the Long Distance Stations

CRITICAL filament adjustment—too fine for ordinary rheostats. That's what turns those C.W. "squeals" into clear, distinct signals. Whether it's voice or code you're after—long distance or greater clarity of tone—close filament adjustment is half the battle. "Get their carrier wave and you've got their signals"—that's the sentiment of every radio fan who uses a



$1.25

BASCO Vernier Rheostat

"Picks the Signals Out of Squeals"

Controls the most critical detector tube. Smaller knob gives coarse filament adjustment—larger one, an extra fine vernier adjustment. Smooth, easy action—positive contact always. Resistance coils rigidly inset in heat resisting fibre—no shifting of coils when in operation. All metal parts, binding posts, etc., heavily nickeled. The Basco Vernier Rheostat represents the highest type of workmanship in EVERY detail.
Get more out of your set with a Basco Vernier—the super-delicate filament rheostat. Costs no more than ordinary rheostats. Ask your dealer to show you one.

OTHER BASCO RADIO EQUIPMENT

Super-sensitive Receivers (2000 Ohm) $6.00
(3000 Ohm) 7.50
Radio Frequency Transformers..... 5.00

Also Variocouplers, Variable Air Condensers, Tube Sockets. Switch Assemblies, Crystal Sets complete or as parts, Binding Posts, etc.

Jobbers and Dealers: Write for extra liberal discount and name of our nearest local factory representative.

Briggs & Stratton Co.
Milwaukee — BASCO PRODUCT — Wisconsin

One-Three-Five Years from Now?

TIME and use are the great laboratory tests for radio telephone receiver quality. What will *your* head-set be worth after months and years of use? Will the steel still retain its magnetism? Will the assembly still exhibit that accuracy so necessary to the critical needs of radio? Will the tone and volume still have those finer qualities that they possessed in their newness and youth?

Will YOUR head-set be in service one year from now? Three years from now? Five years from now?

"here's what one user has to say of "Red-Heads"

The Newman-Stern Company
Cleveland, Ohio

Dear Sirs:

I have a pair of your "Red-Head" receivers purchased about three years ago.

I have carried them with me over 20,000 miles! in suitcase or sea-bag whenever they were not on the table or thrown into the drawer.

They have been dropped on steel decks during rough weather; thrust on the table with a bang when the static was exceptionally annoying.

In fact, they have come through the hardest kind of hard service. They are scratched and nicked all over, but I am happy to say they are still on the job, and as clear-toned as ever.

Yours very truly,

Ralph

"RED-HEADS"

Triumph in Radio Receiver Design

-NOW $6.50

THE goodness and efficiency of "Red Head" Receivers is not a matter of accident. They were designed by skilled radio engineers who understood what was needed to make the right kind of radio 'phones —the kind that would *stay* right. In the seven years that they have been on the market, "Red-Heads" have come into use the world over.

At the new low price of $6.50, they are unquestionably the biggest value on the market today in 3000-ohm, aluminum back receivers.

You take *no risk* when you buy "Red-Heads." We guarantee them *absolutely*. Your money back if you are not satisfied.

At your dealer's or sent direct on receipt of price.

The Newman-Stern Co

Newman-Stern Bldg., CLEVELAND, OHIO

Producers of "Red-Head" radio receivers, "NAA" Arlington Tested Detector Crystals and the Teagle line of *better* radio apparatus. Send for descriptive bulletins.

DEALERS: The Newman-Stern Co. is a pioneer radio organization. The radio instruments we put out have gained a wide reputation. It will pay you well to write for our dealer proposition.

THE NEWMAN-STERN CO.
CLEVELAND, OHIO

Gentlemen:—Enclosed is Money Order for $6.50 for which please send me a pair of "Red-Head" Receivers. It is understood that if I am not completely satisfied with these 'phones, I may return them within seven days and get my money back.

Name _____

Post Office Address _____

The name of my dealer is _____

DUCK'S RADIO CATALOG No. 16

256 PAGES

Continuously since 1909 Duck's Radio Catalogs have never been equaled for completeness and great wealth of radio data

Send 25c in coin carefully wrapped for your copy of this wonderful book, the most unusual and complete catalog ever put between two covers. Not sent otherwise. Enormous cost and tremendous demand prevent distribution at a less retainer.

Over 50 pages of latest hook-ups (wiring diagrams) and invaluable and up-to-date data and information on radio. Not only a catalog, but a wonderful textbook on radio.

Never in the history of radio has there been such a catalog. The radio data and diagrams embracing upwards of 50 pages give the experimenter more valuable and up-to-date information than will be found in many textbooks selling for $2; and $1 could be spent for a dozen different radio catalogs before you could gather together the comprehensive listing of worth-while radio goods found in this great catalog.

Duck's Products Have Stood the Test of Time 1909-1922

There are many Duck products that completely dominate all competitive types.

The Largest Line in America —62 Complete Instruments— 58 parts.

DEALERS

We want live, responsible dealers in every city and town in the United States, both for the sale of our extensive line of radio apparatus and all other worth-while lines of radio goods, on all of which we can quote attractive dealer's discounts. We can offer you facilities and advantages that no other radio house can offer.

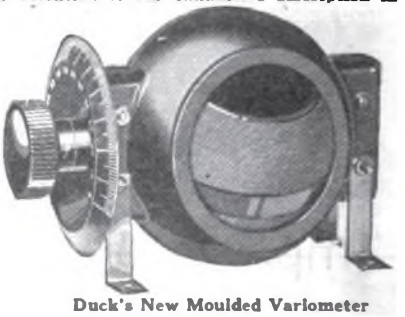
DUCK'S NEW MOULDED VARIOMETER

Our new moulded variometer (shown below) speaks for itself. For a comprehensive description of the design and radio thought back of our variometers, we invite your attention to our exhaustive description in catalog. In prettiness of design, compactness and lightness of weight, we have not seen any variometer that we believe compares with ours. The forms, unlike many others, positively will not warp.

No. A900 plate variometer, with knob and dial, $7.25

No. A901 grid variometer, with knob and dial, $7.25

Note: If knob and dial are not desired deduct 75c.



Duck's New Moulded Variometer

The WILLIAM B. DUCK CO., 243-245 Superior St., Toledo, Ohio

3000 OHM SETS, $3.98

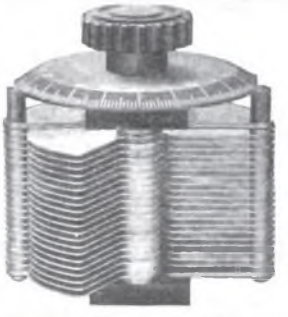
PLUS 20 CTS. POSTAGE AND PACKING

Satisfaction Guaranteed or Money Back

We mail phones the day your order arrives. Every pair tested, matched and guaranteed as sensitive as $8 to $10 Sets. Circular Free.

TOWER MFG. COMPANY

107 STATION ST., BROOKLINE, MASS.



BUY DIRECT

SAVE MONEY

ON GUARANTEED RADIO EQUIPMENT

43 Plate Condenser without Dials	$3.00
23 Plate Condenser without Dials	2.50
13 Plate Condenser without Dials	2.25
3" Dials	.60
Vacuum Tube Sockets (unbreakable)	.65
Rheostats	.65
Mica Grid Condensers	.25
Mica Phone Condensers	.35
Grid Leaks	.60
Head Sets (3000 ohms)	4.50

Money back if you are not satisfied. We operate on small margins. Send stamp if you want folder.

TEL-O-QUIK COMPANY

1446 Wilson Ave., Chicago, Ills.

TO RADIO DEALERS

State Territories NOW Open. Aggressive Dealers can make good profit selling Guaranteed Radio parts. Write for Complete Information.

Ray-Di-Co. Organization, Inc.

1215 Leland Ave., Chicago

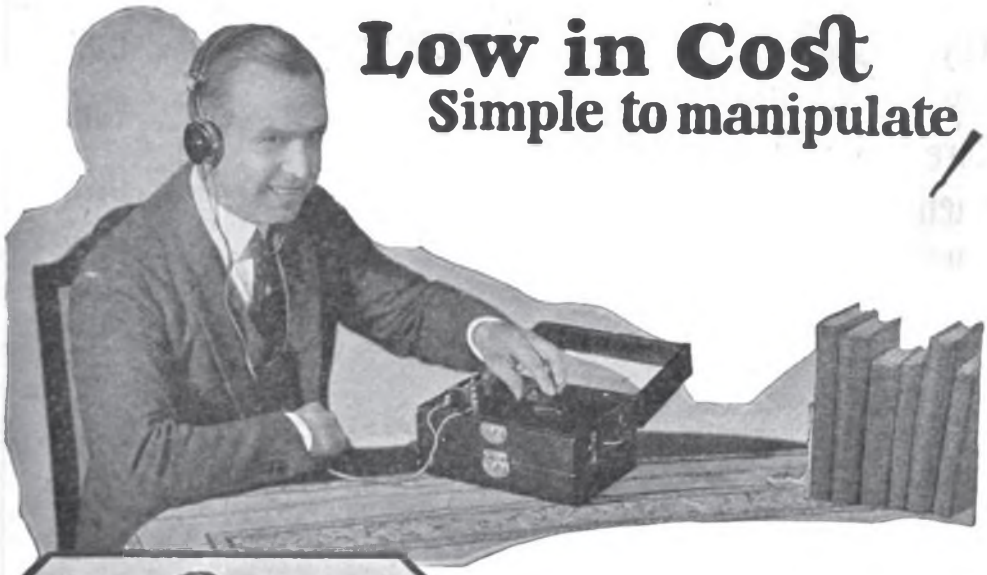
JOY-KELSEY CORPORATION

Manufacturers

RADIO EQUIPMENT

4021 West Kinzie St. Chicago Ill.

Low in Cost
Simple to manipulate



Opened like a book

Carried like a satchel

THE radio enthusiast who lives within ten to twenty miles of a broadcasting station has exactly what he wants in Radiola I (ER 753-A)—low cost, compactness, portability, and simplicity of manipulation.

Open the walnut cabinet, and on the front panel you find the tuning control, the crystal detector and the binding posts. In the body of the cabinet are the head-telephones. Tuck away the telephones, close the front panel, and you can carry the whole set as you would a satchel.

Radiola I at your dealers, $25.00

The Book That Brings Radio Into the Home. For 35 cents you can obtain from your dealer or from us a copy of the book "Radio Enters the Home." It explains the principles, the fascination of radio in plain English. It describes Radiolas and their accessories. It contains the most valuable wiring diagrams ever published.

RCA

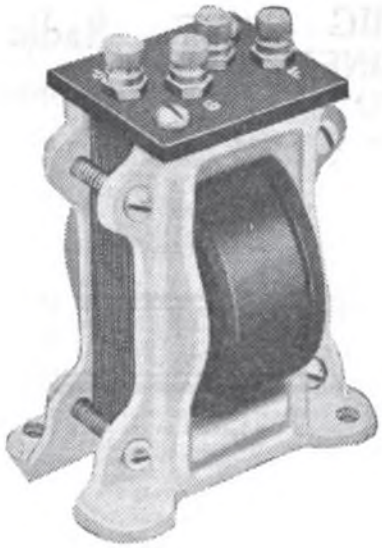
This symbol of quality is your protection.

Radio Corporation of America

WORLD WIDE WIRELESS

Sales Department, Suite 2068
233 Broadway,
New York, N. Y.

District Office
10 South La Salle St.,
Chicago, Ill.



$6.00 from your dealer. No exposed wiring to break or short. Can't be incorrectly connected. No impregnating compounds for insulation, thus avoiding noises due to losses. TESTED FOR 600 VOLTS A. C. Ideal for power amplification. For use with any V. T. in any circuit. REMEMBER THE NAME—3 Y Q.

Joy With Every Step

We invite you to pass judgment on a remarkable achievement in Audio Frequency Amplification. In the name of the 3 Y Q Transformer you have been promised amplification without distortion and Radio Engineering ability has completely filled that promise.

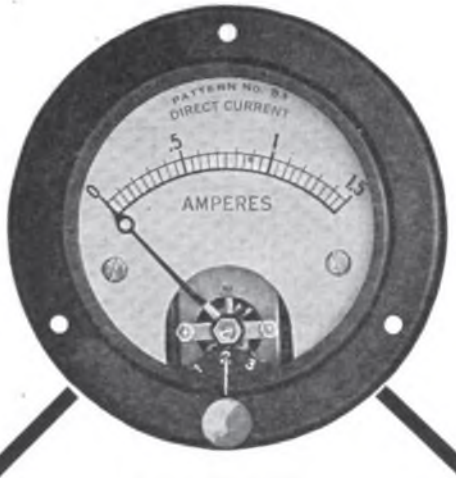
Delving straight to the heart of good engineering, radioists demand the rarest, the most unusual trait in a transformer—absolute dependability. They require that the transformer of their choice shall be so correct electrically, mechanically and in theory that they need give it no thought save admiration for its consistent, flawless performance.

The 3 Y Q Transformer meets those requirements. There is amplification in 3 Y Q Transformers that gives joy with every step. Howling and distortion due to electrical leaks and high mechanical resistance has been eliminated by master Radio Engineering construction. New mechanical and constructional laws have been proven true by 3 Y Q results.

The proof of these facts rests with you. Discriminating radioists everywhere are according first place in their favor to the 3 Y Q Transformer. It deserves the same favorable verdict from you and, once you have tried and tested the 3 Y Q Transformer, that verdict will be assured.

FEDERAL RADIO
3YQ
CAMDEN, N.J.

Federal Institute
of
Radio Telegraphy
2nd & Federal Sts., Camden, N. J.



TRIPLEX FILAMENT METER

Filament control by the use of proper instruments in receiving sets is the trend of the times. The Jewell triplex filament instrument, made as an ammeter or voltmeter, places on your panel the proper means for controlling the filaments of three tubes. It has a self contained mechanism for switching to either tube and being of small size, can be accommodated on the most compact tube set.

PRICE $10.00

We were the first to supply a complete line of miniature radio instruments of uniform size. Ask your dealer or write to us for complete radio circular.

Jewell Electrical Instrument Co.
1650 Walnut St., Chicago

JOBBERS AND DEALERS

BIG MONEY IN RTS Radio Equipment

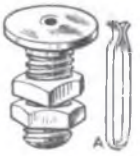
The demand for RTS Equipment has become so great that for two or three months we have been behind on orders. But now, with our greatly enlarged plant, we are able to supply standard and special equipment to dealers and jobbers in any quantity.

We show here one article that has proven exceedingly popular.

The RTS Condensers shown above are standard in type and among the leaders in the industry. They eliminate howling, clear up phone speech and make the tubes perform perfectly. Furnished with mountings complete, ready for connections. Every condenser is thoroughly tested. They are made in three capacities.

	Retails at
Grid Condenser .0005 M. F.	**30¢**
Grid Condenser & Leak, combined	**45¢**
Phone Condenser .0013 M. F.	**30¢**

This new R. T. S. Cord Tip Jack leads the way in price particularly. Used in place of ordinary jack in Detector and last stage of amplification, and in place of binding post and for experimenters in making any desired connection.



A—Illustrates inside of jack. Constructed of spring phosphor bronze highly nickel plated. By method of a wiping spring contact a clean and positive connection is always assured. Where others sell from $1.00 to $2.50 the R. T. S. Cord Tip Jacks are 50¢ per pair.

Amateurs order direct from dealers. If they can't supply R. T. S. will supply you direct.

JOBBERS AND DEALERS OPPORTUNITY

Now is the time to cash in big profits! Amateurs in all parts of the country are demanding RTS Equipment and Specialties. Write today for price lists and liberal discounts to the trade.

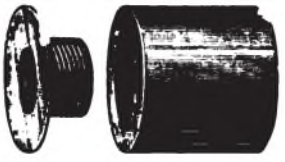
RADIO TESTING STATION
Dept. Q-11, 25 Sturgis Street
Binghamton, New York

Na-ald
Small Space
V. T. Socket

35c each, 3 for $1.00, Moulded genuine condensite. Requires but small space for mounting. Readily accessible binding posts. No excess metal to interfere with efficiency. Unaffected by heat of bulb or soldering iron. Phosphor bronze contacts. Nickel plated brass binding screws. Slash cut slot. Price possible because of large production.

Special proposition to dealers and jobbers.

ALDEN-NAPIER CO.
Dept. M.
52 Willow St., SPRINGFIELD, MASS.

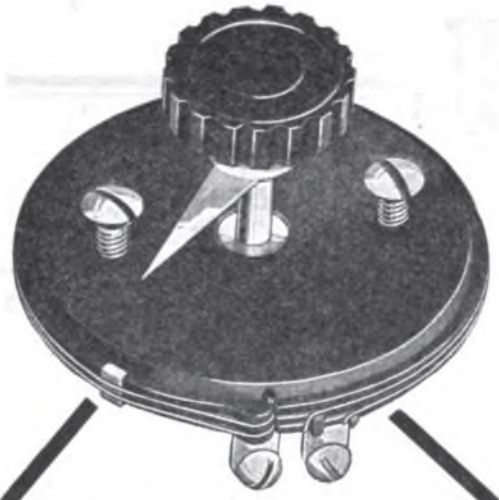


ATTENTION RADIOTICS

IF YOU USE AMPLIFYING TUBES you can make your Victor talking machine a RADIO LOUD SPEAKER, with a "BEEKO" Radio-Phone attachment.

Sample by mail, 40¢.
Liberal discount in quantities

J. H. BUNNELL & CO.
32 Park Place, Department Q New York



VERNIER RHEOSTAT

The Jewell vernier rheostat is extremely simple and substantial in construction, employing a new principle of contact which we have patented. Made of the highest grade bakelite and using the best resistance wire obtainable. Very fine adjustments are obtained by a single turn of the knob. Ask your dealer or write to us for special circular.

PRICE $1.00

Jewell Electrical Instrument Co.
1650 Walnut St., Chicago

KING
Rheo-Socket

***Another* Radio Surprise**

Price $3.00, f. o. b. New York City

Compact, increased efficiency, shorter connections, less wiring—brings in stations you never heard before. Make this a part of your up-to-date set.

A high grade article in Red Bakelite with Phosphor-Bronze Contacts and Alloy Resistance Wire.

For Base or Panel Mounting.

KING AM-PLI-TONE
82 Church Street, New York

NOVO
"B"
BATTERIES FOR RADIO

22½-45 & 105 VOLTS

NOISELESS
DEPENDABLE
GUARANTEED

ASK YOUR DEALER

NOVO MANUFACTURING CO.
424-436 W. 33rd ST.
NEW YORK
531 SO. DEARBORN ST., CHICAGO.

APEX SERVICE

All orders shipped same date as received. Try our service—you will like it. Price bulletin sent on receipt of 2¢ stamp.

Frost Phones—2000 ohms	$5.00
Frost Phones—3000 ohms	6.00
Brandes Superior—2000 ohms	8.00
Western Electric—2400 ohms	12.00
Baldwin Mica Diaphragm	16.00
Radiotron UV200 Detector	5.00
Radiotron UV201 Amplifier	6.50
Radiotron UV202 5 Watt Power Tube	8.00
Air-Way Variometer	4.50
AirWay Variocoupler	4.50
Standard Variable Condenser 11 (.00025 mfd.)	3.25
Standard Variable Condenser 21 (.0005 mfd.)	3.50
Standard Variable Condenser 41 (.001 mfd.)	4.00
Apex Bakelite Dial 3", ¼" or ⅛"	.75

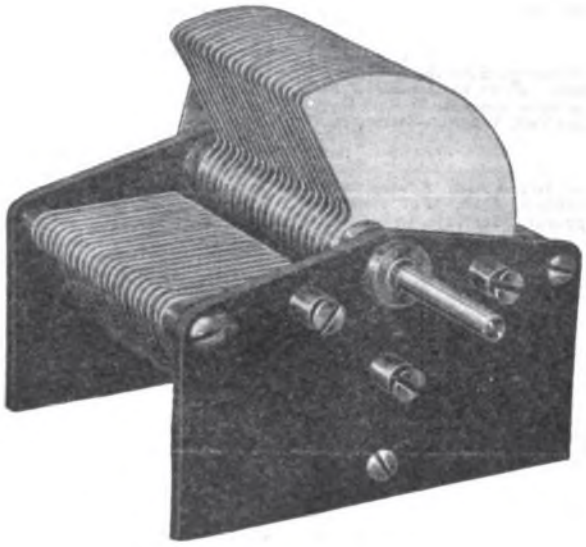
APEX RADIO COMPANY, INC.
1105 W. 69th St., Dept. Q, Chicago, Ill.

It Pays To Buy Where You See This Sign

Mr. Dealer:—If you are a progressive merchant you will be interested in this sign. Write us.

SHIP OWNERS RADIO SERVICE, INC.
Wholesale Distributors 80 Washington St., N. Y.

Wimco Announces



THE WIMCO VARIABLE CONDENSER

After months of experimentation to produce a really good Variable Condenser, we take pleasure in introducing to the trade The WIMCO Variable Condenser, which will be furnished in 43, 23 and 3 plate type. Tests conducted by the Washington Radio Laboratory show that The WIMCO Variable Condenser of the 43 plate type has a resistance, at maximum capacity, of but .018 ohms, and the capacity at zero on the scale is but 15 micro-microfarads. These values, we believe, are lower than in any other condenser manufactured for general amateur use.

The WIMCO Variable Condenser is now in production and your orders will have our best attention.

We have a very attractive proposition for the Jobber, and solicit inquiries. Write for complete price list and discount sheet.

THE WIRELESS MANUFACTURING CO.

CANTON, OHIO

Manufacturers — Distributors

CLASSIFIED ADVERTISEMENTS

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WEST COAST signals all over the room with 4Gl. radio frequency transformers. Range 200-600. Price $3.15 each with circuit. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

PRINTED CARDS and Stationery. Something Different. Printed cards $3.75 per 500. Write for samples. Stationery samples and prices upon request. F. Earl Beaudry, Radio 4FA. P. O. Box 746, Winston-Salem, N. C.

FOR SALE—Regenerative tuner with 2 step, $100, with tubes, batteries, rectifier, $150. Will trade for alto saxophone. Other apparatus for sale. Grant Boltz, St. Marys, Ohio.

HAVE 900 CYCLE, 200 watt self excited alternators for sale. Are like new. Price $25. Great for the plates of those tubes and some note. Dope on request. Also have high voltage transformers for spark. V. M. Bowers, 1658 W. Congress, Chicago, Ill.

WANTED: Omnigraph with Continental dials. Write Dr. Peter J. Brown, Racine Wis.

RUBBER STAMP with large call letters 50c; Radiogram and Relay Radiogram blanks 25c per hundred Post Cards 60c hundred. Send us your orders. Carolina Printing & Stamp Co., Wilmington, North Carolina.

VARIOMETERS (Mahogany) $3.50; 23 Plate Condensers $2.70; 43 Plate Condensers $3.40; Switch Levers $0.40; Nickel Plated Switch Points per Doz. $0.20; Westinghouse 1½ volt Tubes $8.00; Sockets for Westinghouse Tubes $1.50; Manhattan & Turney Phones. Cash or M. O. Add Postage. Columbia Radio Company, P. O. Box 1720, Washington, D. C.

RADIO STORAGE BATTERIES $6.50 to $15.50 Miraco Radio Products. Aeroplug Aerials $1.50 ea. Send stamp for folders. Lloyd E. Clark, 383 Broadway, Everett 49, Mass.

COMPLETE SET OF NEW PARTS for 3 step variometer set, including panel, knobs, cabinet and tubes. Want 3A or 5 x 7 Graflex camera. Box 1050, Greensboro, N. C.

FORCED SALE: DeLuxe Short Wave Regenerative Tuner-Detector, $29; Supreme Quality two stage Amplifier, $22; New Hammond Mathematical Typewriter, $60; $55 Vocaloud at highest bid; Standard Detector 2 step $26; Big list radio parts at half price. Palmer Craig, 3401 Glenmore Ave., Cincinnati, Ohio.

LOOK! 9BUD's 20 watt C.W. Fone. Everything complete to use $250.00 Cash. Write for details. The best set in materials, design and operation you ever saw. Act now. Box 967, Ogden, Iowa.

EXCELLENT CONDITION: Clapp-Eastham HR Receiver, $25; Amrad Coil, gap and electrolytic interrupter $15. Thordarson Transformer, $3; Donald Detwiler, 1120 Va. Ave., S. W. Washington, D. C.

FOR SALE: Grebe CR-5 (150-3000m.) regenerative receiver and detector, slightly used, $75; Grebe type RORD detector and two-step with UV-712 transformers, $65; Short wave regenerative (Baldwin variometers and variocoupler in Grebe cabinet) $55; General Electric AA-1400 detector and two-step (metal cabinet), $70; R-3 Magnavox loud speaker, $40; Pair Seibt 2000 ohm fones, $14; Pair Western Electric fones $8; F-F Battery Booster, 6 amps, $12. All apparatus guaranteed in excellent condition. Sent postpaid East of Mississippi on receipt of price. Jack Dunham, 49 Overlook Circle, New Rochelle, N. Y.

FOR SALE: To close out business, all articles brand new, guaranteed. 10 Howard Rheostats, 80¢ each; 6 Paragon Sockets 75¢ each; 8 Radiotron Amplifier tubes $5.25 each; 1 Hipwell Multiphone, $2.00; 1 Telmacophone, $15.00; 3 Rasla Radio Frequency transformers, $3.50 each; 2 Radio Corporation UV-1714 Transformers, $6.00 each; 1 Brach Lightning Arrester, $1.90; 1 Remler Detector Panel $6.50; 2 pair Murdock 256 2000 ohm phones, $3.75 each; 5 S.P.S.T. Switches, 22¢ each; 70 switch points, $1.40; 1 single circuit jack, 70¢; 2 Filament control 2 circuit jacks 90¢ each; 2 Acme Audio transformers, $3.75 each; 1 UL1006 Helix, $8.25; 3 UC1014 Condensers, $1.75 each; 1 UP1016 Power Transformer, $31.00; 1 5000 ohm grid leak, $1.00; 4 UT541 Sockets, $1.75 each; 2 Kenotron UV217 Rectifiers, $22.50 each; 1 G. R. 0-10 H.W.A., $4.00; 1 UT1357 Magnetic Modulator, $9.00; 2 Penn C Junior Regeneratives (Write for description), $35.00 each; 1 Penn C. 2 Stage Audio Amplifier, $35.00; 1 Magnavox R-3 $36.00; ½# spools #24 S. C. C. wire, 40¢; 1 18x8x⅛ Formica Panel, $1.75; 3 feet Formica 3½" tubing, $2.00; 1 Gross O. H. N. P. Wood Screws, $1.00; 24 6x8 Formica Panels, 25¢ ea. Will ship C.O.D. Send your order today. Eastern Ohio Radio Co., East Palestine, Ohio.

FOR SALE: Ten (10) Dynamotors: Motor Side, 8 volts; Generator Side, 600 volts; Manufactured for the United States Aviation Service. Price, $35.00. Eksaf Trading Company, 1515 Eastern Parkway, Brooklyn, N. Y.

FOR SALE: Two thirty foot steel radio towers special construction. Flat top antennae, 5 wire also if desired. Full particulars from R. F. Fowler, Frankfort, Indiana. 9BK.

FREE—We will give you a copy of "Twenty Radiophone Diagrams" free with your order of $15.00 worth of radio supplies. We have a complete line of standard apparatus, tubes, etc., etc., at standard prices. Try our service and you will use no other. Twelve hour service or your money will be returned. Florman Radio Laboratories, Dept. B, McPherson, Kansas.

AMAZING PRICES on standard equipment, lists free. Rectifier Plates, 72 square inch sheets. Lead 60¢, Aluminum 75¢. Stewart Semi-Dry Mahogany Radio Batteries, 80 amperes, $14; 100—$16. Two years written guarantee. Howard Frazier, 5714 Hazel Avenue, Philadelphia.

UV 203 FOR SALE—Never used with socket $25.00 plus express. Radio 5SR.

SELL: Half kilowatt Thordarson, $10; Murdock O. T. $3; 2 Murdock Condensers, $1.50 each; Murdock aerial switch, $3; Remler variometer, $3. Pliny Goddard, Leonia, New Jersey.

TURNEY SPIDER WEB. Duplex and Remler Detector outfit, new, $17.00. W. D. Hamilton, 28 Alderman St., Springfield, Mass.

FOR SALE: Clapp-Eastham Type ZRF Regenerative Receiver and Type ZRD Tube Control. Complete ¼ K.W. Spark Transmitting set. Panel detector, Federal Amplifying transformer, Federal Desk Microphone, Radiotron UV202 and other C.W. apparatus. Pair phones and condensers. Bud Hartmann, 73 Liberty St., Meriden, Conn.

TENTH HP Emerson DC Motor, $10. Hazen, 627 Fillmore, Topeka, Kansas.

$1.00 RADIO FREQUENCY TRANSFORMERS—Hear distant stations. Designed to fit any standard socket. Three sizes 160-500M; 500-1000M; 1000-2000M. Complete set of parts and full directions for assembling, postpaid, $1.00; 3 for $2.75; 6 for $5.00. Arkenberg Agency, 702Q, World Bldg., N. Y.

LOOK: Formica Panels 6-12, $0.95; 6-21, $1.65, Mahogany finished cabinets to fit respectively, $3.00, $4.00, Radiotron Detectors $4.50, Murdock fones, $4.50, Manhattans $5.40, B Batteries 22½ volts $2.50 and $1.60 each, Variocouplers, $4.50; Crosley Variables Model B, $1.65. Home Radio Company, 140 Liberty Street, Bowling Green, Ohio.

CHEAP: Set honey comb coils mounted on new plugs L100 to L1500 triple gear panel coil mounting, new pair, 3000 ohm Murdock receivers, used pair 2000 ohm. Electro phones, audiotron bulb with socket. 500 volt, 100 watt generator, 40 volt generator. Lot other stuff all in good condition. All letters answered. J. P. Hyde, Markham, Va.

EDISON B BATTERY ELEMENTS 10c a pair. Post Paid. 18 pairs will make a 24 volt Battery. Joseph Instone, 703 Carroll St., Brooklyn, N. Y.

FOR SALE: 1 K.W. Acme Transformer, $18; .007

Mfd. 25,000 volt Dubilier, $25, General Radio 0-5 hot wire Ammeter $5, large new lightning switch, $2.50; all excellent condition, 2UK.

A REAL radio frequency transformer for amateur use; beats anything on the market; range 200-600 meters; designed by 4GL; price $3.15 each postpaid anywhere in U. S. Circuit with each transformer. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

BARGAINS: Grebe CR3, $35.00; 50 watt Acme C.W. Transformer, $11.75; UV201's, $5.75; Baldwin Fones, $13.50. Write for list. Henry Kulikowski, Ansonia, Conn.

FOR SALE: One 410 Winchester trap gun with complete trapshooting outfit. Need CW apparatus or Binoculars. Dan Lake, Lake City, Kansas.

CALLS HEARD CARDS printed on government postals, $1.50 hundred up. Your call in colors. Samples. 9AVO, 746 So. Armstrong, Kokomo, Ind.

BARGAIN: Westinghouse RC receiver and two stage amplifier in cabinet, $75; 1/6 HP 10 volt Motor-Generator, $15; 5 ampere battery charger, $8. Further details on request. A. R. Leinbach, 137 Walnut St., Reading, Pa.

FIRST $25 Money Order takes my Reinartz Tuner. Formica panel—Crosley cabinet. Also 2 Chi-Rad Variometers $3.00 apiece—Crosley Condensers, $1.00—Rhamstine Amplifying Transformers, $3.00. 9CHF, Rubert Lewis, Princeton, Ill.

SELL: Complete 1 K. W. Spark Transmitter. $45.00. Good Condition. Linville, Box 593, Winston-Salem, N. C.

McTIGHE STORAGE B BATTERIES, $5.00. Rectifiers, $1.50. Brandes phones, $8.00. All new; postpaid. Cash with order. Latrobe Radio Service, Latrobe, Pa.

FOR SALE: $30 Station 600. Five watt panel, meter, 200 watt Acme transformer, etc., complete. Records 9WD, 8BZY and average 150 miles. Write, G. Mackin, 58 Peralta Ave., San Francisco, California.

FOR SALE: 1KW transmitter NEW. Positively has never been used. ½ HP Crocker Wheeler special synchronous type 110v motor Bell rotary spark gap 16 point adjustable; 1 K.W. Electrical Engineering Co. oil cooled transformer 20,000v, O. T. has 2 inch copper ribbon prim. 1 inch sec. Cond. plates 14¼x 12x12 glass lead foiled shellaced; 5 gal. tested high tension oil for condenser; $120 takes the above. Omnigraph 15 Disc type $12.00. Harry Martin, 1446 John Ave., St. Louis, Mo.

ANY PRICE for March and June 1916 QST. W. A. Mason, Avon Lake, O.

FOR SALE: Grebe CR-8 and two step amplifiers. Irvin Maurer, Minersville, Pa.

BARGAIN: New Western Electric Loud Speaker. Never out of box $135. Also New Western Electric $15 phones, $11. Going away December. First money gets them. George Merz, 606 26th north, Seattle, Wash.

FOR SALE: Spark Set, Bargain, write for particulars, Arno Meyer, St. Petersburg, Florida.

BLACK FIBRE PANELS nicely finished 7"x18"x⅛" $1.25, cut to order any size .01¢ sq. in. Immediate delivery. Geo. H. Mollahan, Lowell, Mass.

GREBE CR-5, $65, Brand new John Naratil, Palmerton, Pa.

TESTED GALENA CRYSTALS From our own Mines shaped and tested at the mine in best standard hookup—direct to user. A real crystal—not a pinhead. Twenty-five cents postpaid, five for $1.00 to group buyers. Ozark Crystal Co., Box 1, Morrellton, Mo.

10 AMP. G. E. Tungar Rectifier new bulb $75. Edison elements 10¢ Pair. 1KM, 118 Pleasant St., Malden, Mass.

VARIOMETER WOOD parts, large size, solid mahogany, $1.50; Brass parts, 25¢. Winding form 25¢. Wood rotors for couplers 50¢. Tested Galena 2 pieces 15¢. Tested Radiotron Det. Tubes $5.00. William N. Perry, 333 Ontario St., Racine, Wis.

FOR SALE: 9BIZ, 30 watt CW set complete, 500 volt generator, chopper, Magnetic Modulator. Meters, tubes, etc. Have worked 1100 miles—heard much farther. Like new. H. C. Powers, Toulon, Ill.

9OX SPARK FOR SALE Complete 1KW set. Bargain at $80.00. Write for description. Box 2332, Louisville, Ky.

OUR OSCILLATOR ATTACHMENT makes any regenerative receiver super-regenerative. In cabinet, $40; mounted open, $35; parts only, $25. Radio Panel Shop, Junction City, Kansas.

WANT New York Wireless Institute model Omnigraph. Have high power prism binoculars, brand new French glass worth $48. E. H. Reeves, 1231 East 100th St., Cleveland, Ohio.

FOR SALE: All Brand new apparatus, never used. 3 prs. Federal 2200 ohm Receivers, $6.75 each; 5 prs. Murdock, Number 56, 3000 ohm receivers, $5.00 each. 2 Paragon Vt. Controls, $4.75 each; 1 Westinghouse RA. Tuner, $55.00; 1 Westinghouse detector and two step amplifier, type DA. $60.00, 1 Radio Corp. Microphone Transformer, $6.00; 1 Magnavox two step power Amplifier, $65.00, 2 Brach outdoor lightning arresters, $2.50 each; 2 Brach Indoor Type Arresters $2.00 each; 4 UV200 Detector Tubes, $4.25 each. 5 UV201 Amplifier Tubes, $5.50 each. All sent prepaid, everything guaranteed to be brand new. Have more parts, etc. Wesley Robinson, Jr., St. Marys, Georgia.

IDO IS EASIEST and best international language. Information free. Rostrom, 7616 Tioga Street, Pittsburgh, Penn.

BARGAINS: Large Eveready tapped B batteries $2.50. Finest quality 3in. bakelite dials 75¢. 7 strands 22 tinned copper aerial wire 75¢ hundred ft. 43 plate variable condenser $3.75. 23 plate, $3.25; 3 plate Vernier cond. $1.25. Add postage to your city. Terms 25% with order, balance C.O.D. We will quote prices on any standard apparatus. The Radio Shop, Hobart, Ind.

SELL: "E" Baldwins $8, Two-step tubes $25, Detector panel $5, Duplex Rotary Gap $15, OT, $2.50. Ted Rosser, Crawfordsville, Ind.

BARGAIN! 150-600 meter regenerative receiver, $15; 5000 meter "smokestack" loading coil, $5. W. Schwaner, Boonton, N. J.

FOR SALE: Grebe CR3, $40.00; Grebe detector and two step with automatic filament control, $40. Special price on complete receiver and 1KW transmitter. Hayden Shamel, Gibson City, Ill.

TWO NAVY DYNAMOTORS for direct current, each 27 volts, 90 Watts, input; 350 Volts, 30 watts, output. In spring frame, $45.00. Singly $22.50. Ten watt C.W. Transmitter—Weston thermoammeter, two selected "E" tubes, $45.00. All $80.00. Silver, Room 202, 51 East 42, New York.

WANTED—Salesman on commission basis to cover New England for manufacturer making a radio specialty. Must be able to set up and install radio equipment. A liberal commission allowed right party. References and experience must accompany application. Address QST, Box S, 1045 Main St., Hartford, Conn.

SELL: Magnavox, $36; 43 plate variable, unmounted, $1.75; "J" tube, $6.50; all new; money order, plus postage. Fred Timper, 3238 Steuben Ave., New York City.

RADIO FANS: Send for our catalog of Electrical, Radio and Mechanical books, includes radio outfits and amplifying transformers. Prices reasonable. A. C. Urie & Co., 333 W. Manhattan Blvd., Toledo, Ohio.

9EA'S 15 WATT DX CW SET $65; Grebe CR2, $35; honeycomb coil set, complete, $25, amplifier with tube, $10. Wagner, 123 West 4th, Duluth, Minn.

FOR SALE: Tuska "E" tuner, good condition, $35; Navy SE-98-A Tuner, 1000-10,000 meters, actually covers 700 to 20,000 on amateur aerial with primary honeycomb load, wonderfully constructed to navy specifications, $200.00; C.W. transmitter, four 5-watt tubes, panel, best material throout, all meters, etc., 300-watt motor-generator, complete, $200.00; old type Amrad wavemeter, $3.50; Immense Clapp-Eastham variable condenser, big plates widely spaced, capacity

one gallon, $10.00; Connecticut Telephone spark-coil transmitter, Army SCR-65 aeroplane set, new, $50.00; old double-lever Vibroplex key, $5; 23-plate Torrington variable, unmounted, $1; 43-plate ditto, $2; set of 12 misc. Coto-Coil honeycombs and mounting, $10; 2 standard Murdock 43-plate variables, $2.50 ea.; Tuska 5-watt C.W. inductance, $3; Tresco long-wave tuner, $4; 2 unmounted Tuska variometers, $3 each; set Turney spiderwebs, $3; 2 pair Brownlie phones, new, no headband, $6 each; old Murdock phones, no headband, $2; marble base United Wireless change-over switch, worn but OK, $4; 2-amp Tungar, bulb burned out, $8; Tresco version 1921 Reinartz tuner, $10; 6 burnt-out VT-14 CG-1162, $3. Details on request. Prices f.o.b. Hartford. K. B. Warner, c/o QST, Hartford, Conn.

BEAUTIFUL REGENERATIVE SET, finest standard parts. Two stages radio, detector, two stages audio; vernier variometers, polished case with bakelite panel. Completely successful. $125. Write owner for details. Warren Weaver, 100 Summit Ave., Madison, Wis.

AGENTS WANTED in every city and town to sell standard radio apparatus. Attractive discounts given. If interested, write us at once stating age and radio experience. Wilmington Electrical Specialty Co., Inc., 912 Orange St., Wilmington, Delaware.

INVENTORS: Protect your invention through A.M. Wilson, Inc., Washington, D. C. Over 20 years of efficient, expert, confidential service. Skilled in Radio-Electrical, Chemical, and Mechanical fields. Our 1922 illustrated Booklet, giving much necessary and very useful information which every inventor should know, will be sent free upon request. Prompt and careful attention. Highest references. Moderate fees. Send sketch or model for our careful opinion and preliminary advice. Write today to A. M. Wilson, Inc., (Radio 3ARH) 310-16 Victor Building, Washington, D. C. (Successor to business established in 1891 by A. M. Wilson).

DON'T MISS THIS—With every pair of Superior Phones, $8.00; Murdock 3000 ohm Phones, $6.00 or 2000 ohm Phones $5.00 you will receive an Amateur Radio Call Book FREE. Immediate shipment Postpaid. Wright Electric Co., Scottdale, Pa.

4GL RADIO frequency transformers; DX, fones and 600 meters; $3.15 each with circuit. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

FOR SALE—New Western Electric Loud Speaker complete. Will sell at dealer's cost. R. F. Fowler, Frankfort, Indiana. 9EK.

DEALERS: To close out business will sell our $65.00 A. B. C. Addressograph for only $25.00 with cabinet. Eastern Ohio Radio Co., East Palestine, Ohio.

PARAGON, radiofone and C.W. set. Practically new. Cost $70. What am I offered? Spencer Shotwell, 1450 Victoria Ave., Cleveland, Ohio.

WILL ANY ONE HEARING 6BRG—C.W. Pse. QSL to 1708 W. 23d St., Los Angeles, Cal.

SPECIALS FOR NOVEMBER: 22½ volt Eveready batteries, $2.70; Fada rheostats, $0.70; Cunningham or Radiotron tubes at $4.75 and $6.25; All goods sent prepaid. Penns Grove Radio School, Broad Theatre Bldg., Penns Grove, N. J.—Sales Dept.

FOR HANDINESS,

COMPACTNESS AND

READY, EASY REFERENCE—

Q S T BOUND VOL. IV.

Aug. 1920-July 1921 inclusive

NOW ONLY $3.50 POSTPAID

Only a few left—get yours NOW!

Q S T, 1045 MAIN ST., HARTFORD, CONN.

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Why Pay More When You Can Get Rock Bottom Prices From Us.

$ Save $ Save $ Save

Just glance over our list and send us your money order. Twenty-four hours after receiving your order it will be on its way to you.

List Price		Our Price
$5.00	Radiotrons U V-200	$4.24
6.50	Radiotrons U V-201	5.75
16.00	Baldwin Phones Type C	13.98
7.75	Baldwin Unit Loud Speakers	6.75
45.00	Magnavox	38 00
6.00	Murdock 3,000 ohm Phones	5.00
5 00	Murdock 2,000 ohm Phones	4.25
8.00	Federal 2,200 ohm Phones	6.00
8.00	Brandes Superior Phones	7.00
5.00	Acme Transformers	4.25
1 00	Double Jacks	.60
.70	Single Jacks	.50
2.50	Pull-Dog Plugs	1.25
1 50	100 ft. stranded Aerial Wire	.50
.£0	Aerial Insulators	.20
1.00	100 ft. stranded Aerial Wire	.40
75.00	Paragon R A-10	69.00
25.00	90 Amp. guaranteed storage Battery	16.00
8.00	Westinghouse W. D. 11 Tubes 1-½ Volt operated on 1 Dry Cell. Can be used as Detector or Amplifier	7.25
1.50	Sockets for W. D. 11 tubes	1.00
1.00	Rheostats	.75
1.00	Fada Rheostats	.65
1.00	Vacuum Tube Socket	.50
18.50	Homchargers	15.50
3.50	B. Batteries Volt Meters 0-£0 V.	2.75
4.50	Murdock Enclosed 43 plate Variable Condensers	4.00
4.00	Murdock Enclosed 23 plate Variable Condensers	3.75
3.25	Murdock Panel Mounting 23 plate Variable Condensers	3.00
4.00	Murdock Panel Mounting 43 Plate Variable Condensers	3.60
3.75	Arrow 23 plate Variable Condensers	2.25
4.75	Arrow 43 plate panel mounting Variable Condensers	2.50
	Contact Points per doz.	.15
	Switch Levers 1-½" Radius	.25
	Honeycomb Coils All Sizes 20% Discount	
1.00	Fixed Condenser	.50
1.50	Crystal Detector	.75
8.00	3000 meter loose couplers	4.75
4.00	Tuning coils	2.00
12.00	Western Electric VT-1	7.50
13 00	Western Electric VT-2	8.25
8.00	Atwater-Kent variometers	7.00
8.00	Atwater-Kent variocouplers	7.00
4.50	Thordarson Audio Transformers	3.75

Space being limited we are obliged to omit many items.

REMEMBER WE UNDERSELL ANY RADIO HOUSE IN THE U. S.

Write for our quotations.

We prepay charges East of the Rocky Mountains. West of the Rocky Mountains we pay half the charges.

Cut Rate Radio Co.

P. O. Box 472, Newark, N. J.

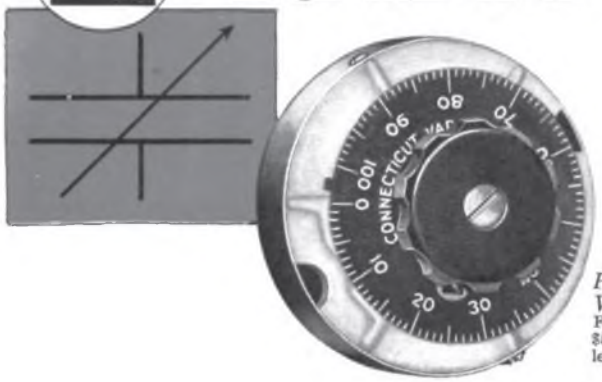
—FOR YOUR CONVENIENCE—

QST'S INDEX OF ADVERTISERS

IN THIS ISSUE

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

CONNECTICUT RADIO



Panel Type CONNECTICUT *Variable Condenser, J-108*
For desk use, $6.50; for panel, $5.50. Ask for descriptive booklet.

What Do You Demand in a Condenser?

Fine Adjustment? The useful portion of Condenser adjustment spreads over a dial turn 2½ times greater in the CONNECTICUT Variable Condenser than in the rotary type. That gives more than twice the control for fineness of adjustment.

Selectivity? The CONNECTICUT Condenser, because of its low effective resistance, insures greater selectivity.

Signal Strength? You're bound to get a stronger signal from CONNECTICUT Condenser, with only 0.2 ohms resistance, than from the rotary type, with a resistance of two to fifteen ohms.

Stable Adjustment? In any position, without counterweights to sacrifice insulation, or friction to sacrifice control. CONNECTICUT adjustments are permanent.

Sturdy Construction? Two plates; no chance for bending and short-circuiting.

A Philadelphia user writes:
"Its use in connection with my—set has enabled me to intercept with good volume New Orleans, St. Louis, Atlanta, Anacostia, Davenport, Cleveland, Rochester, Schenectady, Troy, Boston, Springfield, and others, which was not possible with any other condenser, many of which I have tried. Another advantage is to be able to tune out at will many stations. Your condenser has made my set so sensitive that the thought of buying a more expensive set is no longer considered."

CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden Connecticut

AMRAD

The Recognized Symbol of Superior Performance

R. F. 1 Stage
AMPLIFIER
No. 3290
Price $23.00
(Requires 1 Radiformer)

R. F. 2 Stage
AMPLIFIER
No. 3071
Price $30.00
(Requires 2 Radiformers)

Radio Frequency STANDARDIZED

Now you can add a standardized Radio Frequency **Amplifier to your Receiver and regularly bring in distant stations rarely or never heard before. Amrad Radio Frequency Amplifiers, 1-stage or 2-stage, may be applied to standard Amrad, General Electric, Grebe, Westinghouse and other popular Receivers or to your own home-built Set. Wavelengths from 150 to 4000 meters may be tuned efficiently by applying the proper Radiformers, furnished *extra* to the Amrad Amplifiers.**

Send for Bulletin D for complete description or Diagram illustrating application to standard Receivers.

Amrad Radiformer
(R. F. Amplifying Transformer)
Price $5.00
Fits any Tube Socket

Radiformers The Reason

The requirements of efficient radio frequency reception at short, medium and long wave-lengths have been exhaustively studied by the Amrad Laboratories. The Amrad Radiformer, in 4 types—companion to the famous Amrad Ampliformer—is the final result of patient research and critical comparisons.

In purchasing Amrad R. F. Amplifiers, it is highly important to specify the proper type Radiformer—which depends on wave-length range and stage of amplification desired.

Bulletin C, sent free on request, describes the unique Radiformer construction. Bulletin 348, enclosed with each Radiformer, gives wiring diagram. Complete Amrad Catalog describing the 60 separate products, 10 cents in stamps.

AMERICAN RADIO AND RESEARCH CORPORATION

205 College Ave., Medford Hillside, Mass.
(4 Miles North of Boston)

New York District Office
13 Park Row

Chicago District Office
218 State Street