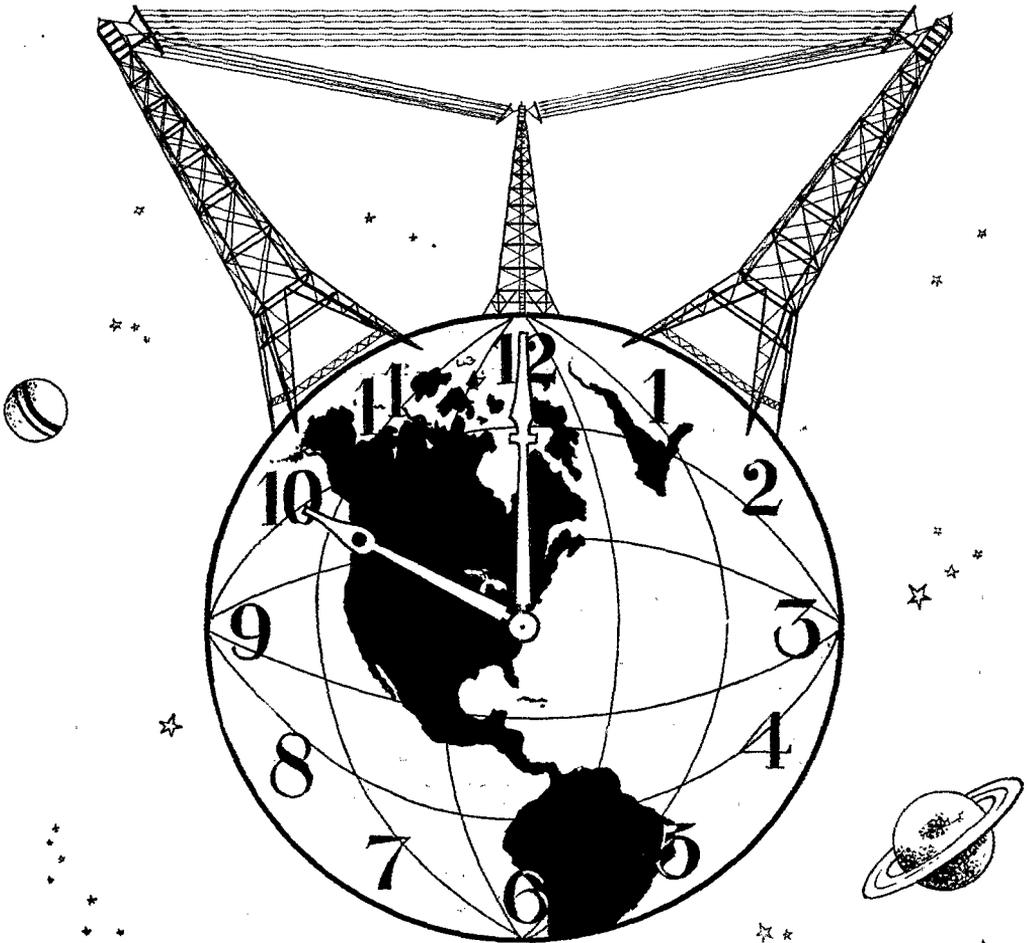


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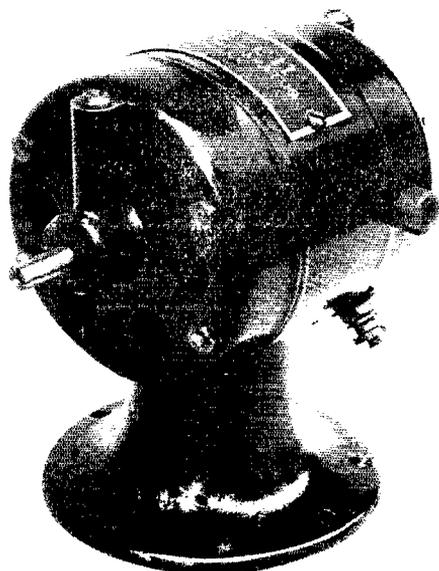
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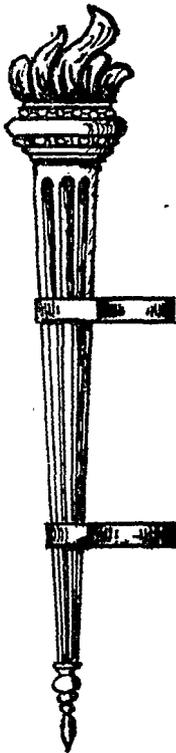
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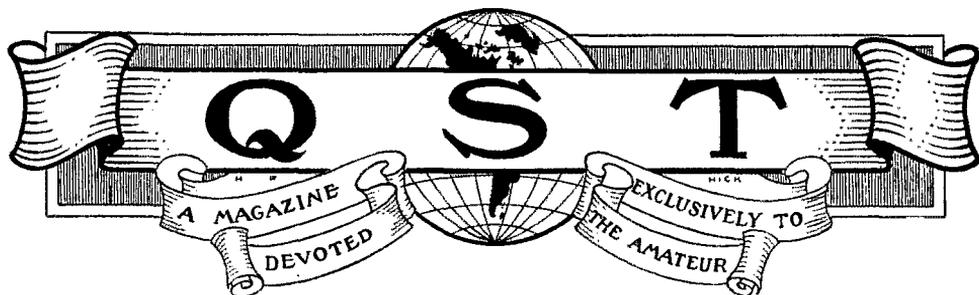
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Operation of a Non-Synchronous Rotating Gap

By A. S. Blatterman

Radio Laboratory, Washington University, St. Louis, Mo.

RESULTS OF PRELIMINARY INVESTIGATIONS TO DETERMINE CORRECT CONDENSER CAPACITY FOR USE WITH ROTARY GAPS AND THE EFFECT OF SPARK RATE ON POWER AND TONE OF WIRELESS OUTFITS

Reprinted with permission from the Electrical World, September 16, 1916

SEVERAL interesting articles have appeared recently* dealing with the rotating gap, and the writer would hesitate to bring up the subject again if it were not for the fact that in studying the literature on the subject little data is discovered bearing directly on the operating features. This is particularly true of the non-synchronous type of gap as affected by changes in the size of the condenser and in the spark rate. General experience has shown that the correct value of capacity is considerably less for a given transformer when a rotary

gap is employed than when a plain stationary gap is used, and the spark rate effects both the tone and the amount of power utilized. The efficiency is also involved here. In attempting to study the problem analytically, it appears that the relations between both these factors, capacity and spark rate, and the power and high-fre-

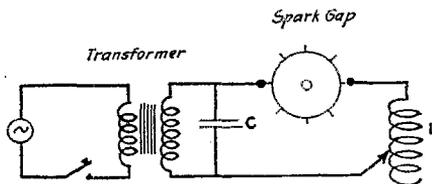


Fig. 1—A Common Form and Arrangement of Spark Gap

*"Theory and Design of Radio Transformers," F. Cutting, Proc. I. R. E., April, 1916.

"Design of the Audio Frequency Circuit," J. Weinberger, Proc. I. R. E., December, 1915.

"Resonance in Transformer," L. B. Turner, Electrician, Aug. 2, 1912.

"Hytone' Radio Transmitter," M. Eastham, Proc. I. R. E., December, 1914.

"Resonance Phenomena in Low Frequency Circuit of Radio Transmitter," H. E. Hallborg, Proc. I. R. E., June, 1915.

quency currents in the condenser and antenna circuits are very complex. An investigation of the subject is now under way and it is the results of the first set of experiments which have been carried out in this connection which form the basis of this article.

Where the cycle of primary current is of

low frequency, that is, 25 to 133 cycles, the advantages of a high spark rate with musical tone can be achieved by using for the spark gap a device which breaks up the wave of voltage from the inductor or transformer into several sparks per alternation. A common form of spark gap for this purpose consists of a metal disk, rotated at high speed, which carries a number of equally spaced studs or spokes about its periphery and which revolves between stationary electrodes. The familiar arrangement of the gap and its arrangement in the circuits is shown in Fig. 1.

Construction of Synchronous Rotating Gap

The device differs in its operation and to some extent in its purpose from the so-called synchronous rotating gap. In the latter the disk is rotated at a particular speed such that the r.p.s. multiplied into the number of studs on the disk is equal to the number of alternations per second of the primary alternating wave. The stationary electrodes are mounted on a frame so that they can be rotated about the disk after the manner of the brush-rocker on a dynamo, and thus cause stationary and revolving electrodes to come opposite each other for sparking at the instant when the alternating wave is passing through its maximum. Thus, one spark is obtained in each alternation of the voltage cycle, and it can be made to take place at the maximum value of voltage in the cycle. To secure and maintain the synchronous relation of spark disk to primary wave the disk is mounted on the shaft of the generator which supplies power to the transformer. To secure the desired high spark tone the spark gap, transformer and generator are designed for a primary wave of high-frequency, commonly 240 or 500 cycles, which give respectively spark rates of 480 and 1,000 per second. The transformer is adjusted (approximately) to the condenser so as to produce a condition of resonance for the frequency employed. That is, if L represents the inductance of the transformer in henries, and C the capacity of the condenser in farads, then, roughly, adjustments are made to make

$$2\pi fL = \frac{1}{2\pi fC}$$

In practice the adjustment is made for a condition of 15 or 20 per cent off resonance. Thus, if resonance is obtainable at a speed of 1,500 r.p.m. the operating speed will be set at, say 1,300 r.p.m.

Construction of Non-Synchronous Rotating Gap

With the non-synchronous rotating gap, on the other hand, the disk is revolved at high speed, generally without regard to the primary frequency, and instead of obtaining one spark per alternation at a constant voltage, the voltage wave is broken up into several sparks occurring at no very clearly defined instants during the alternation, though one particular condition may be that shown in Fig 2, where 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 indicate instants of sparking.

The condition for sparking is that the instantaneous value of voltage in the wave shall be sufficient to break down the gap between the stationary and moving electrodes when these come opposite each other. If, as is entirely possible, a pair of moving electrodes come opposite the side electrodes at an instant in the alternating wave when the voltage is not sufficient to break down the gap or when the voltage is passing through its zero value, then the regular sequence of sparking will be broken, and one, two, three or more studs may pass the stationary side electrodes before the voltage has reached a value sufficient to cause a spark. Important factors are the number of studs on the disk, the rotative speed, the length of the spark gap between the moving and stationary studs, the size of the condenser.

If the spark gap is made long by drawing the side electrodes back from the disk then a considerable voltage will be required to produce sparking, and thus only a few sparks will be obtained during an alternation. Some of the moving studs will come opposite the stationary studs without sparking, because they do come opposite at instants in the alternating wave when the voltage is too low to bridge the gap. The greater the number of moving studs or the greater the rotative speed of the disk the greater will be the number of inactive studs during the cycle. If, however, the gap is made very short, as short as is mechanically possible, then a very low voltage is

all that is required to break down the gap, and hence the condition may exist that sparking takes place to every movable stud as each pair in turn is presented to the stationary electrodes.

Limitations of Spark Length

The maximum possible spark length, to take the case which is shown in Fig. 2, which can be used and still permit sparking to each stud, is that corresponding to the voltage at instants 1, 5, 6, 10, where now the division points 1, 2, 3, 4, etc., must be interpreted as denoting instants when moving and stationary studs come opposite one another in a position suitable for sparking.

When the gap length is longer than this every stud will not yield a spark. When it is shorter each stud may still yield a spark. When the gap is set at the critical length every stud will yield a spark only when moving studs are presented to stationary studs at instants which divides the alternation symmetrically, as shown in Fig. 1. For if the instants of opposite position, which will hereafter be called the sparking posi-

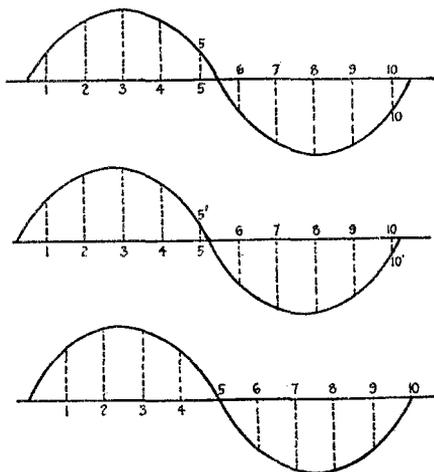
tion, of moving and stationary studs are displaced along the cycle as shown in Fig. 3, then at instants 5 and 10 there is available only a potential 5-5' (=10-10') to break down a gap whose length is set for the potential 5-5 (=10-10), see Fig. 2, and hence instead of five sparks per alternation there will be only four. One stud has become inactive. If the gap is shortened to allow discharge at voltage 5-5', then all studs will again yield sparks; and the shorter the gap is made the greater is the permissible displacement of instants 1, 2, 3, 4, 5, etc., along the cycle. When the displacement is such that the instants 5 and 10 of the representative case coincide with instants of zero voltage in the wave, then, of course, one stud will be inactive. This is shown in Fig. 4.

If the above reasoning is correct we must conclude that when the spark gap is very short there are two ways in which sparking may occur.

1. In every alternation each stud may yield a spark, in which case the sparks will follow each other at equal intervals.

2. In every alternation each stud but one may yield a spark, in which case sparks will occur in groups, the time interval between groups being twice as great as that between sparks in a group.

If sparking occurs in either the first or second way just described, it may be expected that the length of the gap must be less as the speed of the disk is increased,



Figs. 2, 3 and 4—Cycles of Transformer Voltage Showing Sparking Positions of Gaps

In Fig 2 sparking positions of gap are shown as symmetrically placed in the low frequency cycle. In Fig. 4 a particular case is shown of certain sparking positions occurring at instant of zero voltage in wave.

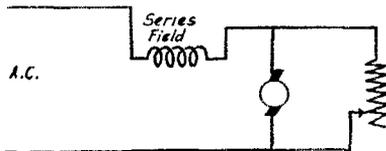


Fig. 5. Connections for Reducing Speed of Series Motor

while at lower speeds it should be possible to use longer spark gaps. Experience has shown that these effects do exist. When the disk is rotated at high speed the spark gap must be made very short to produce anything like a smooth tone; and lengthening the gap by as little as 1/100 in. is often found to give the spark tone a very ragged quality, apparently indicating that a number of studs miss spark. On the other

hand, when the disk is rotated at low speed the allowable spark gap is found to be much longer.

Effect of Gap Speed on Power and Aerial Current

General experience has also shown that the rotative speed of the gap as well as the size of the condenser has important effects on the power and the aerial current, and in order to investigate this the following experiments were carried out.

For the first experiments a small 60-cycle, 5000-volt transformer was used. The spark gap was of a common type carrying eighteen studs. The motor was an a.c. series motor whose speed could be varied through a range of 500 r.p.m. to 5,000 r.p.m., the lower speeds being obtained by adjusting a water resistance placed in shunt with the armature, as shown in Fig. 5. The higher speeds were obtained by giving the brushes a considerable lead. Instantaneous values of speed were read from a tachometer. In this way the speed could be kept quite constant for any set of readings.

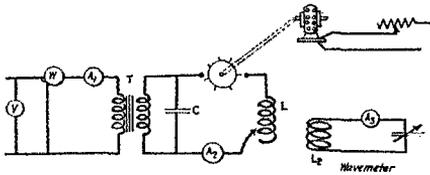


Fig. 6. Connections of Apparatus for Spark Gap Experiments

An adjustable glass plate condenser of maximum capacity, 0.01 mf., was used. The high-frequency inductance was of copper strip wound in a flat spiral. The set-up is shown in Fig. 6. An ammeter A, voltmeter V and wattmeter W were placed in the primary side of the transformer. In the high-frequency circuit was placed a hot-wire ammeter. As the maximum range of this meter was only 8 amp., it had to be used with a shunt and calibrated for the wave length used. The calibration was effected by sending with reduced power and observing the reading of the meter without the shunt and then with the shunt connected. The ratio of the two readings then gave the multiplying value of the shunt. For observing wave length and decrement in the

high-frequency circuit the wavemeter inductance L was loosely coupled with the condenser circuit, and observations taken by means of the hot-wire milliammeter in the wavemeter circuit in the usual way.

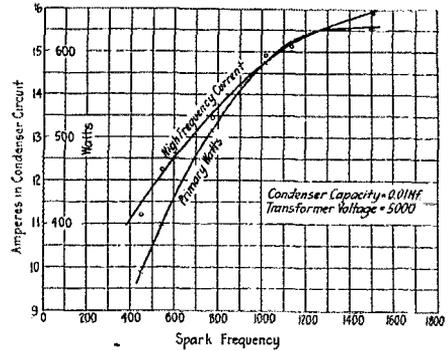


Fig. 7. High-Frequency Current in Condenser Circuit and Watts in Primary of Transformer as Functions of Spark Frequency

A preliminary set of readings (Table 1) were obtained with the speed as independent variable.

Current in the condenser circuit and power in watts in the primary of the transformer were plotted against spark frequency, as in Fig. 7. It was found that with the higher spark rates the condenser current and power increased at a slower and slower rate toward what appeared to be a maximum.

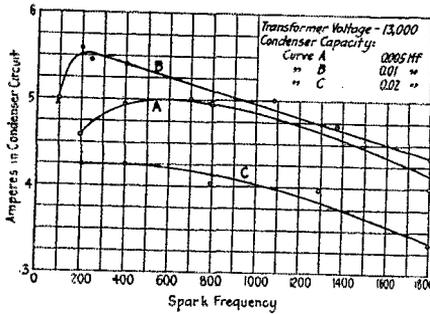
This was interesting, and steps were at once taken to ascertain if the curves did pass through a maximum and then fall as the motor speed was carried to very high values.

The 5,000-volt transformer was replaced by one wound for 13,000 volts, and a new spark gap installed having twelve points, whose speed could be accurately controlled from 200 r.p.m. to 12,000 r.p.m.

The effect of disk speed was examined first. The motor speed was varied for different values of the capacity in the condenser and readings taken of speed, high-frequency current, watts input to the transformer, primary voltage and primary current. Table 2 and curves of Figs. 8, 9 and 10 show results with condenser capacities

of 0.005 mf., 0.01 mf. and 0.02 mf. respectively.

All three of these curves exhibit distinct maxima of current in the high-frequency



Figs. 8, 9 and 10. Current in the Spark Circuit as a Function of Spark Frequency with Different Condenser Capacities

the effective length of the spark with change in speed, this being greater at the low speeds. It is also probably due in part to a quenching effect at high speeds. This method of determining the resistance of a spark circuit by the usual methods of measuring decrement and substitution in the above formula cannot be applied when the spark is quenched or when its resistance is comparable with the resistance of the rest of the circuit. Under this condition the damping is linear and not logarithmic.*

The important thing to know, however, is that as the spark frequency is continuously decreased from a high value, the high-frequency current at first increases, reaches a maximum, and then decreases. This result had been anticipated, and in the theory proposed to account for it, it seemed that similar effect might be produced by chang-

Table 1—Effect of Variations of Spark Frequency on Primary Watts and High Frequency Current

Motor Speed, r.p.m.	Spark Freq. N	Primary Watts	H. F. Current, Amps.
1500	450	345	11.2
1800	540	400	12.2
2600	780	510	13.4
3400	1020	590	14.9
3800	1140	610	15.2
5000	1500	630	15.9

circuit corresponding to certain critical motor speeds.

The power in the condenser circuit, which if this circuit were coupled to an aerial, would, of course, determine the aerial current, is

$$P=I^2R, \text{ watts,}$$

R being the high-frequency resistance of the circuit and equal to

$$R = \frac{1}{300\pi^2} \frac{\lambda\delta}{C}$$

λ =wave length in meters

where C=capacity in microfarads

δ =logarithmic decrement (semi-period).

Decrement determinations made at different speeds showed some variation in the high-frequency resistance of the spark circuit. This is probably due to a change in

ing the size of the condenser. Accordingly, a set of readings were taken at different speeds, the speed being held constant and the condenser varied in steps from 0.005 mf. to 0.02 mf. The results are given in Table 3. The curves of Fig. 11 drawn from this data show that for any given speed the current in the condenser circuit is maximum for a certain value of capacity and any change from this critical capacity is accompanied by a decrease in current.

The curves of high-frequency current in the above figures may be taken to indicate in a comparative way the variation of power in the condenser circuit. The power is, of course, proportional to the current squared, provided the resistance of the cir-

*J. Stone Stone, "The Electrician," Sept. 18, 1914, Proc. I. R. E., December, 1914.

Table II—Effects of Variations of Condenser Capacity and Gap Speed on Primary Watts and High Frequency Current

Capacity of Condenser in mf.	Motor Speed r.p.m.	H. F. AMPS.	Watts	Prim., Amps.	Prim., Volts
0.005	12,000	3.6	115	5.1	108
	6,900	4.7	140	5.2	108
	4,000	4.9	150	5.2	108
	2,000	4.9	173	5.3	108
	1,000	4.46	185	5.4	108
0.010	12,000	4.0	110	5.3	108
	5,400	5.0	125	5.3	108
	3,500	5.0	130	5.2	108
	2,000	5.4	140	5.3	108
	1,220	5.5	150	5.4	108
	1,000	5.6	165	5.6	108
	500	5.0	175	5.8	108
0.020	12,000	3.0	96	5.3	108
	6,400	4.0	115	5.4	108
	4,000	4.0	115	5.4	108
	2,000	4.5	124	5.4	108
	1,000	4.5	135	5.5	108

cuit does not change, but in a qualitative way, the plot of current also shows the changes in power. In this connection, Table 2 shows that the efficiency as determined by the ratio output to input, reaches a maximum for a certain spark frequency. This

procedure kept the radiated wave length the same and thus avoided the possibility of changing aerial resistance with changing wave lengths.

It would appear, offhand, that with a given transformer potential, an increase in

Table III—Results with Constant Gap Speed and Variable Condenser Capacity

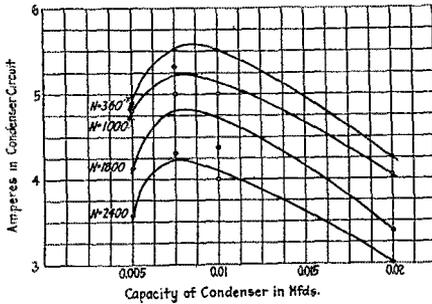
C in mf.	Amperes in Condenser Circuit			
	N=360	N=1000	N=1800	N=2400
0.005	4.9	4.8	4.1	3.6
0.0075	5.3	5.0	4.3
0.01	5.5	5.0	4.4	4.0
0.02	4.25	4.0	3.4	3.0

is evident because the primary watts continue to increase after the current in the condenser circuit begins to fall off.

Results similar to the above have been obtained with an actual transmitter, the readings of the aerial ammeter being kept under observation while the spark frequency and condenser were varied, care being taken in the latter case to keep the wave length constant by compensating changes in closed circuit inductance. This

either spark frequency or in the size of the condenser would be accompanied by an increase in power, in accordance with the formula, $\frac{1}{2}CV^2N$. The frequency observed increase in power with decrease in spark frequency and condenser, therefore, leads to the hypothesis that the average value of V is affected by these factors, and entering as the square in the determination of power, overbalances opposing changes in either C or N.

Consider, first, the case in which capacity is changed and N remains fixed. When the condenser is reduced the potential to which



it is charged in a given short interval of time is greater than when a larger condenser is used. The condenser charges in the time interval between successive sparking positions of the disk electrodes, and hence, if in this interval the potential is increased, even though it be at the expense of decreased capacity, the energy per spark may be increased because this varies with the square of the spark voltage and only according to the first power of capacity.

Limit to Changes in Condenser Capacity

There is evidently a limit to which this automatic adjustment of spark voltage through changes in condenser capacity can be carried. There soon comes a point beyond which the potential, for a given transformer winding, cannot be further increased, and hence at this point it is disadvantageous to use smaller condensers.

We are not dealing here with the resonance effects producible through the proper balancing of capacity against the inductance of the transformer, although the curves of Figs. 8, 9, 10, 11 do undoubtedly show that for the particular transformer used in these tests a capacity in the neighborhood of 0.01 mf. is best, and it may be that a condenser of this value is that required for resonance. The effects described, however, are believed to be due to the inherent regulation of spark potential in the manner described. In fact, the build-

ing up of potential through resonance in the usual way does not take place when discharges occur, as they do here, several times in each alternation.

An explanation similar to the above also explains the results obtained by varying the spark frequency, either by changing the speed of the disk or the number of studs thereon. It was found, starting with a very high spark frequency, that decreasing the motor speed while the condenser remained unchanged, caused at first an increase in oscillatory power which continued up to a maximum value corresponding to a certain critical motor speed, beyond which (i. e., lower speed) the power fell off. As in the previous case of variable capacity and constant speed, it is believed that the effect is due to the fact that down to a certain speed corresponding to a certain spark frequency the condenser potential reaches a higher value due to the longer interval of charging between studs so that even though the spark frequency is decreased the average value of the squared voltages increases at a more rapid rate and hence more power is utilized.

This theory is roughly checked by the fact that when a non-synchronous gap is rotated at low speed and with small condensers the spark does not spring radially from the moving electrodes, but anticipates the exact diametrical position of moving and stationary studs and leads to the advancing electrodes as they approach successively into sparking position. At high speeds and with large condensers this effect is not nearly so pronounced.

It is also important to note that these experiments show that as the speed decreases the condenser required for maximum high-frequency current increases, and bear out the statement made in the opening paragraph of this paper that smaller condensers must be used with rotary gaps than with stationary ones.

In regard to the readings of the hot-wire ammeter in the condenser circuit it must be understood that these are the summation effects of a high and a low-frequency current, the former being that of the oscillatory condenser discharge while the latter is the current sent through the condenser at line frequency by the transformer. This

Aerials

Mr. Wolfe has outdone his article on "Liars" in the October QST, by coming out with this one. "Aerials" is the leader for humor and is so true. A large number of us have antennas which might be taken for the hero of this article.

EDITOR.

THE aerial is a trap, a snare, cunningly suspended in space by the crafty experimenter for the purpose of way-laying migrating wave trains as said trains pass by. That it way-lays passing kites with great avidity is merely incidental. Were it not for the aerial, foolish wave trains would dissipate their substance in riotous and worthless waving.

We are indebted to Marconi, whose last name we can pronounce and whose first name we cannot, for this ingenious method of gathering unto ourselves those which the Government says possess a damping decrement not exceeding two tenths. There is much discussion in amateur circles as to whether Marconi should be thanked or shot.

Generally speaking, aerials are divided into two great classes; amateur and commercial. Commercial aerials are used to prevent ships from growing lonely. Amateur aerials are highly efficient at lofty tumbling. Some aerials get greater results than others out of a single collapse, depending largely on the location and lack of tensile strength of guy wires, but on the whole, every amateur aerial will do more actual damage per foot of falling matter than anything which uses the air as a medium of flight.

I remember gazing in admiration at the skilfull fall of a certain amateur overhead. In one fell swoop it shoved twenty foot of spruce through a plate glass display window, pushed the other twenty feet through the brittle dome of a hot house nearby, dropped a strand of copper across a few street wires, thereby sending in four fire alarms and summoning three patrol

wagons; then wound the remaining strand gracefully around the neck of a passing policeman. The lead-ins, after a barely perceptible instant of hesitation, attached themselves lovingly to a friendly barrel wagon, which was, at the time, en route. All this, mind you, in one simple, easy movement. Darned fine falling, I call it.

No man knoweth what an aerial will next do. They are eccentric, and-er-capricious. I have a distinct recollection of an evening in February. Six or seven of us were assembled in my station, industriously using up the contents of a four volt forty and speeding a much abused filament towards a premature demise. On this placid gathering burst one of my usually peaceful neighbors. There was fire in his eye, and his nostrils belched forth smoke. He shook a brawny fist in our direction and announced in exceedingly harsh tones that he could lick anyone of the assembled multitude, regardless of height, weight, race, color, or previous condition of servitude. When no one took advantage of this very generous offer, in a burst of magnanimity he made it any two, three, or four, collectively, or individually, the choice resting entirely with us.

Some one politely remarked that ours was a radio station; that the gentleman had evidently become confused and lost his bearings, the prize-fighting factory being several blocks down, and to the left.

I calmed the irate one with some difficulty, and allowed him to tell the following tale: One of my aerial strands had elected to break, just as a gentle zephyr of north-east persuasion was passing. My wire joined forces with the depraved zephyr, and landed athwart my neighbor's tele-

phone line. It seems that as I transmitted, a few wave trains of high frequency, on adventure bent, had, out of curiosity no doubt, wandered along the telephone line and into my neighbor's instrument. The unfortunate part of the whole affair was the fact that the receiver happened to be in our visitor's hand at the time. Hence, the threatened breach of diplomatic relations.

The aerial is the first thing the prospective amateur considers. The aerial is also the last thing the disgusted veteran considers, when about to dismantle. Incidentally, one continues to consider it throughout his entire career. Consideration of the aerial enriches the vocabulary. Even as Minerva sprang full-grown from the forehead of Jove, so do many new, picturesque, and very expressive cuss-words spring spontaneously from the lips of the hapless bug as he considers the wreck of a fallen aerial. The last thing the enthusiast considers at night is his aerial, wondering if it will last the night and knowing blame well it won't. The first thing the same enthusiast considers in the morning is his aerial, wondering if it's still up, and knowing blame well it isn't.

He considers the aerial in the heat of

summer, when the joyous lightning is playing tag with his No. 12 B. & S. He considers the aerial in winter, when sleet and ice cluster on spreader and strand; in fact, he considers it at all times and on all occasions.

About the very first lesson that the novice learns in the wireless game is the sad fact that aerials do not grow on roofs, but are, alas, placed there by the sweat of one's brow and at the risk of one's neck. After about six months on the inside, the owner of an aerial finds a great feeling of comradeship growing within him for tinnies, and those who pass the greater part of their lives on roofs. In fact, when passing a group of dusky hod carriers, he never fails to say, "How are you, fellows?"

Patiently, he stands on his scorching tin roof and mends lead-ins when a difference of one degree Fahrenheit is all that determines whether he is alive, human, or Experimenter a la Friccasse. Patiently, he stands on that same roof in winter, en rapport with Cook, Peary, Shakleton, et al, and mends those self-same lead-ins. Won't some kind scientist please find a way to get Calcutta without an aerial? Think of it, friends! Aerial-less wireless!

More Tough Luck

By 8ARB

HAVE you ever listened to a long distance station and just as he was about to sign off his call letters, a gang of children outside with these coaster wagons (noiseless) would rumble by and make all the racket imaginable, or some factory or locomotive whistle would blow to its fullest blast, and you would no longer hear the station sending? At least, you would not try to hear him, for you would throw down your pencil and take off the phones; then think how you could stop the noise.

This is the experience I have occasionally and I suppose many others have the same.

But to fellows living on a street car line as myself, is still worse. The other night while copying a long distant amateur, a

street car passed the house just as he was signing off his call. But this did not happen once, but the second time. After he had sent gain and was about to sign the second time, another car passed, and a mighty noisy one at that. Just my luck. I was unable to get his call and was mad enough to shoot (or otherwise punish) the motor-man for causing all the disturbance.

No wonder I never hear many long distance stations. Am able to hear them alright, but it is just my luck to be bothered by some noise or other as I am about to copy the call letters.

What about it fellows?

Have you experienced the same tough luck?

Navy Type Audion Detector

By Bernard Kahn

THE accompanying photographs show the latest type of audion which was developed by Dr. Lee de Forest. It is being used exclusively by the United States Navy and is said to be the most sensitive of all the existing audions. The construc-



The Navy Type Audion

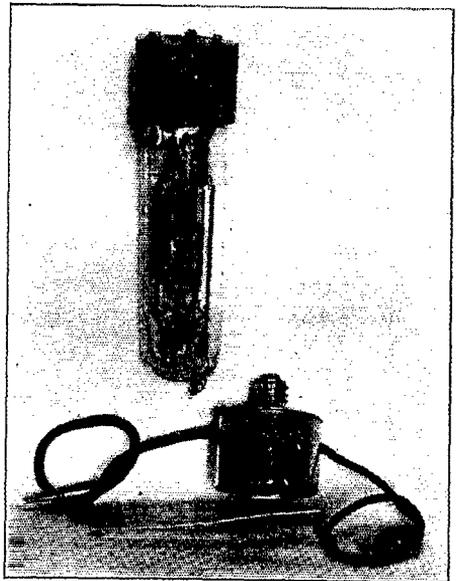
tional details of the detector are somewhat different than the ordinary type. This new bulb employs a spiral filament. The grid which is rectangular consists of a fine nickel wire wound on a special glass frame. The wing comprises a double nickel plate supported by glass stilts on both sides of the grid as may be seen in the photograph.

One very important feature of this tube is the overcoming of loose conductors which lead from the grid and wing of the older type. A special cap is placed on each tube

which is fitted with terminals as indicated, two of which connect to the grid and wing electrodes, while the third is linked with one leg of the filament and the other end of the filament is connected to the case.

A brass shell, shown in the illustration is secured to the insulated cap of the tube. Contacts are fastened on the interior of the shell so that the proper connections are made when it is put together. Two conductors from the shell connect with the grid and wing electrodes while the screw base is connected to the filament in the usual manner. The whole arrangement fits into a standard size socket. One illustration shows the audion completely assembled and ready for use.

The audion in this make-up is extremely sensitive and may be used for spark or arc



Navy Audion with brass shell removed

signals. The filament has an average life of 5,000 hours, which is ten times as long as the existing ones.

Judge Mayer Holds DeForest Device is an Infringement of Dr. Fleming's Invention

Basic System Purchased by Marconi Company Has Never Been Improved Upon, Court Holds

From New York Times

THE contention of the Marconi Wireless Telegraph Company of America that the DeForest Radio Telephone and Telegraph Company had infringed its rights to the sole use and ownership of the patent covering the Fleming detector was sustained in an opinion written by Judge Julius M. Mayer of the Federal District Court. Dr. John Ambrose Fleming, an English educator, invented the detector in 1905, and almost immediately thereafter the Marconi Company obtained the rights to its use.

While the invention is more than ten years old, it has never been improved upon by any other discovery for making more resonant the messages sent through the air. It was preceded by many other contrivances, variously known as the coherer, which was a glass tube filled with filings; the Crystal detector, the magnetic detector, and the electrolytic detector that was invented by Professor Fessenden.

William B. Vansize of counsel for the Marconi Company said that the DeForest Company said that the DeForest Company had been using a device set within the globe of a lamp, but that the idea was taken from the invention of Dr. Fleming, and was clearly an infringement of the patent owned by the Marconi Company.

In his decision Judge Mayer said that no matter what differences of opinion might exist between men of science in respect to the theories by which they accounted for the movement and action of the unseen forces concerning which testimony had been taken during the trial of the cause the solution of the issues at bar was not very difficult, because courts placed their deci-

sions upon things demonstrable and could speculate as to theories concerning which authorities did not agree. Then the decision read:

"Within the limits of an opinion it is, of course, impossible to analyze at length a mass of experiments, tests and theses, and an infinity of detail necessarily involved in testimony of experts in an art of this kind. But if the plaintiff's theory that its own device and that of defendants operate on the same principle has not been proved, and I think it has as far as such proof is possible — at least defendant's theory has not been demonstrated and, finally, the physical facts all support plaintiff's claims."

Judge Mayer complimented Mr. DeForest on the contributions he had made to science. Then the court found for the plaintiff, dismissed the counter-claims made by the defendant, but said that there was no evidence against Mr. DeForest personally.

Dr. Lee DeForest, President of the DeForest Radio Telephone and Telegraph Company, said that an appeal would be taken from Judge Mayer's decision by his company. He added that while the Marconi Company also was found to have infringed he believed they would not appeal, since the royalties they might be able to exact from the DeForest concern for infringement of the Fleming valve patent would be far in excess of the amount they would be called upon to pay for infringing the audion amplifier. The latter, he said, was widely used, particularly by the American Telephone and Telegraph Company on its transcontinental lines and by amateur wireless operators all over the country, while the United States Government had bought more than 10,000

of them. The infringement decision, he explained, lay in the fact that the audion amplifier made use of an incandescent electric bulb, though this was employed in taking practical advantage of a principle altogether different from that upon which the Fleming valve was based, though the latter

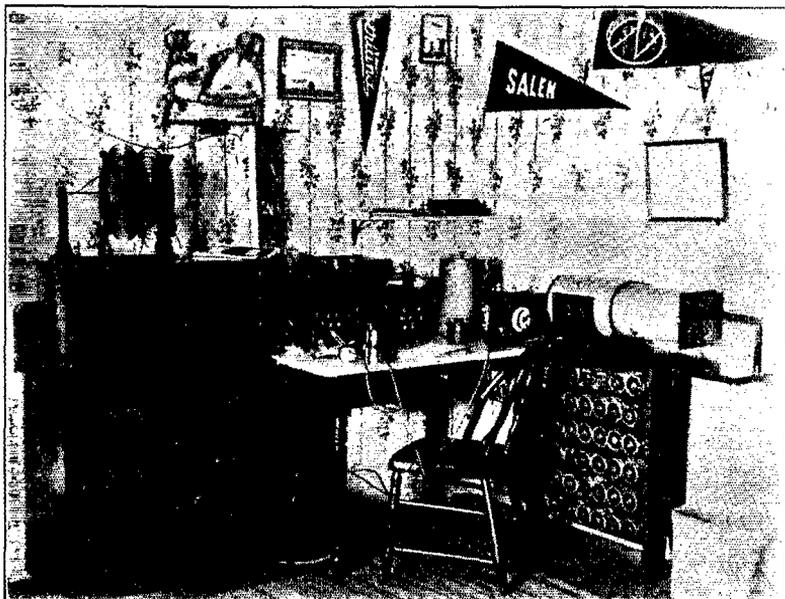
was the first device embracing the use of a lamp to be patented. Dr. DeForest thought the Marconi Company would not attempt to force discontinuation of the audion device, as he said, it had proved a far more satisfactory amplifier than the Fleming valve.

Long Distance with a Spark Coil

By E. A. Hartnell, 9KY

After the article, "Long Distance with a Spark Coil", appeared in a recent issue of QST, I received numerous inquiries concerning my set and the conditions under which such distances may be covered. The

sary for long distance work. This condenser was made by coating twenty-four nine by fourteen inch glass plates on both sides with heavy tinfoil. These plates were connected in series multiple and immersed



MR. HARTNELL'S STATION

accompanying data describes my set. I have been able to cover 75 miles, day or night, except during cases of extreme QRM. I use a three inch spark coil, run on a twelve volt storage battery with a power input of only twenty-four watts.

The coil is of Bunnell make, but equipped with a high-speed vibrator. The condenser has a capacity of .01 m. f. d. This is considered large for a spark coil, but I found a large capacity absolutely neces-

in insulating oil. An ordinary fixed spark gap is used. I have one of the well-known 1kw. brass ribbon oscillation transformers with which one may obtain a very sharp wave. The transmitting aerial is of the "T" type consisting of two wires, 130 feet long and 40 feet high.

I have a regenerative audion receiving set and no difficulty is experienced in picking undamped wave stations at a distance

Continued on Page 339

Rotten Relaying

By The Old Man's Understudy—S. Kruse

LAST winter we got the first considerable number of relay msgs thru this town. It was then we became acquainted with the relay jinx.

For some reason the same fellows that are ordinarily perfect gentlemen and good operators will suddenly and unanimously lose their minds when a relay comes along and commit radio crimes that make you long to drown them in their condenser tanks or brain them with their own spark coils — supposing that they have brains, which seems unlikely.

One evening last December I was called by a fellow down in the west end of the state who had a message for New York with a request for an immediate reply. I was working an Illinois station at the time and asked this station to QRX while I got the msg. Mr. Illinois O Kd and I asked the westerner to GA.

At this point the radio jinx grunted uneasily and rolled over but didn't awake fully—he merely started a fellow in Ohio on the exact tone and wave of my westerner. Still I got most of the msg tho I chewed an inch off the top of my pencil and revised and edited till the thing looked as if it had come thru a British censor's office. Then I called my westerner and said "Here repeat" and shot it back at him.

Possibly he answered; I don't know. A 3-4 K. W. Thordarson in the next block started just then and called 8NH six or eight times. I waited patiently till he was done and then asked him to QRX till I got my msg, unless he had some special business with 8NH.

He was still, after that, so I guessed he was going to stand bi. Well he did, but when I called my westerner again he was as silent as an audion on visitor's day. I called twice more and then told my neighbor to ga with 8NH as our sunset friend had shot something. Did he ga? He did not. He had quit in disgust. I felt rather bad about it and called him on the fone to

tell him how matters stood. He said that he would call again right away.

I don't need to tell you what I heard when I got the receivers back on, do I? It was my westerner and he was in the middle of his msg. I got about three words thru the 3-4 Thordarson and then he flipped off with "Please repeat back agn". I hardly had the heart but still called the neighbor and asked him to QRX again and help me get the msg.

Then the jinx choked on a joke that he had dreamed of and woke up coughing. He was mad and took it out on the nearest ham. That was me.

My neighbor retorted with great promptness and vast heat that he was crash blanked if he would lose 8NH again.

I retorted with a classic abbreviation of three letters advising change in surroundings. Then I flipped off the audion, and went after a drink of water.

When I got back the 3-4 was in the midst of a seven chapter account of something that did not interest me. I stood bi till considerably after twelve, hoping that the conversation would cease after a time, but as it did not, I got down Zenek and read the chapter on decrement for the fifth time with the usual result that I got stuck on the determination of the instrument decrement. I was still fighting that when it dawned on me that friend neighbor was not talking to 8NH at all any more, but was swapping yarns with a fellow in the next town about 20 miles away.

I cut into that conversation and asked them to have a short smoke—or while I got that msg I had waited an hour for.

To my surprise they did it. I got my westerner and repeated back only to discover that I had gotten the thing right to the letter an hour ago. The jinx shuffled back into his hole cackling and snorting.

I called my Illinois man and shot him the msg and asked for an ok or repeat as he pleased. He spoke right up and sent me a good clear cut string of Continental—concerning the ships he had been hearing.

He took 300 words to do it while I sweat blood and chewed the pencil into an evil brown pulp.

Finally he signed six or nine times and I cut in again and in my very crisp tones said "Hw abt msg? Pse report."

Then a spasmodic noise as of a Katy-did with throat trouble began somewhere near the top of the keyboard where the little "tink-tink" notes are and gradually jerked down the scale till it got stuck on the last bass note and abruptly expired with a choked grunt.

I was getting angry and said "D— that electrolytic" and called VBK giving him a "99 min Pse". Then I called Illinois and asked for a repeat account of QRM. He said O K and started to tell me about a camping trip. After ten minutes of that he casually referred to the msg, saying that he got it O K and would get it off later.

I said "See Here O M! It's twelve thirty now and that msg is addressed to New York. Please rush to 8NH or 8AEZ right now!!"

Well it took! I thot the jinx had retired sure, and gave a relieved sigh. But it got stuck in the middle, for I noticed right off that our two standbys in Ohio had quit for the nite.

The Katydid started again just then and I don't know what Illinois did next but after the clock struck one I heard him giving it to some fellow up in eastern Michigan. I copied it and he had that msg balled up till its author would have disowned it without hesitation. I called again and corrected it and finally about one twenty the Michigan man got it straight.

I was just going to cut off for the night when I heard that Michigander call a station in North Dakota and start to give him "msg fr u." The Dakotan copied the msg. and then said "Say boob! Why don't you send that east?"

The Michigan man was right there. He said—"Say dig up a map and find yourself. Don't you know that Dakota is east of Michigan?"

Can you beat it?

Well it was two o'clock when the thing was finally turned over to 8BC or someone up in that region and I knew that it would never get back from New York that nite so I turned in.

I woke up with the fone bell still going and dragged the thing over to where I could muffle it with a pillow. Then I got the receiver down and said "Hello."

A familiar voice said—"Say that Illinois is calling his head off. I told him I'd get you. Good night."

Darn it!

I was half asleep when "the Illinois nut" answered and didn't get his drift at once. Suddenly I was wide awake. HE WANTED TO KNOW WHETHER THE DATE ON THE MESSAGE WAS DECEMBER OR OCTOBER.

I called him a jackass. This was not polite. It was not even reasonable, because the idea was original with the fellow up in Michigan. Nevertheless the more I thought about it, the more I decided that he was that animal, and I even went into detail as to his mentality and ancestry. I made scathing reference to the reputation for original and unique foolishness that he owned and operated, and asked if he had to be carried in when it rained. Also I told him that if he went out in the daytime he had better tie a string to himself so that it would hang out of the hole and mark the place where the squirrel had hidden him.

I'll say this for him. He was good natured. He said "HaHaHa" and said he would pass the glad news on to the Michigander.

He was at it when I went to bed—after tying the fone bell.

I don't know if that message got to New York. As far as I am concerned it can go to Sheol.

Long Distance with a Spark Coil

Continued from page 337

of 5,000 miles. NAA time signals may be copied 300 feet from the phones in the evening and about 100 feet away in the morning. Atlantic Coast stations and gulf boats may often be heard 15 feet from the phones. Cuban and Mexican spark stations are often copied in the evening and last but not least, the long distance amateur stations. Amateurs operating on a 200 meter wave have been heard 1,000 miles under favorable conditions. Probably the loudest long distance signals come from 8AEZ and

8NH who actually cause interference at times when receiving from a half Kw. station twenty miles away.

The receiving set, as seen in the illustration, comprises large and small couplers, variometer, four variables, oscillating coil, 200 ohm Brandes' phones and Electron-Audio bulb. Old discarded dry cells supply the high voltage for the audion. The receiving antenna is composed of two wires, 400 feet long and 80 feet high. Both aeriels are supported by a wooden pole, 80 feet high, built from two lengths 20 feet long, 6"x6" and two lengths, 20 feet long, 4"x4", bolted together and supported by No. 12 guy wire.

The ground connection is made by dropping 140 feet of half inch copper ribbon

into a well. Connection is also made to the pump pipe which extends down in the water, 140 feet. Amateurs trying to cover long distances with a spark coil should not be discouraged if their first attempts are unsuccessful, for of course the set must be tuned extremely sharp, all connections soldered and carefully insulated. I believe amateurs who now cover short distances should build more substantial condensers, look after their ground connection, insulation, etc. Then longer distances could be covered. 9MA of this town has also been obtaining equally good results from a two inch coil. Last winter 8AEZ reported having heard his signals on several occasions. This distance is about 200 miles.

Rottenest Luck Ever

By El Amateur

TALK about your rotten luck, but I think the following story has them all "skinned a mile."

"M", a promising young amateur of limited means, in a certain city, was always on the watch for ways to improve his station.

Seeing a picture of one of the U. S. Army Field sets with the mast, he decided to make a mast somewhat like that he saw using ten pieces of bamboo ten feet long. Everything went well until the pole got up about seventy-five feet, when one of the top guy wires came loose from its fastening and down came the pole.

Nothing undaunted, he cut out the broken parts and started the pole up again. When it was eighty feet up he decided that would do. He began to make fast the guy wires when the pole buckled and fell.

Being still determined to have a tall pole, he secured six sections of good solid pine, twenty feet long, and ranging from 5"x5" to 3"x3". This he formed into a pole and erected, guying it securely (or so he thought).

He then raised his aerial and to complete the decorations he raised a 3'x5' flag. All went well for exactly six days when

Dame Nature exerted herself mightily, breaking off the top forty feet of the pole which in falling broke four telephone wires and stretched two others.

Even then he was not discouraged but put the pole back up using larger guy wire. He pulled his aerial up and tried it out twice, when six days after erection Dame Nature once again exerted her strength taking off the top twenty feet, which in falling tore through the roof of "M"'s wireless room.

All this covers a period of about four months and "M" says he is so disgusted that he is just about ready to sell out and quit the business.

If anyone can tell why a 110 foot pole guyed strongly with No. 12 galvanized iron wire to "dead men" forty feet from the base of the pole should fall, please write it out and send it to QST for "M" would like to correct his faults.

Say fellow "Hams", doesn't this beat 'em all? If any of you have ever heard of any worse luck than this I think we should all greatly enjoy reading it.

By the way, "M" asks should he try it again or throw it away, which?

Amateur and Government Stations Test

THE NAA test has been changed. Originally, it was proposed to have NAA at Arlington send out a certain message and have the amateurs of the country copy and deliver it to a local Federal officer, such as the Postmaster. The latter was to send them to Arlington where they could be listed and the number of towns and cities throughout the country which could be reached immediately by Arlington ascertained.

Commander D. W. Todd, Director of Naval Communications at Washington, was the authority in the matter, and he suggested that it would be better to have the tests conducted by the different Naval Radio Districts, rather than by NAA. To use his own words, "The District Communication Superintendents at the U. S. Naval Stations, Boston, Washington, Charleston, Key West, New Orleans, Puget Sound, San Francisco, and San Diego are responsible for the organization of amateur stations in their Districts, and should any tests between the stations of the American Radio Relay League and the district center stations of the various districts be desired by you, it would improve the co-operation between radio stations in the various districts and the District Communication Superintendent. The spirit prompting your suggestion is appreciated, as it is to such co-operation that the present organization of amateur stations by districts is due."

This plan is distinctly better than using NAA because, among other things, stations on the Pacific Coast would be out of it as compared with stations in the eastern part of the country. If the tests are conducted from the different District Headquarters, on the other hand, pretty nearly all parts of the country have an equal chance. The only parts which will have to tune closely and listen carefully will be those down through the middle, equi-distant from each coast. Another thing:—In actual stress, it would be easier for NAA to notify New Orleans, and the latter hand it on to San Diego, and the latter to Puget Sound, than to attempt to cover the entire country

from NAA. The mere repetition of the relaying would help distribute the news.

Commander Todd was hearty enough in his cooperation with us to immediately notify the District Communication Superintendents at the various U. S. Naval Stations mentioned. Each one of them took the matter up with a view to doing the best they could in the way of a test, as is shown by letters received from each of them. In fact, one station went at the matter immediately, and ran the test in his District on the night of October the 7th. This was earlier than we expected.

In the case of this District, however, every amateur with a Government license in the District was notified by mail of what was to be done, so that even if nothing was printed in QST, the information went out.

The different Districts tests are summarized in order that all amateurs may know what is being done in all Districts. Doubtless many amateurs will lap over from one District into another even if they do not hear three Districts in some cases. Here at Headquarters, we certainly would expect to hear Boston, Washington and Charleston anyway, and possibly Key West also.

Summary:

Boston.—"I desire to inform you that I am greatly interested in any tests you may desire to make between the Radio Relay League and the Boston District Center Station and assure you of my hearty co-operation. I believe it will be necessary to hold a personal conference and will be pleased to make an appointment with you or your representatives in Boston, at such time as may be most convenient to you." We intend to call on Lieut. Blakeslee, the officer in charge, as soon as possible, and arrange for the tests. His District includes the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. The Boston Communication District proper, includes the Naval Radio Stations at Portland, Me., Portsmouth, N. H., Boston, Mass., Cape Cod, Mass., and Newport, R. I. In

organizing communication between amateurs in New England, it is the Government's desire to make use of all of these stations.

Charleston, S. C. — "The Charleston Radio Station will be very glad to co-operate with you in regard to the tests mentioned. The following procedure will obtain if satisfactory to you. Charleston will send on 600 meter wave length at 11:15 a. m. on the date decided. We will send out a QST (general call) followed by the word amateur, spelled out three times, and then the message of about thirty words. The speed of transmission will be at the rate of ten words per minute. Use 75th Meridian time. The following alternative times are suggested in case the time mentioned above (11:15 a. m.) is not convenient: 6:15 p. m., 7:15 p. m., 8:15 p. m. The Charleston District embraces the States of North Carolina, South Carolina, Georgia, and Tennessee." The time, 11:15 a. m. would be very inconvenient for most of us amateurs, and we have selected the alternative offered us of 8:15 p. m. and the date of November 16th 1916. Three tests will be conducted, known as Test A, Test B, and Test C. Test A is sent after giving notice of date and hour of test, for instance, 8:15 on the night of Nov. 16th. Test B is sent out after giving twenty-four hours notice in advance by radio of the date and hour of the test message. Test C is sent out without giving any notice of the date and hour. The notice to be given in Test B will be given during the transmission on the night of Nov. 16th. Every amateur receiving the message is expected to write it on a postal card, sign and date it and mail it to the District Communication Superintendent, U. S. Navy Yard, Charleston, S. C. A witness must sign the post card to assure that the message was actually received by Radio from the Naval Radio Station at Charleston by the person signing the post card. This is to avoid "cribbing." All amateurs in this District should make every effort to make a good showing for their States.

Washington. — Lieut. McCandish decided that the only test he would care to make in his District, was to ask the amateur stations in his District to copy NAA press on the nights of Sept. 28th and 29th.

This District covers the Washington Naval District, and seems to be the best the amateurs in this locality can secure in the way of a test at this time.

San Diego, Cal. — This station through its District Communication Superintendent, Lieut. J. M. Ashley, sent out the following printed notice:

"To All Amateurs:—

1. In accordance with arrangements made with the Relay League of America, and to determine the results obtainable with amateur stations, the following tests will be carried out from the Point Loma Navy radio station (NPL):

2. On Saturday October 7th at noon (immediately or within an hour after the time signal) the above named station will send a message. The call will be "Amateurs, amateurs, amateurs—(text)—(sig) NPL."

3. Two messages will be transmitted, the first of 750 meters and five minutes later the second, on 1900 meters. "Time" is always sent out on 2400, which may help you on your tuning adjustment. Each message will be transmitted twice at about 20 words per minute.

4. Immediately upon receipt of these messages, you are requested to mail your copy to the District Communication Superintendent, addressed envelope enclosed, no postage necessary.

5. Within one week after the transmission of the above messages, another message will be sent from NPL. The date of this message is withheld, but will be sent between 9 and 10 p. m. on 1200 meters. You are requested to use the other envelope for returning copy of this message, as per instructions in paragraph 4. In both tests, please send in your copies even if you do not get the entire message.

6. Your copy shall be signed by yourself and one witness that it was received only by radio. Also immediate mailing is requested as one of the results hoped for is to determine the time required for replies to reach this office.

7. You are urged not to co-operate with other amateurs in comparing or correcting your copies, because, as is plainly evident, this would destroy the value of the results.

8. Requesting your hearty co-operation and with best wishes for results of this

test and progress of Radio, I am

DCS—580

EJB—HOE

Very respectfully

J. M. ASHLEY,

Lieutenant (j. g.) U. S. Navy,

District Communication Superintendent."

OFFICE OF
DISTRICT COMMUNICATION SUPT.
PUGET SOUND DISTRICT

Navy Yard, Puget Sound, Wash.

Bremerton, Wash.,

October 7, 1916.

Circular letter to all Amateur Radio Operators in Puget Sound District.

Dear Sir:

This test is of course now over, having been put through between the October and November issues of QST. We shall have the results of the test in due course, and will print them in these columns. It will be very interesting for the rest of us to see how the fellows in Southern California made out with NPL.

TEST A—On November 1, 1916 at 6 p. m. the North Head Naval Radio Station (NPE) at the mouth of the Columbia River will send a test message to all amateurs, transmitting on 1512 meters and at a speed of ten words per minute. It is requested that upon reception of this message you have some witness certify as to the reception and that you mail a copy of the message as received to this office.

Key West.—"Have delayed in answering your letter of Sept. 16th, with the hope that our work would be so arranged that we could carry out a test with amateur stations of Florida, something we had planned to do some time ago. Today we received instructions to start a test with all arc stations, test to continue indefinitely. As you will understand, this kind of work brings no end of correspondence. I do not believe a test should be attempted unless we are in a position to attend all correspondence and answer all inquiries from amateurs which are sure to result from such a test. I have on file the names of forty amateurs in this state and to prepare circular letters and mail to each, and next, to handle the resultant correspondence would be more than we could handle at the present time. It is probable that as soon as our new distant control station is completed we will be in much better shape and will be glad to arrange a test as outlined in your letter." This District includes the State of Florida. As soon as Mr. Stotz can arrange things, he will run the test and let us know the results. The number of amateurs in that part of the country is much less than in other parts farther north and west.

The Puget Sound Naval Radio Station (NPC) at Bremerton, Wash., will send a test message at 7 p. m. November 1, 1916, to all amateurs, transmitting on 1512 meters and at a speed of ten words per minute. It is requested that upon reception of this message you have some witness certify as to the reception and that you mail a copy of the message as received to this office.

TEST B.—Information will be broadcasted by the North Head and Puget Sound Stations as to Test B and this information will be imparted 24 hours previous to this test. Test B will otherwise be as per Test A. A copy of the message received and certified by witness is requested.

TEST C.—Same as for test A except that no advance information as to time of sending message will be given. Copy of message as received and signature of witness is requested.

Yours very truly,

E. J. BLANKENSHIP.

By the time this is printed this test will be completed. We hope everything worked out all right with NPE. We are promised the results by Mr. Blankenship and will print them in due course.

Puget Sound.—This station sent out the following circular letter to all registered amateurs in the Puget Sound District:

Continued on Page 357



MONTHLY REPORT OF TRUNK LINES "C" AND "D"

A. A. Hebert, Manager

Members will please note the following changes on the report appearing in the October issue:

Line "C"

UPPER MONTCLAIR, N. J.

2ZE, P. F. Godley.

YONKERS, N. Y.

2ABG, C. R. Runyen, Jr.

JACKSONVILLE, FLA.

4EI, John C. Cooper, Jr.

Since the last report no other STAR trunk relay stations has been developed, although several tests are now being conducted with the view of extending the long distant work.

The Bi-Weekly test messages were started on September 14th, but it is with regret that I have to report that so far the work has not been satisfactory, due to the fact that two of the stations on which we depended, are closed and the operators employed on ships for the present.

The relaying of messages has started in earnest in this vicinity, and good work is being done by 2ABG, 2LK and 2AGJ, but unfortunately we are having trouble with the western business, and cannot yet handle it through the regular channel—most of it being diverted to Line "A" through 2AGJ. However, it is hoped that the next month will see a great improvement, as several of our members are now working on their stations, and all are desirous of accomplishing results.

The Southern Stations are taking a great deal of interest in the work, and from reports received there is no doubt that very

efficient work will be done this winter.

Mr. W. T. Gravely, 854 Main St., Danville, Va. (3RO) has been formally appointed District Superintendent, and will have charge of all stations in Virginia and North Carolina.

Mr. John C. Cooper, Jr., Atlantic National Bank Building, Jacksonville, Fla. (4EI) called on your manager the early part of October, and has consented to accept the appointment of District Superintendent, and will have charge of stations in Florida and Georgia.

All members of the League and Amateurs interested in our work in the states mentioned should communicate with the respective Superintendents, and we can feel assured of complete success if every one will co-operate with the Superintendent of their District.

Branch 1 has been inaugurated, and runs between Albany and Atlantic City, N. J., and the following is the route:

ALBANY, N. Y., 2AGJ.

PEEKSKILL, N. Y., 2CE

YONKERS, N. Y., 2ABG.

ASBURY PARK, N. J., 2ARI.

ATLANTIC CITY, N. J., 3RF—3RQ.

A. A. Hebert,

246 Highfield Lane,

Nutley, N. J.



REPORT OF TRUNK LINES "A", "E" AND "F"

By R. H. G. Mathews, District Manager.

Your manager, after being literally besieged with mail from Iowa, has decided to create a new Trunk Line F, running through Iowa and Nebraska to Denver, there connecting with route B, under Mr. Seefred. Mr. Ralph Batcher of Toledo, Iowa, has been appointed local manager of this route which will be under the same management as Routes A and E. Full details as to the organization of this new route, F, are not available but a full report will appear in a later issue. In the meantime, all members desiring positions on this route should communicate with the District Manager at Chicago, through Mr. Batcher, at Toledo.

It is probable that this route may event-

ually supplant the old route "A West" as the interest on A west of Chicago, does not seem to be alive, several of the important stations not having been on the job for one test message. If the delinquent members of Route A do not show a little more interest, at least to the extent of answering the Manager's letters, this route will be changed to run through Iowa instead of the way it now runs.

A good, efficiently working route F is desired, so all applications for positions on it will be welcomed by Mr. Batcher and myself.

The other routes, E and "A east" have displayed sufficient enthusiasm to make up for that lacking in "A west". As an example of this enthusiasm, I will tell the following little incident.

Mr. W. E. Antony, 5ZS, of Shreveport, La., wrote for a position on Route E. His letter became lost in my pile of mail and so went unanswered for about four days. At the end of this time, Mr. Antony sent me a twenty-five word Western Union telegram asking for an appointment and an answer by telegraph. Needless to say, he received his appointment. We want men with Mr. Antony's "push" in our League, and I know that he will be a valuable acquisition.

Because of this appointment, Route E now reads as follows:

CHICAGO, ILL.
 9IK, R. H. G. Mathews.
 MATTOON, ILL.
 9GY, L. A. Kern.
 LOUISVILLE, ILL.
 9ZL, C. Budges.
 CAPE GIRARDEAU, MO.
 9NN, H. B. Deal.
 CAIRO, ILL.
 9JT, K. B. Warner.
 LITTLE ROCK, ARK.
 5BV, J. M. Clayton.
 5XO, E. Cornish.
 DALLAS, Tex.
 5ZC, F. M. Corlett.
 HOUSTON, TEX.
 5EO, J. L. Antry, Jr.
 SHREVEPORT, LA.
 5ZS, W. E. Antony.

NEW ORLEANS, LA.

?

Several more branch routes have been created. Among them are:

BRANCH 1

CHICAGO, ILL.
 9IK, R. H. G. Mathews,
 KENOSHA, WIS.
 9BK, H. C. Boardman.
 MILWAUKEE, WIS.
 9AOL, C. Bates.

BRANCH 2

CHICAGO, ILL.
 9IK, R. H. G. Mathews.
 LANSING, MICH.
 8ACD, R. Palmer.
 SAGINAW, MICH.
 8AAK,—?
 DETROIT, MICH.
 ??

BRANCH 3

CHICAGO, ILL.
 9IK, R. H. G. Mathews.
 ELGIN, ILL.
 9EY, L. J. Simms.

BRANCH 4

ST. MARYS, O.
 8NH, Mrs. Chas. Candler.
 INDIANAPOLIS, IND.
 (9GU, 9JL.)

BRANCH 5

CHICAGO, ILL.
 9IK, R. H. G. Mathews.
 GARY, IND.
 9AAB, P. West.

BRANCH 6

LOUISVILLE, ILL.
 9ZL.
 CENTRALIA, ILL.
 ?
 BELLEVILLE, ILL.
 9FR.
 E. ST. LOUIS, ILL.
 9QZ.
 GRANITE CITY, ILL.
 9IU.
 ST. LOUIS, MO.
 9VP.

BRANCH 7

MATTOON, ILL.
 9GV.

DECATUR, ILL.
9NW or 9KN.
SPRINGFIELD, ILL.
9AGN.

BRANCH 8

FALL RIVER, MASS.
1ZF.
NEW BEDFORD, MASS.
1ZN.

BRANCH 9

FALL RIVER, MASS.
1ZF.
CUTTYHUNK, MASS.
1KV.

BRANCH 10

FALL RIVER, MASS.
1ZF.
TAUNTON, MASS.
1EC.

BRANCH 11

FALL RIVER, MASS.
1ZF.
ATTLEBORO, MASS.
1ABS.

BRANCH 12

FALL RIVER, MASS.
1ZF.
PROVIDENCE, R. I.
1AEM.

BRANCH 13

FALL RIVER, MASS.
1ZF.
LAKEWOOD, R. I.
1BT.

BRANCH 11

FALL RIVER, MASS.
1ZF.
PAWTUCKET, R. I.
1TU.

BRANCH 15

FALL RIVER, MASS.
1ZF.
NEWPORT, R. I.
1TI.

BRANCH 16

ST. MARYS, OHIO—8NH.
Toledo and Michigan points, 8JD.
Time: Friday, 1:30 p. m.

BRANCH 17

ST. MARYS, OHIO—8NH.
Fort Wayne, Ind.
Time: 9WF, Daily, 4:00 p. m.
9VF, Nightly, 12:40 p. m.

BRANCH 18

ST. MARYS, OHIO—8NH.
Indianapolis, Ind.
Time: 9JI, Daily, 3:45 p. m.
9EG, Daily, 8:30 p. m.

BRANCH 19

ST. MARYS, OHIO—8NH.
Cincinnati, Ohio.
Time: 8ACK, Wed., Friday, Saturday,
1:00 p. m.

BRANCH 20

ST. MARYS, OHIO—8NH.
Columbus, Ohio.
Time: 8IK, Time not definitely arranged.
8YO.

Other routes will be added as the Trunk Line operators succeed in organizing them. A route book containing these lines will be compiled and mailed to all stations on Trunk Lines A and E, as soon as a sufficient number of branch lines are created.

From the outline above, it will be seen that 1ZF has been an extremely busy young man. He is another example of the kind of "pushers" that we have in our League.

Test messages have been sent regularly from 9IK on every Monday and Thursday at 10:15 p. m., Central Time. On the whole, these messages have been successful, most of them getting through on Route A east without trouble. Route E is temporarily tied up because station 9NN is not working at this time, due to the fact that Mr. Deal is moving into new quarters.

Route A east makes its Manager proud of it. The record on this route is a message relayed clear through to New York and a QSL back to Chicago, fifteen minutes after the message was sent. That beats the Western Union, Fellows. This record was made on the night of September 28th through extremely heavy static and during very warm weather. Chief credit for this speed goes to Mrs. Candler at St. Mary's Ohio, and Mr. J. K. Hewitt at Albany, N. Y., who worked with each other through the static without difficulty. Get a move

on you, you fellows of Route A west and Route E. You are letting a woman "show you up" every time. The results secured on Route A are highly gratifying, due largely to the efforts of Mrs. Candler, but those on the other routes are not at all satisfactory.

Route E is, as I have said, temporarily tied up because of 9NN, but there is no such excuse for Route A west. Now fellows, let's get into this relay game and get these messages through just to show that we can do it. I would like to discontinue the sending of test messages by the first of December, but I must keep sending them until we can handle them successfully.

Any suggestions as to routing, test messages, etc., will be greatly appreciated by all concerned in this relay work.



LONG DISTANCE WORK

Several of the Trunk Line stations have sent in lists of the stations heard by them during the past month. Among these are the following.

Heard at 9GY, Mattoon, Ill.

8AEZ, 8NH, 8PA, 8CS, 9PC, 8AOR, 8AOI, 9DV, 9VH, 8CI, 9IK, 8CX, 9AAB, 8JZ, 8NF.

Heard at 9IK, Chicago, Ill.

2AGJ, 8NH, 9PC, 8AEZ, 8OH, 8AOI, 8AOF, 9JI, 9EG, 9GY, 9VP, 9ABD, 5DU, 9AAB, 9NW, 8CS, 8NF, 8JX, 5BV.

Mr. Bridges at Louisville reports 9GV, 8NH and 9IK all strong on test messages.

Mr. W. D. Woodcock at Buffalo, N. Y. reports 9AAB, 8NH, 9GV, and 9IK all strong through heavy static on September 28th.

Heard at 8NH, St. Marys, Ohio.

9GE, 9AAB, 9IC, 9IK, 9DB, 9AIK, 9GY, 9EG, 9KD, 9AV, 9AHK, 9WO, 9JI, 9ON, 9GJ, 9LW, 9NW, 9ABD, 9ACS, 9ACM, 8KS, 8CS, 8HE, 8ZW, 8FO, 8AOI, 8CL, 8DT, 8NQ, 8CO, 8JZ, 8NF, 8JX, 9NN, 8AKM, 8WW, 8DX, 8SK, 8JO, 8BX, 8NY, 8ACK, 2AGJ, 2ZV, 2LK, FD (Bristol, Tenn.)

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

REPORT OF TRUNK LINES "B" AND "F"

The conditions now being favorable, we expect to make our first tryout of the relay stations on Saturday night, October 7th.

We have a new oil immersed condenser and rotary in connection with our old "helix" type oscillation transformer and one half Kw. transformer. We have already worked 6BJ (Centerville, Cal.) and 6BY (Richmond, Cal.) direct, so it will be seen we are prepared to do our part in making the work a success.

On the night of September 27th, we mailed a card to every relay station on our Trunk Lines announcing our first test message which will be sent out from here on the night of October 7th at 10:00 p. m., immediately after NPG's time. We received many "QSL's" to the same. Hereafter a test message will be sent out each week at the same time until further notice.

We have changed the routes so as to take in the best stations, as you will see by the enclosed report.

Following is given a line-up of the different relay stations on Trunk Line B and F:



TRUNK LINE "B"

Portland, Ore.—KDP.

La Grande, Ore.—7ZH.

?

Pocatello, Idaho—7SP.

Salt Lake City, Utah—6ZV and 6SL.

Victor, Colo.—KIW.

Denver, Colo.—KIX.

?

Lincoln, Neb.—9XT, 9RB, and 9AHR.

St. Joseph, Mo.—9HU.

Leavenworth, Kans.—FJ.

Topeka, Kans.—9QV and 9JW.

Lawrence, Kans.—9XP and 9LQ.

Kansas City, Mo.—9XT, 9MQ, 9EP, and 9LO.

Continued on page 357



SINCERE FLATTERS

When Shakespeare was operating, he pulled one off something like this:

"He that filches from me my good name
Robs me of that which not enriches
him

And makes me poor indeed."

He had a way of getting things straight the first time, and we have a hunch here at headquarters, that the feeling we are conscious of in our midst is just about the same as the one which the late William had when he filled in the message blank above mentioned. Our mail indicates more clearly daily that advantage is being taken of the confusion which exists between our name, THE AMERICAN RADIO RELAY LEAGUE and a certain other organization combining all the words in our name except "RELAY". The amateurs of the country must keep this in mind because it is becoming a matter of greater importance every day. Our organization began over

a year earlier than the one which we feel is copying us, and the idea of joining together all of us amateurs into a working organization, started with us. We recognize it is a pretty good form of flattery to be imitated, but when application blanks intended for one organization are received by the other organization, and when amateurs join one thinking they are joining the other, we begin to think the weather is turning warm. We expect to do something about this some day, in justice to those of us who have been misled in the past, and those who are at the present time coming along and who are likely to be misled in the future. Until we actually throw the switch, however, and press the key, we want the amateurs of the country to thoroughly understand that confusion as to names exists and that they must look for the word RELAY whenever they are considering us. That word RELAY is us.

THE NEXT NUMBER

For eleven months we have all pushed hard to make QST the success which we all felt it deserved. Here is our twelfth number. Each one of the twelve showing a general improvement over the previous copy. Our first issue of December, 1915, contained only twenty-four pages. This issue has sixty. The first issue had six and one quarter pages of advertising which this issue has over twice as much. The December copy which follows this will be the Anniversary Number. In this QST, we hope

to show a still further improvement which will make everyone of us feel glad he has played a part in making this magazine of the amateur, by the amateur, and for the amateur. But now let us keep up the good work by telling all our radio friends of the great success and the coming issue. Many have not yet subscribed. Help these to get their dollar for a year's subscription and you will be helping QST. Who dares to predict what strides we may make during the coming year?

THE MESCO CATALOGUE

We have received the latest copy of the Manual of Wireless Telegraphy gotten out by the Manhattan Electrical Supply Company. The standard of this little book is something which deserves recognition. To us, the first part of the catalogue is a wireless treatise on apparatus and all the things which an amateur likes to know of. Data of all descriptions may be found—an extract which covers the Government laws, diagrams, the codes, the abbreviations, the weather report code, curves for calculating wave length and all manner of interesting material. It is a book which will start beginners on the right path.

This catalogue indicates more to us than a mere description of apparatus offered for sale. It shows us the trend of amateur wireless. No longer are wireless instruments slapped together over night and de-

scribed with a rough print on an equally rough piece of paper. Apparatus is designed and constructed with the greatest amount of care. The instruments have become standardized to a certain extent and this whole atmosphere is felt when one looks over the pages of the Manual of Wireless Telegraphy. Every page contains only the best of material and there is nothing which one would hesitate in recommending. Among the new instruments offered to the amateur trade which promise experimenting along research lines are: Standard Inductances, Calibrated Condensers, Resistance Boxes, Phantom Antenna Resistances, Spark Indicators, and Audibility Meters. We hope all our readers will secure a copy and we feel confident that no one will be disappointed after looking it over.

ROTARY GAPS

The leading article of this issue is the "Operation of a Non-Synchronous Rotating Gap" by A. S. Blatterman reprinted from the September 16, 1916, *Electrical World*. The question of the condenser for a non-synchronous rotary gap has long been one of discussion. We wish to compliment the *Electrical World* in coming out with such a complete discussion and right here we might mention that the *Electrical World* is a leader among the technical papers of the United States. It seems a shame that so few of the younger generation read it. Especially as in almost every issue we find highly interesting wireless data. This article is no exception to the rule and we

amateurs would have missed a most interesting paper if permission had not been granted for the reprint.

The speed of the gap, size of the condenser, amount of inductance, radiated energy, and wave length, has long been a question which we amateurs have puzzled over. Here is an article by Mr. Blatterman which covers the question in a manner which will be clear to all of us. No longer will it be necessary to argue blindly about high notes and low notes of rotary gaps. No longer will we wonder if the condenser should be large or small. This data is of greatest importance to all of us.

A. R. R. L. CONVENTION

The membership in the eastern part of the country may be interested to know that a plan is on foot to hold a convention of all the League members who can attend in New York some time during the Christmas holiday season. Nothing like this has ever been attempted before. We have had meetings of Clubs and Societies of general character to discuss scientific questions in radio, but there has never been a convention of operating amateurs to discuss

operating questions. It would be intensely interesting for many of us who hear each other nightly to meet and get acquainted.

The attendance at such a convention would be of course mostly local. Many members would come from a distance of a few miles. Several would probably come from a hundred and fifty miles. A few would come from five hundred miles. In the east this would mean a very large attendance, in all probability. Just the same, it

would not be by any manner of means, country wide. This is usually met by such Societies as the Institute of Electrical Engineers, the Institute of Mechanical Engineers, etc., etc., having branches organized and meet in the other large centers of the country. We could do the same. The fellows for some distance around might meet in Cleveland Ohio, for example. There would be many who could get to Chicago. Probably St. Louis would draw a large number. In the Northwest, Portland or Seattle would be centers and in the Southwest, San Francisco and Los Angeles would have

a large number of stations to draw from.

After the meeting in New York, it will develop what the sense of the great body of amateurs is. If it seems to be something which appeals to the majority of us, we could nominate representatives from the eastern section to meet representatives from the western sections and thereby spread the intimacy of actual personal contact.

The plan is being developed and in subsequent issues, we hope to give further details.

PUBLICITY RELAYS

According to circulars which many of us have received, there is to be another RELAY soon. Like the others which we have had, it comes from the middle west, notwithstanding that it emanates from Washington, D. C. It is proclaimed in pretty bold type, but somehow the prizes offered for the one who breaks in on Mr. Hughes with it first, and the one who gets a lot of signatures, etc., etc., cause many of us to lose some of our interest. The thing smacks of something which does not taste well nor sit quite comfortably.

The stations of our League are of course supposed to handle any respectable mes-

sage which comes along, and our membership will be glad to handle the Relay which is now striving for publicity. It should be borne in mind however, that it is not a matter which is handled officially by the American Radio Relay League. If we were sure it was strictly to the interests of all of us, we would welcome it with open arms, but if it is intended for the special interests of some one, then we look at it differently. Our idea of a general relay is more like the one described elsewhere in this issue, and which is being run between the different Naval Radio Districts, and ALL OF US.

MONTHLY STATEMENT OF QST

Statement of the Ownership, Management, etc. required by the Act of August 24, 1912, of "QST," published monthly at Hartford, Conn. for October 1, 1916. Editor, Clarence D. Tuska, Hartford, Conn.; Manager, Clarence D. Tuska, Hartford, Conn.;

Publishers, The QST Publishing Company, Inc., Hartford, Conn.

Stockholders holding one per cent. or more of total amount of stock: Clarence D. Tuska, Hartford, Conn.

Other stockholders holding one per cent. or more of total amount of stock, none.

Known bondholders, mortgagees, and other security holders, holding one per cent. or more of total amount of bonds, mortgages, or other securities: None.

CLARENCE D. TUSKA, Manager.

Sworn to and subscribed before me this 28th day of September, 1916.

CECIL POWELL,
Notary Public.

WHO'S WHO IN AMATEUR WIRELESS

We shall publish each month two pictures of amateurs who have become known by call letters. This will draw us all closer together. We are often curious as to just what the other fellow looks like, and here's our chance to see.—Editor.



L. F. SEEFRED



H. C. SEEFRED

— 6EA —

Here's a Who's Who which is one we have all been looking for. The Seefred Brothers have been counted among the most earnest of the League workers. They have taken hold of the Pacific Coast Trunk Line Routes and have shown what can be done if one will only put a little enthusiasm in the work. Before Seefred Brothers had taken the Trunk Line Managership, the Pacific Coast interest in the A. R. R. L. had an awful decrement, but now the interest has a sharpness which would pass any Radio Inspector. This is due to the earnest efforts of H. C. and L. F. Seefred. They are 22 and 21 years respectively, natives of Los Angeles, Cal. For the past nine years they have been in the radio game and operate station 6EA. Many of our Pacific Coast friends have heard of them, but this will be their first meeting.

Radio Communications by the Amateurs

OUR WESTERN CORRESPONDENT

Mr. Winsor, our Western Correspondent, sends in such interesting data to the Editor that it is to our general interest to read a few extracts from his report.

"I was very much interested, on looking over Mr. Hebert's report in the August issue, to note the number of special stations there are. It is good to see that the U. S. Radio Service appreciates the value of the LEAGUE organization and is willing to help us out with a 425 meter wave on long hauls.

I have been absolutely cut out of any chance at summer work by a phenomenon which I have never mentioned to you before on account of my inability to do so without resorting to language prohibited by the Postal authorities. This phenomenon took the form of an electrostatic brush discharge across the insulators of a neighboring high tension line. On wave lengths from 600 meters down, it produced a noise in the phones closely resembling Niagara at short range. The trouble is a regular all-summer performance, but is entirely absent during the winter months. A recent storm put a stop to it for this season, leaving me ready to start amateur work as soon as the "Chinese Government" permits.

Our little magazine is certainly getting to be "Bear Cat" and its influence is being shown in a great many different ways. Witness the changed relations between the amateur and the manufacturer. A year or so ago, it was the manufacturer who set the fashions in radio equipment. Today, the advanced amateur figures out something god and then there is a race between the manufacturers to see who will get it-on the market first."

(Sgd.) LINDLEY WINSER, 6ZW

THE CHAMBERS CIRCUIT

Philadelphia, Pa.

Editor QST,
Dear Sir:

Without the least desire to enter upon any controversy with any of the writers of QST, I feel called upon to make some reply to the uncalled for insinuations contained in the article in the September issue of the magazine, headed "Audion Circuits" by Mr. Paul F. Godley.

There is much in Mr. Godley's article to be commented upon, and much to be ignored. I propose to ignore the sum and substance of Mr. Godley's somewhat caustic criticism.

My purpose in presenting to the readers of QST an article on the Chambers Circuit was to give an economical method of receiving the undamped waves, or Arc's, in a far more satisfactory manner than has ever before been possible.

That the "Chambers Circuit" has accomplished this, has been proven in dozens of cases, under my immediate notice, and in many others; as is attested to by the numerous letters I have received.

In conclusion I want to present a copy of just one of the letters which I have received this week:

West Chester, Pa.

Mr. E. C. Andrews,
22nd & Morris Sts.,
Philadelphia, Pa.

Dear Sir:

I read your very interesting article on the "Chambers Circuit" in the August QST and have tried it out with wonderful results. I have tried everything to get the Arc's, but believe me this is the real dope. I saw it in a borrowed copy, so am now sending in money for a subscription as the QST looks good to me. I will now be a sub-

scriber and will look for many more articles from E. C. Andrews.

Yours truly,

E. J. SCHULTZ.

I need only add that Mr. Schultz's letter speaks for itself, as do all the many others received.

(Sgd) E. C. ANDREWS,
Philadelphia, Pa.



MORE CALLS

Arlington, Md.

Dear Mr. Editor,
Hartford, Conn.

In reading over the September QST I noticed, and read with interest, Mr. Spencer's letter in which he suggests that we send in a list of the stations we hear. I really think it is a very good idea and hope the amateurs will act upon the suggestion.

To keep the ball a-rolling, I am enclosing a list of the stations I have heard between the dates, November 30, 1915 and April 19, 1916. The list is rather large, but some fellow may be pleased to see his call. They are:

1ON, 1ZL, 2FH, 2DA, 2KK, 2MA, 2RL, 2DF, 2ZP, 3WN, 3UF, 3IQ, 3BD, 8YC, 8DZ, 8VJ, 8DX, 8LN, 8ZF, 8NH, 8IF, 8WP, 8AAE, 8AEZ, 8NF, 8ZW, 8NN, 8JZ, 8TD, 8ZT, 8KF, 8OU, 8SP, 8CS, 8NT, 8UE, 8XC, 8NQ, 9ACM, 9WF, 9PC, 9NN, 9FY.

In case any amateur should like to measure distances on the map, Arlington is just about five miles out from Baltimore, practically Baltimore itself.

Receiving Set

1800 meter loose coupler, Fixed condenser, Galena detector, 2,000 ohm Murdock phones, all mounted in a panel set.

Aerial

84 feet long, four wires spaced about 18 inches, and about 50 feet high.

Trusting I may be of service to the League and QST and wishing both the greatest of success, I remain ever yours,

(Sgd.) Jno. R. Sherwood, Jr.

HEARD AT VALLEY STREAM, L. I.

QST,
Hartford, Conn.
Gentlemen:

The log of 2LK station shows the following stations, outside of the second district, were copied during September: 1ZL, 1IZ, 1ZD, 3AEP, 3ZS, 3WN, 8AHR, 8QD, 8NQ, 8NH, 8AEZ, 8KS, 8PA, 8ZW, 8AKM, 8CL, 9IK, 9PC, 9ACM, 9JI.

On September 24th this station accurately worked 8NH and 8AEZ through considerable static. This record is for eighteen out of the thirty days of September only.

The writer started the practice of sending cards to the various stations heard, as suggested in QST, but as yet not a single acknowledgment came back, so has discontinued it.

Cordially yours,

(Sgd.) J. O. SMITH.



OUR PRESIDENT GETS LONG DISTANCE. IS YOUR CALL HERE?

Just to carry out the idea of letting each other know when we hear him:

I had the pleasure of listening to the following stations on the night of September 29th, between 9:00 and 11:00 p. m. The signals were strong, and readable in every case mentioned, so that the call letters were absolutely certain, and the messages in many cases were read. The receiving was done on one of the new Grebe short wave regenerative receiving sets, and this record is the first test made with this instrument here in Hartford. Its high efficiency speaks for itself.

9PC at Fort Wayne, Ind.

8KS at Cleveland, Ohio.

8NF at Battle Creek, Mich.

8HB at Cleveland, Ohio.

2ZF, 9YK, 8OH, 2ZV were also read. In the case of 8KS, who had a relay message to Bill McCutcheon, 107 Hancock Ave., Detroit, Mich., this was read here in Hartford the first time he sent it. All the troubles of 8NF in Battle Creek, Mich. and his final suggestion that the message be relayed

through 8AEZ were heard distinctly.

1CM in Laconia, N. H. also came in loud enough to be heard with the phones on the table.

On Sunday evening, October 1st, 8NH, Mrs. Candler of St. Marys, Ohio, came in loud and readable, except when interrupted by local QRM.

When any one hears my signals, 1ZM, will they please say so in QST.

HIRAM PERCY MAXIM.

✪✪

MESSAGE PREAMBLE

207 Parkwood Blvd.,
Schenectady, N. Y.

Mr. C. D. Tuska, Editor QST,
Hartford, Conn.

My Dear Mr. Editor:

I was much interested in Mr. Winser's suggestion in the August QST. I expected to see some further suggestions in the September QST, but did not although I read it all, ads included.

While I have done very little relay work, I am in the game and would like to see some system adhered to as Mr. Winser suggests. As I have suggested before, when new blanks are printed, it would be very convenient if they were so printed as to be filled in in just the same order as they should be transmitted.

The preamble suggested is very good, but I would like to ask Mr. Winser and any others if "w" and "da" (being shorter) are not better than "2ck" and "date" respectively?

I would say that it would be useless to give the hour of filing any closer than five minutes, but that we send 805 and not 85. I think the rest is clear.

Very truly yours,

W. L. BROOKS, 2ZB.

✪✪

CALL SIGNALS

Little Rock, Ark.

Dear Mr. Maxim:

The September copy of QST received today—let me compliment you upon the

excellent reading matter presented in it. I think it is the best amateur wireless magazine.

Following Mr. Spencer's plan of reporting extracts from the logs, I have copied the following within the last year upon a DeForest audion: 5ED-5DO-5ZA-5XC-5AD-5ZB-5ZC-5ZI-5AA-4AF-4DG-4AT-9XK-9JF-9IK-9IC-9EE-9JT-9LT-9XC-9JB-9YA-9YGO-9YK-9XE-9XT-9UC-9IO-9LM-9IT-9XL-9XN-9XP-9XV-9IF-9AU-9KD-9KU-9FW-9LR-9DG-9ACS-9ABD-9YD-9BW-9DX-9ZA-8TI-8YO-8AEZ-8DZ-8XA-8ZI-8YL-8CX-9AAU.

Any amateur who hears 5BV or has heard 5BV, after April, 1916, will confer a great favor upon me by notifying by a card.

9UC comes in particularly loud and steady. 4AA, so I understand uses a 1-4 Kw. Packard and has worked with 8AEZ, a distance of nearly 600 miles.

Wishing QST the best luck ever and hoping it will continue to be the good magazine that it is, I am

Yours truly,

(Sgd) JOHN M. CLAYTON, 5BV.

The Who's Who is FINE.

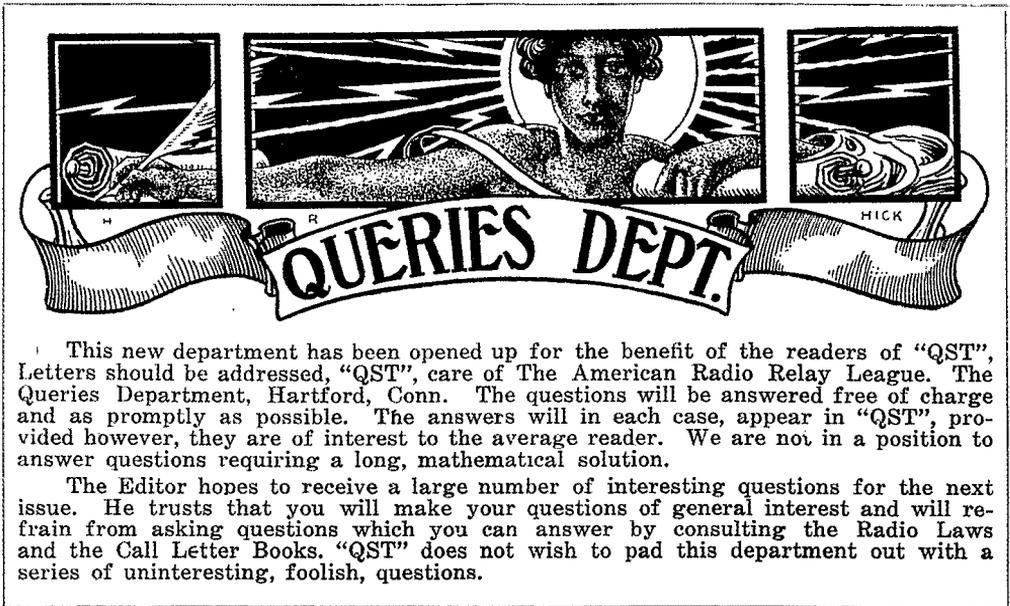
✪✪

CHANGE OF ADDRESS

Last month we had an exceptionally good issue and a few of our subscribers failed to receive it. What was the trouble? Was it any fault of ours? On investigating, we find that a great many of the readers change their address, but neglect to inform us of the change. This causes a great deal of QRM and these same subscribers come back at us with a QRU? in capital letters. If you are about to move to a new address, just drop us a card and we shall see that your QST does not go astray.

Synchronous Gap. Cont. from page 332

low frequency charging current, however, is very small, being, in these experiments, of the order of $\frac{1}{4}$ of 1 per cent. of the total indication and can therefore be neglected. Errors of observation of speed and meter readings probably amount to 2 per cent or 3 per cent, the latter due primarily to slight variations in the spark.



This new department has been opened up for the benefit of the readers of "QST". Letters should be addressed, "QST", care of The American Radio Relay League. The Queries Department, Hartford, Conn. The questions will be answered free of charge and as promptly as possible. The answers will in each case, appear in "QST", provided however, they are of interest to the average reader. We are not in a position to answer questions requiring a long, mathematical solution.

The Editor hopes to receive a large number of interesting questions for the next issue. He trusts that you will make your questions of general interest and will refrain from asking questions which you can answer by consulting the Radio Laws and the Call Letter Books. "QST" does not wish to pad this department out with a series of uninteresting, foolish, questions.

Arthur Shedd, Penna.:

The roaring induction which you hear is in all probability due to a noisy commutator on an arc light generator in your local power house, or to a leak from a nearby high-tension transmission line. If the latter it may be located by following the lines with a portable receiving set. In many localities the owners or radio stations cooperate with the lighting companies in locating trouble of this sort to the advantage of all concerned.

Frank Hamilton and Russell Blair, Ohio.

1. Can you give diagrams of regenerative audion receivers for short wave-lengths and also a brief description of same?

See Fig. 17, page 200 August "QST."

2. For calculating wave-length of antenna see reply to W. J. King in October issue "QST."

G. W. Lilienthal, N. Y.

1. How many pounds of wire will I need for the primary and secondary respectively of the auto-transformer described in "Applications of the Audion," August "QST"?

One and one-quarter and one and five-eighths pounds each respectively.

2. Which is best, the round or tubular audion bulb.

It seems to be a matter of opinion.

Edmund Howlett, N. J.

1. We cannot tell you to what wave-lengths the coil you mention will tune without knowing the antenna constants. Twenty taps will suffice for the coil.

2. For calculating wave-length of your antenna see reply to W. J. King in October issue.

3. The gap you mention will probably suit your purposes.

Francis R. Pray, Mass.

1. See "Applications of the Audion," August "QST."

2. The construction of the "Trons" is identical.

A. C. Young, N. Y.

1. By using an Audiotron bulb as an amplifier with a galena detector, would better results be obtained in receiving spark stations than if the bulb was used separately, and why?

Results might or might not be better de-

pending upon the efficiency of the particular audion used. On the other hand if a regenerative circuit is used such as described in "Applications of the Audion" August issue "QST," the results with the Audion alone would be far better.

2. Increasing the height of the antenna will increase the wave-length providing the flat-top portion remains the same lengths. An increase in height should enable you to do better work both with transmitter and receiver.

3. We do not understand what you mean by "which style rotary gap."

4. As far as we know the D. L. & W. have discontinued the use of radio stations on their passenger trains. As we understand it this service was merely temporary.

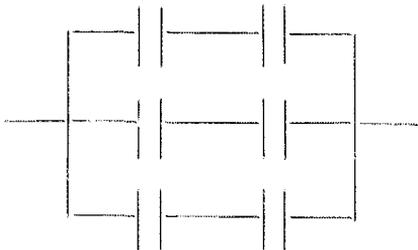
Cedric E. Hart, Utah.

1. We are not familiar with the construction of the auto transformer you mention.

2. Best results will be obtained if a variable condenser having a maximum capacity of at least .0002 is used in the grid lead of the audion. A capacity of .02 would be entirely too large.

R. W. Harvey, Ills.

1. How are condensers connected in series-parallel?



When connected in this manner twice as many plates will be needed to give the same capacity as before. We are of the opinion that the make of rotary gap has very little to do with the results obtained at the transmitter. Most amateurs make the fatal mistake of trying to run their gaps at too great a speed, thus failing to give the condenser sufficient time to receive a full charge.

Wm. R. McCaleb, Penna.

Worn out dry batteries can not be used successfully in the wing circuit of the audion.

Henry Klaus, Ills.

A single wire 350' in length and 50 feet or so in height will be sufficient for the reception of distant long-wave stations providing a properly handled Armstrong circuit is in use. We do not understand your last question.

Mr. John J. Bueb, Jr., Conn.

1. The Multi-Audi-Fone consists of a telephone receiver and a microphone in modified form mechanically connected. The incoming signal actuate the telephone receiver which in turns actuates the microphone, this in turn operating a local battery circuit which includes a second telephone receiver of low resistance.

2. What condenser capacity shall I need for a 1/4 Kw. transmitter with a rotary gap running at about 200 R. P. M.

A capacity of .005 should serve the purpose.

3. Can I make an Ultra-Audion of an R. J.-4 by adding a variable condenser? Where do I add the condenser?

See "Applications of the Audion," August issue "QST."

John C. Lewis, Jr., Maryland.

1. Commercial lighting current whether A. C. or D. C. cannot be used for the wing circuit of the audion due to the noises produced in the telephone resulting from commutation of the generator.

2. The hook-up on the second page of the May issue should prove efficient for short wave work. This is a regenerative circuit. See also "Applications of the Audion" August issue.

Fred Dickely, New York.

1. For the wave-length of your aerial see answer to W. J. King in October issue "QST."

2. What do you consider the best contact for silicon?

Most ship and shore operators use a small piece of an "E" steel mandolin string.

3. Is it safe to have a ground wire running through the house?

The fire-underwriters would not pass such an arrangement.

E. B. Jockers, N. J.

1. If you will tell us what you are trying to use the coil you mention for, we will be glad to give any information we can.
Lawrence Bunting, Cal.

1. Does it make any difference in receiving whether there are one or more wires in the aerial?

It is the practice at stations employing separate aerals for sending and receiving to employ only a single wire for reception, inasmuch as the increase in signal strength if any does not justify the expenditure necessary for the second.

Trunk Line Report. Continued from page 347

Cape Girardeau, Mo.—9NN.

TRUNK LINE "F"

San Diego, Cal.—6SR and 6WF.

Pomona, Cal.—6AAG.

Los Angeles, Cal.—6EA.

Bakersfield, Cal.—6ZW.

Fresno, Cal.—6RD.

Centerville, Cal.—6BJ.

San Francisco, Cal.—6SC.

Berkeley, Cal.—6WL and 6JZ.

Richmond, Cal.—6BY.

Stockton, Cal.—6SH.

Ione, Cal.—6RJ.

Acampo, Cal.—6PN.

Reno, Nev.—HB.

?

Portland, Ore.—KDP.

Seattle, Wash.—7NG.

?

At present we need relay stations very badly at the places marked (?).

Seefred Brothers, Trunk Line Mgrs.,
343 So. Fremont Ave.,
Los Angeles, Cal.

Amateur and Gov't Tests. Cont. from p. 343

San Francisco.—"In accordance with orders of the Pacific Coast Communication Superintendent, I am corresponding with

you direct concerning plans for radio tests with amateurs of the San Francisco district of the Naval Communication Service. The tests will be made some time during the month of November. Plans are now under consideration and your recommendations will be followed as closely as practicable. I shall be pleased to keep you fully informed of all details. The San Francisco district comprises the States of California, (north of San Diego district) Nevada, Utah, and Colorado." This is a big district and there are a lot of amateurs and many very good ones. We expect great things from this test and will report it with much interest. The rest of the country will certainly be interested.

New Orleans.—"In reference to your letter dated September 16th, 1916, and Director Naval Communications letter 14680-11-A, of September 14th, 1916, in regard to conducting tests with amateur radio stations in this district; I have to inform you that the District Communication Superintendent Lieutenant E. H. Loftin, U. S. Navy, is at the present time on duty at the Navy Department, Washington, D. C. Therefore, during the absence of the District Communication Superintendent, I would suggest that no action be taken in the way of tests until Mr. Loftin returns to this District, on or about November 15th, 1916."

The above shows the way the Government is willing to co-operate with us amateurs. Tests along each coast and extending far inland will eventually be made. Let us all hope that a good showing will be made, especially on Test A and B, for which advance notice is given. Test C, having no advance notice of any kind will of course only be caught by those of us who are on duty regularly. The chances are the latter will get the star position in the records.

It is suggested that every amateur co-operate in these tests whether he is registered in the Government book, a member of our organization or not. All he has to do is to send in his copy of the message for receiving only, so the timid ones need he receives. The law requires no license have no qualms about disclosing the fact that they have a detector and a loose coupler and know the code.

Wireless Spirit

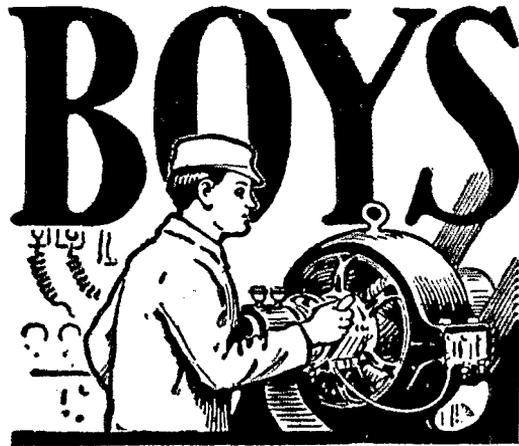
By A. Nony Mous

The Wireless Spirit does not resemble its namesake, in that it cannot be bought in bottles like other well known spirits, but like its nickname "Bug" (and hereafter referred to as such) bites you when you least expect it. Among some of the very marked symptoms which are noticed after a bite may be mentioned:—insomnia, acute wasting away of the pocketbook, loss of future Salvation, discoloration of the hands, unintelligible conversation, occasional swelling of the head, kleptomania in the direction of homeless copper wire, and even sometimes cessation of diplomatic relations with the family. This bug usually attacks males but has been known in a few instances to have attacked females. It has no respect for age and like measles and love, the older you are, the harder the attack. It flourishes mostly in the temperate zone and unlike other bugs, it hibernates in the summer during which period, temporary relief is afforded the victim. He gets more sleep and his pocketbook is relieved on one score. This bug has such habits as would please a nature-faker, for it has been known even to cause holes in tin roofs. It has a very monotonous cry, when calling to its mates on a cold winter night:— — — — —. When a young man has been bitten and can say oscillation transformer, galena, condenser, etc., without consulting a book, he gets so inflamed and enlarged that it takes a neighbor several minutes to walk completely around him. The Wireless Bug like everything else has its enemies, the most important of which are the Electric Lighting Co., Telephone Company, Static and the rest of the victims family who even go to the extreme of destroying wireless catalogues in which the bug is often hiding. This pest is claiming every year more and more victims from our best families. A great many antidotes have been tried by friends and relatives but there is only one cure—A commercial station in the same city.

ERRATA

Mr. George C. Barney's call should read IENU instead of 1XK.

Mr. Eurcile L. Shaw's call should read 8PQ instead of 8PA.



Big Money in Electricity

The electrical industries offer wonderful opportunities to boys with a liking for Electricity. The salaries paid to trained men are large, promotion comes rapidly and, best of all, the work is fascinating.

The discovery and development of new lines (such as wireless telegraphy and telephony), from time to time, promise attractive and paying fields to those who wish to specialize. The *will to do* and *Special Training* will bring success to you.

The International Correspondence Schools can help you to become an expert in electrical work, no matter what branch you like best. Thousands of young men have already won success through I. C. S. help. You can do as well as anybody, *if you try*. Everything is made so clear that you can learn in your spare time, regardless of where you live or what your work. No books to buy.

There's big money in Electricity. Get after it by marking and mailing the Coupon today. *Finding out costs you nothing.*

—TEAR OUT HERE—

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 6123, SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, before which I mark X.

<input type="checkbox"/> ELECTRICAL ENGINEER	<input type="checkbox"/> CHEMICAL ENGINEER
<input type="checkbox"/> Electrician	<input type="checkbox"/> SALESMANSHIP
<input type="checkbox"/> Electric Wiring	<input type="checkbox"/> ADVERTISING MAN
<input type="checkbox"/> Electric Lighting	<input type="checkbox"/> Window Trimmer
<input type="checkbox"/> Electric Car Running	<input type="checkbox"/> Show Card Writer
<input type="checkbox"/> Heavy Electric Traction	<input type="checkbox"/> Outdoor Sign Painter
<input type="checkbox"/> Electrical Draftsman	<input type="checkbox"/> RAILROADER
<input type="checkbox"/> Electric Machine Designer	<input type="checkbox"/> ILLUSTRATOR
<input type="checkbox"/> Telegraph Expert	<input type="checkbox"/> DESIGNER
<input type="checkbox"/> Practical Telephony	<input type="checkbox"/> BOOKKEEPER
<input type="checkbox"/> MECHANICAL ENGINEER	<input type="checkbox"/> Stenographer and Typist
<input type="checkbox"/> Mechanical Draftsman	<input type="checkbox"/> Cert. Public Accountant
<input type="checkbox"/> Machine Shop Practice	<input type="checkbox"/> Railway Accountant
<input type="checkbox"/> Gas Engineer	<input type="checkbox"/> Commercial Law
<input type="checkbox"/> CIVIL ENGINEER	<input type="checkbox"/> GOOD ENGLISH
<input type="checkbox"/> Surveying and Mapping	<input type="checkbox"/> Common School Subjects
<input type="checkbox"/> MINE FOREMAN OR ENGINEER	<input type="checkbox"/> CIVIL SERVICE
<input type="checkbox"/> Metallurgist or Prospector	<input type="checkbox"/> Railway Mail Clerk
<input type="checkbox"/> STATIONARY ENGINEER	<input type="checkbox"/> Textile Overseer or Supt.
<input type="checkbox"/> ARCHITECT	<input type="checkbox"/> AGRICULTURE <input type="checkbox"/> Spanish
<input type="checkbox"/> Architectural Draftsman	<input type="checkbox"/> Navigator <input type="checkbox"/> German
<input type="checkbox"/> PLUMBING AND HEATING	<input type="checkbox"/> Poultry Raising <input type="checkbox"/> French
<input type="checkbox"/> Sheet Metal Worker	<input type="checkbox"/> Automobiles <input type="checkbox"/> Italian

Name _____

Present Occupation _____

Street and No. _____

City _____ State _____

If name of Course you want is not in this list, write it below.



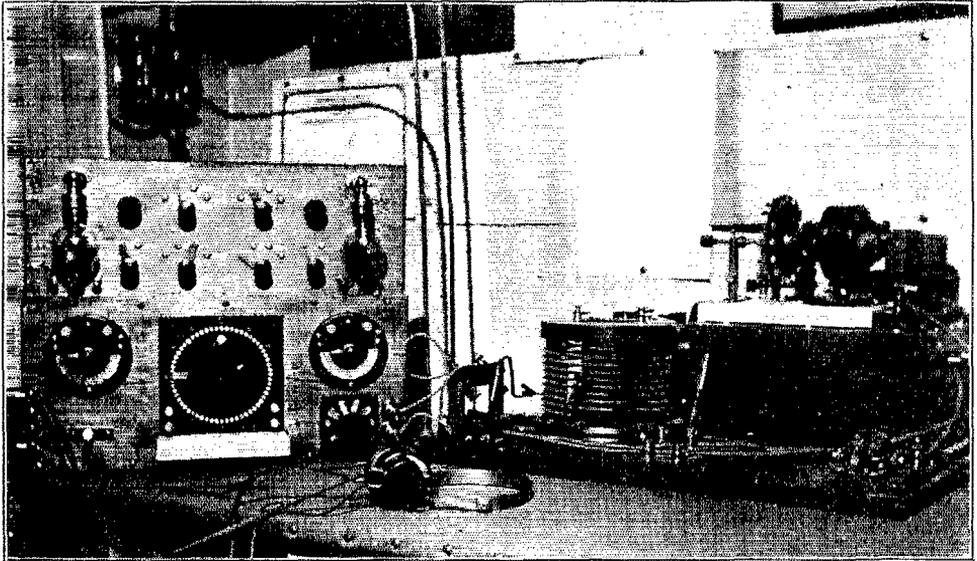
Special License Station 2ZP



The Special License Station of John W. Hubbard, Port Chester, N. Y., is shown by the accompanying illustration. Mr. Hubbard has been very successful in relay work being able to communicate with 9LQ, 9PC, 8XA, 8YL, 8ZW, 8NH, 8JZ, 1ZL, 1CW, and many other middle west and southern sta-

tions. The receiving set was designed by the owner and was used in connection with a one-step amplifier. The sending outfit is a one Kw. Marconi set. Mr. Hubbard calls QST the best amateur wireless magazine published. Do you agree with him?

The Station of H. L. Stanley, Babylon, L. I.



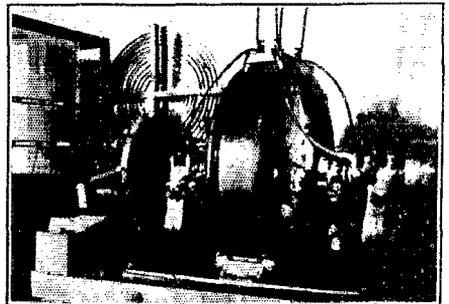
This outfit is owned by one of the League members, Mr. H. L. Stanley, who has done considerable work in the relay line although he is hampered by certain directional effects which are very prominent on Long Island. The photograph is clear enough to

describe itself and we can offer few suggestions except to note that our old slogan has been followed by keeping the leads short in the oscillation circuit. Mr. Stanley has done everything he could to make the station efficient and easy to handle.

A 200 Cycle Generator and Synchronous Gap

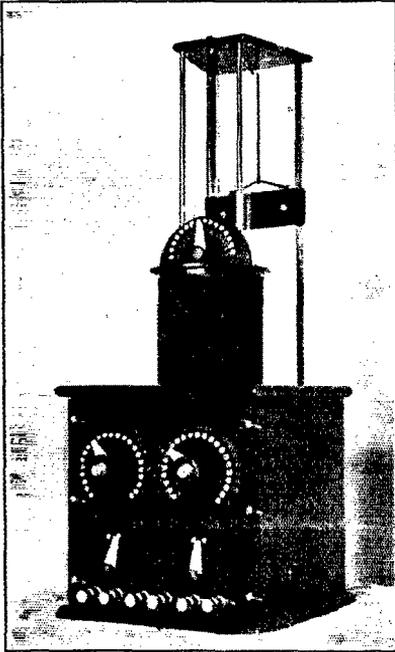
The accompanying illustration shows the transmitting outfit of R. A. Miller, Ione, Cal. The set consists of a 200 cycle A. C. generator run by a three horse power gas engine. A synchronous gap is shown on the end of the generator shaft. A half Kw. transformer with an air space condenser completes the outfit. The antenna is 60 feet high and two stranded wires eight feet apart.

With the set, 6RJ has had no difficulty in working 7ZH at LaGrande, Ore. (550



miles). He has also been heard by 7CM, Lacy, Wash. Mr. Miller says our magazine is certainly a live one.

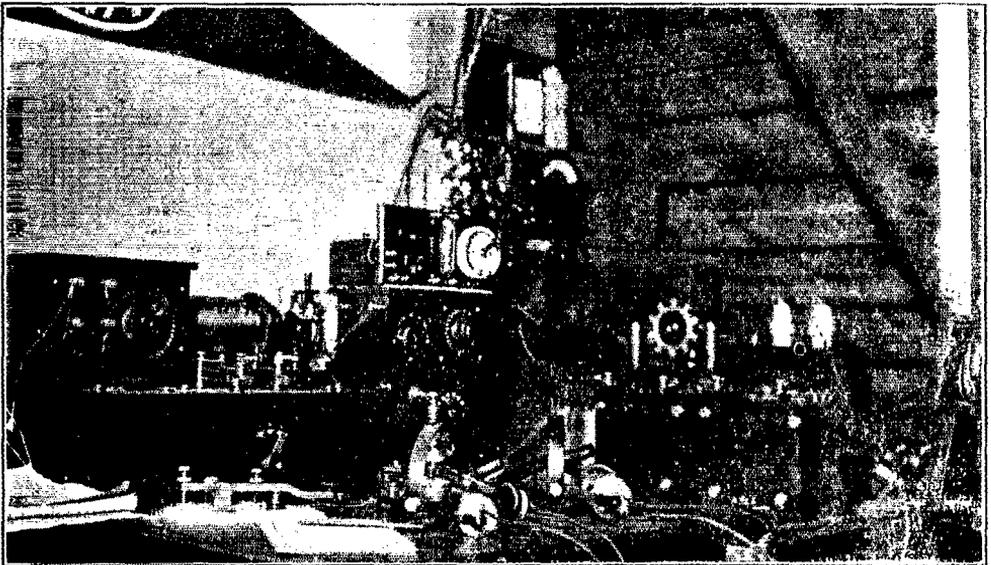
A Novel Loose Coupler



This illustration shows a novel loose coupler which was designed and built by Roy Haynes of Chicago. One of the many good features is that it only takes up a square of eight and one-half inches on the operating table. Another element worth mentioning is the easy adjustment of the secondary, which is counter-balanced very accurately so that a slight pressure will raise or lower it.

The coupler was designed primarily for undamped wave reception. The primary is five and one-half inches in diameter and eight and one-half inches in length. The secondary is one-half inch smaller in diameter and the same length as the primary. This design insures very close coupling. Taps on the primary and secondary are taken off in the usual manner allowing variations of single turns on the primary and fifteen turns on the secondary. The switches shown at the bottom are for dead-end and putting a variable across the secondary.

A Texas Station



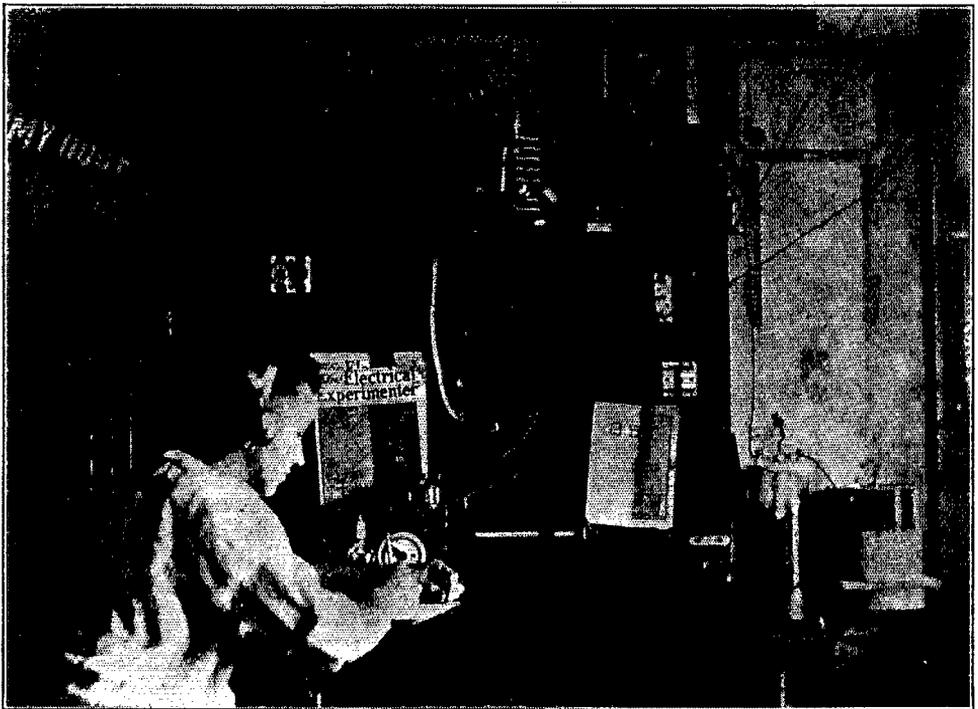
Description on following page

The accompanying picture shows one of the outfits near the Texas border. The equipment is located at House, Texas, and owned by D. H. Graham. His antenna is made up of eight, seven strand wires spaced three feet apart. It is 70 feet long, leads being brought from each wire to a lightning switch and then into the station with a Packard stranded cable. The ground is composed of a No. 4 D. B. R. C. wire soldered to a pipe which leads from a seven by six foot tank which connects to a well 90 feet deep. The wire is ten feet long.

Two receiving sets are shown in the photo, one being designed for waves up to 3,000 meters, using three Galena detectors and the other for 200 meter work,

using an audion, a one to one transformer, and an Audio Tron, a pair of Brandes 3200 ohm Navy phones and a pair of 2800 Transatlantic complete set. The power is taken from a 110 volt, 60 cycle self-excited generator, driven by a gasoline engine. A Packard $\frac{1}{2}$ Kw. transformer, Marconi key, two banks of four sections of Murdock moulded condenser in series parallel, a rotary gap, Murdock oscillation transformer, hot wire meter of Clapp-Eastham make, and a change-over switch, mounted on $\frac{1}{2}$ -inch Bakelite complete the equipmen. This station is located on Trunk Line "E" and communicates with the No. 5 station, 5ED, on the same line.

The Experimental Station of Raymond Smith, 8KL



The accompanying illustration shows the experimental station owned by Raymond Smith. The station call is 8KL. For transmitting, a one-half Kw. open core

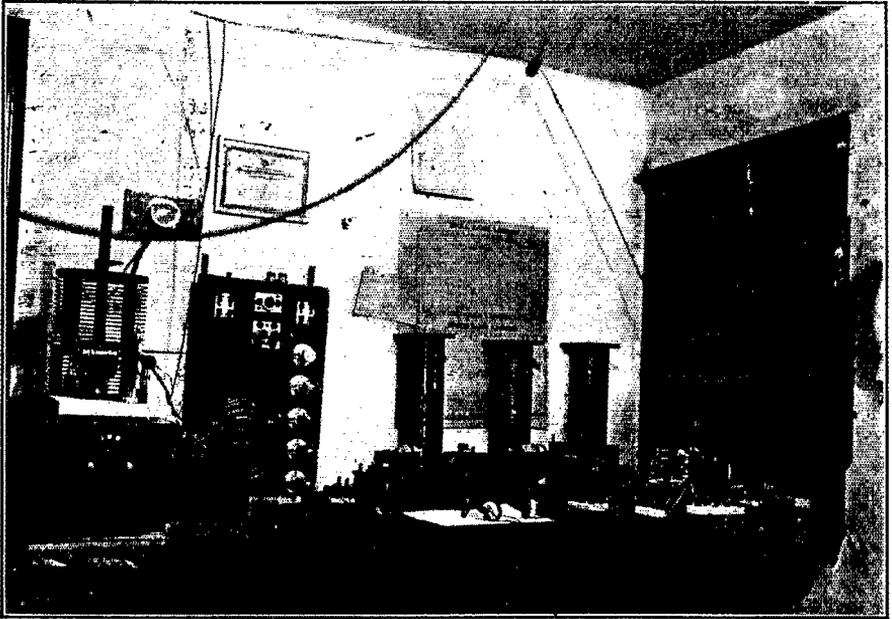
transformer with glass plate condenser, stationary spark gap, and oscillation transformer is used. The transformer is operated in conjunction with an electrolytic in-

errupter with a water rheostat control.

The receiving set comprises receiving transformer, audion detector, variable condenser, Murdock phones, and the necessary

switches. The daylight receiving range is about fifteen hundred miles and the transmitter has already worked sixteen miles.

A League Station in Abington, Pa.



This equipment is owned by C. W. Weber who has been a member of The American Radio Relay League for some time. The sending outfit is comprised of a quarter Kw. Chambers open core transformer, four Murdock condensers, Chambers rotary gap and oscillation transformer. The antenna is 150 feet long in a "V" shape only twenty feet high. No difficulty has been experienced in communicating 250 miles in the evening. This station is in continual communication for relay work with 3WN, Morristown, N. J.

The receiving set is composed of a variometer tuner, designed by Mr. P. F. Godley, with a larger tuner for commercials and undamped waves. Last winter 9FY was heard with the phones on the table and 4AA was copied four nights in succession. He says he was using only 300 watts to communicate 850 miles. This may convince some that long distance work does not always require a high antenna. If anyone hears 3AF he will please notify by writing C. W. Weber, Post Office Box 25, Abington, Pa.

The Contest Scores

The next issue will contain the final scores and this is the last time that we will have for that Amateur-to-Amateur talk. The contest has grown wonderfully this month and some new entries have pushed to the head, proving once more the saying that the last shall be first. You have TWO WEEKS MORE for the final round-up. Help us as well as yourselves, boys. More subscribers means that OUR QST will be

better. And the PRIZES—take one look at them fellows, then grit your teeth and start out again. No matter how hard you have worked, WORK HARDER. It isn't too late yet to boost your name into the first five. If you are in the first five, you will have to push still harder to hold your place. Lets make this finish one grand glorious success, for both of us. QST to the front.

CONTEST DEPT., HARTFORD, CONN., OCTOBER 18, 1916

Chas. A. Service, Jr., Bala, Pa.	249	Henry Cole, Indianapolis, Ind.	
Hodge Alexander, Grove City, Pa.	210	Albert Bousquet, Braintree, Mass.	
Charles Shanks, Maplewood, Mo.	152	Adolph Stein, Jenkintown, Pa.	
Carl Linxweiler, Dayton, Ohio	147	Valentine Harrington, Milton, Mass.	
Ralph Batcher, Ames, Ia.	132	W. F. Justus, Columbus, Ohio.	
F. F. Humphreys, New York, N. Y.	108	William Blum, Atlantic City, N. J.	
Joseph Morgan, Jr. Germantown, Pa.	96	Ashley Williams, Lincoln, Nebr.	
H. R. Hick, Rocky Hill, Conn.	87	Elmer Miller, Los Angeles, Cal.	
G. L. Hartman, Wauwatosa, Wis.	72	Herbert Fuller, Chicago, Ill.	
Albert O. Parmalee, Reading, Mass.	62	Gilbert R. Payson, Jr. Boston, Mass.	
Phil H. Betts, Montclair, N. J.	60	H. W. Eaton, Winter Hill, Mass.	
Albert McKinley, Marion, Ohio	48	G. W. Bonson, Dubuque, Ia.	
V. C. McIlvaine, Tampa, Fla.	47	S. H. Besley, Salt Lake City, Utah.	
Arthur Klaus, Eureka, Ill.	42	Norman Chilton, Westfield, N. J.	
Robert Hill, St. Paul, Minn.	38	E. L. Sypher, Jamaica, N. Y.	
G. F. Tompkins, Hasbrouck Heights, N. J.	36	H. C. Midgeley, Tompkinsville, N. Y.	
Earl Swain, Indianapolis, Ind.	30	E. R. Schwalter, Haven, Kans.	
Paul J. McGhee, Mattoon, Ill.	30	J. G. Schroll, Oak Park, Ill.	
O. Hanger, Haledon, N. J.	24	J. F. Teunisson, New Orleans, La.	
H. H. Lewis, Cincinnati, Ohio	24	R. B. Parker, Hartford, Conn.	
A. C. Spencer, Magnolia, Ill.	24	G. W. Lielenthal, New York, N. Y.	
E. C. Wiendriek, Merrick, N. Y.	24	R. B. Watt, Stapleton, N. Y.	
John Nightingale, Paterson, N. J.	24	W. A. Thompson, Roland Park, Md.	
R. N. Kingsbury, Ravenna, Ohio	24	Fred Caldwell, Jr., Cincinnati, Ohio.	
Arthur Bragg, Evanston, Ill.	24	William Macke, New Orleans, La.	
W. S. Louchheim, Jenkintown, Pa.	24	Ellis C. Pattee, Beaumont, Tex.	
C. R. Pardridge, Saginaw, Mich.	21	B. S. C. Southern, Brooklyn, N. Y.	
Elwood Squires, Berkeley, Cal.	18	J. S. Woodruff, Elmhurst, N. Y.	
H. F. Corson, Newark, N. J.	17	R. Hosmer, Chicago, Ill.	
M. H. Muhleman, New York, N. Y.	15	V. H. Kansier, Reedsburg, Wis.	
Robert Cushman, Brattleboro, Vt.	13	R. W. Pratt, Portland, Me.	
A. C. Young, Buffalo, N. Y.	12	W. O. Watkins, Birmingham, Ala.	
Cedric E. Hart, Salt Lake City, Utah	12	Raymond C. Murray, Chicago, Ill.	
James Hill, Jr., Evanstob, Ill	12	J. W. Hager, New York, N. Y.	
S. Kruse, Lawrence, Kans.	12	E. E. Rose, Detroit, Mich.	
H. B. Tyler, Hyde Park, Mass.	12	E. J. Grieb, Springfield, Ohio.	
Warren J. Mayer, Elizabeth, N. J.			

Q S T SUBSCRIPTION CONTEST

Many of the most promising amateurs are held back for the want of money to buy first class apparatus. We have worked out a plan for helping these fellows. We have arranged for twenty different pieces of the latest wireless equipment and all of it is to be distributed among those amateurs who are willing to put in a little work for QST.

The one who sends in the most subscriptions to QST before November 18, 1916, receives the first prize, a \$25 DeForest Audion Detector of the latest type.

The one who sends in the second highest number of subscriptions to QST receives a second prize, a pair of Brandes Navy Telephones.

The third, fourth and so on up to the twentieth, receive apparatus as stated in the list below.

The conditions governing the contest are simple. They are:—

1. You must send in your name and address, and we will send you a quantity of subscription blanks. Your subscriptions must be made out on these blanks, and sent in to Contest Department, American Radio Relay League, Hartford, Conn.
2. Any one interested in wireless is eligible.
3. *To be entitled to any of the first five prizes one must send in a minimum of 20 yearly subscriptions or their equivalent. To be entitled to any of the last 15 prizes one must send in a minimum of 10 yearly subscriptions or their equivalent.*
4. Weekly reports must be sent in beginning August 12th. The score will be printed in QST each month, so you can see how you stand with the other fellows.
5. Part time subscriptions are counted proportionately. For example, a full year subscription counts 12. Six months subscription counts 6, a three months counts 3. If you buy copies and sell them, they also count as one each.

Remember, the most unexpected people are interested in amateur wireless, and will gladly subscribe if you ask them. Your family doctor, sometimes is crazy to know about the extent to which wireless is practiced. We know one ourselves. The grown-ups are the best kind of material, because not only are they interested themselves, but their children might be made to take an interest from reading QST, and moreover, the grown-ups always have the cash.

THE AMERICAN RADIO RELAY LEAGUE, INC.
Subscription Contest Department.

FOR SALE & EXCHANGE



FOR SALE—Condensers, tuning coils, keys, transformers, phones, and transformer cores. Write for what you need and prices. Al. R. Leavitt, 13 Grant St., Natick, Mass.

FOR EXCHANGE—One Murdock receiver, 1,000 ohms, and one Murdock No. 364 variable condenser; want audion type T bulb, or what have you in exchange? Laurence P. Harsch, Box 110, Mt. Rainier, Ind.

EXCHANGE—Have 4"x5" Blair focusing box camera (plate). Fine double anisigmat lens, revolving diaphragm. Time and instant shutter. Horizontal and vertical finders and tripod attachment. Cost \$35.00 new. Good condition; want typewriter. State make and condition. All letters answered. E. S. Washburn, 302 Orange Pl., Plainfield, N. J.

FOR SALE—Type H-I, $\frac{3}{4}$ Kw. 10,000 volt Thordarson transformer; good condition; new secondary, \$9.00. W. J. King, Woodville, Mass.

FOR SALE—Bunnell two-inch spark coil, slightly used. \$5.00 takes it. Edgar L. Sypher, Jr., 224 Globe Ave., Jamaica, N. Y.

EXCHANGE—Erector for two variable condensers or inch and one-half spark coil printing press, for Helix or what have you? W. Schmitt, 784 Macon Street, Brooklyn, N. Y.

FOR SALE—One step-down transformer; has both binding post and switch variations; 110 v. a. c. Price \$2.50. An Amco Junior loose coupler in very good condition, price \$2.50. John Dow, 20 Woburn St., Reading, Mass.

FOR SALE—Arlington transformer, \$5.00 (receiving), antenna switch, \$1.00, wireless key, 75c., one-half inch spark coil, \$1.00, Mignon RC2, \$10.00, battery ammeter, 50c. new. All letters answered. Walter A. Meyer, 1832 No. 13th St., Sheboygan, Wis.

WANTED—Small wireless receiving set in exchange for other goods. Write for list. Wm. Greenough, Palms, Cal.

EXCHANGE—A new Premo Junior No. 1 camera; takes 2 $\frac{1}{4}$ "x3 $\frac{1}{4}$ " clear pictures. Cost \$2.00. An Electro Importing Company's antenna series condenser on good condition; a new combination slide and moving picture machine, cost \$4.50. All these articles are in fine condition and cost me \$8.50. I will trade them for a pair of Brandes Transatlantic or Navy Type phones, or a Multi-Audi-Fone amplifier. Edmund Howlett, 19 N. Maple Ave., Ridgewood, N. J.

FOR SALE—Spark coil transmitting set consisting of coil and condenser in oak case with helix and gap mounted on top. Coil is built for radio work. Set has transmitted thirty-five miles. Price \$6.00. M. A. Herzog, 16 Faith Ave., Atlanta, Ga.

FOR SALE OR EXCHANGE—Two wall telephones complete with generators, \$5.00 each. A few automatic telephone switches and a few complete ringers, 75c. each; other numerous articles cheap. Radio apparatus, loose coupler, detector, high frequency apparatus, etc. Want, commercial key, Boston preferred, audion, burned out Audio Tron bulb, typewriter, or what have you? Joe L. Smith, 901 Fourth St., Garden City, Kans.

WANTED—QST. I will pay fifteen cents for July QST in good condition. Robert W. Cushman, Guilford St., Brattleboro, Vt.

WANTED—A 20 ampere hot wire ammeter; must be in good condition and read perfectly. All letters answered. Thomas A. McCann, 115 N. Perry St., Dayton, Ohio.

FOR SALE— $\frac{1}{8}$ H. P. Emerson motor, starts on brushes, runs as induction motor. Supplied complete with 3 speed pulley; first \$6.00 takes it. Herbert L. Laube, 315 Grace St., Dubuque, Ia.

FOR SALE—Packard $\frac{1}{2}$ Kw. transformer, \$7.00; large Adams-Morgan variable, \$5.00; Mesco, 4 inch spark coil, \$10.00; pair Holtzer-Cabot phones, cost \$8.60, sell \$4.00; DeForest audion set, cost \$18.00, sell \$12.00; Blitzen \$33 receiving set, consisting of Clapp-Eastham variometer, Clapp-Eastham variable, Crystaloi detector, buzzer, push button and pair Brandes Superior phones, complete set \$20.00 Amplifier bulb, suitable for renewal, \$5.00. James E. Johnston, 1379 Clay Ave., Bronx, N. Y.

WIRELESS FOR SALE—One Kw. Clapp-Eastham Co., transmitter complete, in perfect condition, nearly new; transmitting range 300 to 900 miles; has U. S. Gov. license official call (5ZH); first check for \$125 takes it. W. O. Horner, Jeweler, Cleveland, Tenn.

ATTENTION—Will pay \$1.25 for a complete file of QST from Volume 1, No. 1 to Volume 1, No. 9. Must be in good condition. Address Harry Krug, 6906 Bryant St., Pittsburgh, Pa. E. E.

FOR SALE—Wm. B. Duck Company's apparatus consisting of \$2.00 tuning coil; \$3.00, 1,000 ohm phone head band and cord; 20c. receiver block; 30c. switch; 60c. detector; 50c. fixed condenser; all complete mounted on hard-wood base, \$5.00. Hollis L. Gray, 29 Vine St., Medford, Mass.

FOR SALE—Colby's receiving transformer, great for amateur waves, \$3.25; Amco type rotary gap, \$3.25; Murdock 2800 meter loading coil, \$1.25; Pancake type oscillation transformer, \$1.50; .01 m. f. transmitting condenser in rack, \$2.25; also have some tuners, fixed condensers, detectors, phones, switch boards, receiving cabinets, etc. Write for prices and particulars. Carrollton Radio Laboratory, 214 Maple Ave., Carrollton, Ill.

FOR SALE—1 RJ4 DeForest audion, with new bulb and batteries, \$16.00; with old bulb and less batteries, \$10.00; with slightly used bulb \$15.00. M. H. Pancost, R. F. D. No. 6, Lansing, Mich.

STOP—LOOK—LISTEN —Will exchange large Navy type coupler in good condition, with hard-rubber front, worth \$15.00 for a five dollar bill and a two dollar bill—**CASH**—and for immediate sale. Write or call 3Nr to Gilbert E. Maul, Chatham, New Jersey.

FOR SALE OR EXCHANGE—Two pairs of Brandes Superior; 7 oscillation inductances; 1 large commercial oscillation transformer; 1" Mesco coil. I want cash or amplifier phones or Navy Type Brandes phones, or QRU. George W. Lilienthal, 64 Beekman St., New York, N. Y.

WANTED—At once, a set of QST, Vol 1, numbers 1 to 8 inclusive. Will allow premium. State price and condition. Chas. Steiner, 523 West 113th St., New York, N. Y.

WANTED —Variables; have good set of phones or will pay cash; must be in good condition. Wm. F. Justus, 273 So. Monroe Ave., Columbus, Ohio.

FOR SALE OR EXCHANGE—One small Murdock variable; 2,00 ohm Brandes phones; Audion Tron detector cabinet with bulb and batteries; 150 ohm Bunnell railroad relay; 5,000 meter Navy loose coupler, on fibre panel. Want Blitzen key, Blitzen variables, on aerial siwtch. A. A. Kluge, 1227 S. St., Lincoln, Neb.

QST ADVERTISERS

This will not be the first time we have called attention to the advertisements which appear in QST. This issue shows again an improvement over previous issues from the advertising standpoint. More space is taken and the highest quality of radio goods is shown. There is one element about a QST advertisement which some of us may never have considered. When an advertiser puts his name in our magazine, he has the approval and guarantee of the whole amateur wireless field. We can safely say that QST is the only place which can give him this.

In other words, the advertiser gets more than mere returns; he gets us with him, back of him, and for him here. We amateurs know this manufacturer or that manufacturer is up to the standard. We know

the goods he advertises. His methods are methods of which we approve. His apparatus is of the highest standard. We support the advertisers and the advertisers support our magazine. A mutual feeling has become firmly established, which can be found nowhere else. The advertiser looks on our magazine in the light of a place where he can get with the amateurs, understand their wants, and give co-operation. We are the ones who make his business and he feels that our magazine is a thing for him as well as us. He feels he must advertise to help those who help him. So remember, always, we must show him our appreciation by always acknowledging his QST support whenever we write to him.

ALWAYS MENTION

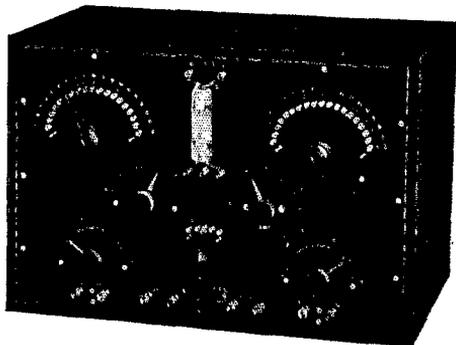
QST when writing to advertisers
ADVERTISERS when writing to QST

Amateurs obtain results by using W. & S. Instruments

Our goods are sold with a guarantee. Tell us your needs and we will furnish you estimates. If you are a beginner, we will be glad to furnish plans for your station **FREE OF CHARGE.**

Agents for **ELECTRON RELAY, BRANDES' PHONES, MULTI-AUDI-FONE
CLAPP-EASTHAM and MURDOCK APPARATUS**

Wilson & Smith Wireless Mfg. Co. 508 Walnut St. Kalamazoo, Mich.



R345 UNDAMPED PANEL RECEIVER

GERMANY--- ON AN 80 FT. AERIAL

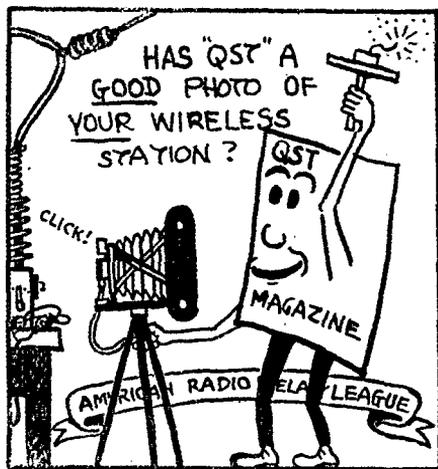
You can read "POZ" (Nauen) and "OUI" (Hanover) daily on our 80 ft. aerial with this

**MARVEL OF EFFICIENCY and SIMPLICITY
PRICE 50 per cent. LOWER than others**

Send 2c. stamp for Bulletin No. 106A

**Radio Apparatus Co. of America
Parkway Building, Philadelphia**

Has an Illustration of Your Station Appeared in QST ???



If it has, you are in luck. You can buy the half-tone and do what a great many amateurs have begun. The scheme is to print a photo on your stationery from the engraving. Then, when you write to a fellow-amateur, he can see just what your station looks like and all about it. It is a fine scheme and to help it we shall place on sale—for the owners—half-tones of stations which appear in QST.

These cost us from a minimum of \$1.25 up to \$2.50. We shall sell each one, regardless of size, for \$1.00. This gives you a chance to save some money and get in on a dandy idea. If your station has enjoyed the honor write today; just enclose a dollar, ask for your half-tone, and it will be sent post-paid by return mail.

ADDRESS: ILLUSTRATION DEPARTMENT

American Radio Relay League, Hartford, Connecticut

BRANDES RADIO HEADSETS

Superior Type, \$5.50



Made for Long Distance Reading

Send 4c in stamps for our new catalog "F"
of select wireless apparatus

C. BRANDES, Inc.

32 Union Square, Room 821
NEW YORK

We
Guarantee
First Grade
Commercial
Operators'
Licenses



The Largest,
Best Equip-
ped and ONLY
Practical
Radio School
in New
England

LEARN WIRELESS

"SEE THE WORLD AND GET PAID FOR
DOING IT."

ENDORSED BY GOVT. AND MARCONI OFFICIALS

Last year EVERY ONE of our graduates were placed in good positions; operating in all parts of the world, and still we are unable to fill the demand for them. We strongly urge you to join one of our Day or Evening classes if you wish to take advantage of the big demand for our Graduates. Send stamp for New Fall prospectus which contains detailed information and other useful data.

Eastern Radio Institute

899 E. Boylston St.
BOSTON - MASS.

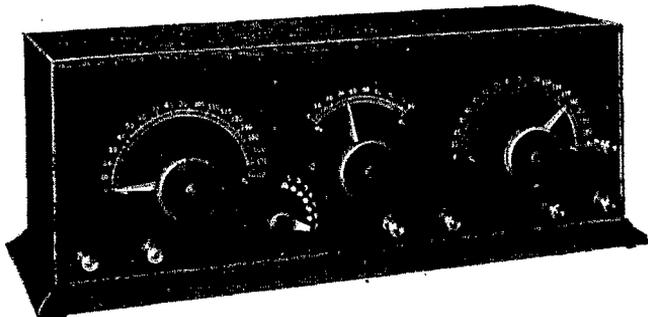
Paragon Instruments Have Set New Standards

They are in a distinct class by themselves. There are no other instruments which can EQUAL THEM IN ANY WAY—regardless of price. WE CAN PROVE THIS ASSERTION TO THE SATISFACTION OF ANYONE.

THIS INSTRUMENT IS SUPER-EFFICIENT, SUPER-SELECTIVE AND SUPER-SENSITIVE.

It was designed especially and solely for reception of AMATEUR WAVE LENGTHS and its development has been carried on over a period of two years. It was the first and is the only worthy adaptation of the Regenerative circuits to short wave reception. The antenna inductance is arranged in steps. **ASIDE FROM THIS THERE ARE NO SWITCHES.** Continuously variable inductances—carefully designed variometers—are used in the closed circuits. **HIGH RESISTANCE CONTACTS,** the capacity of switch points and leads, end-turn losses and the necessity for a variable tuning capacity are thus **ENTIRELY DONE AWAY WITH.**

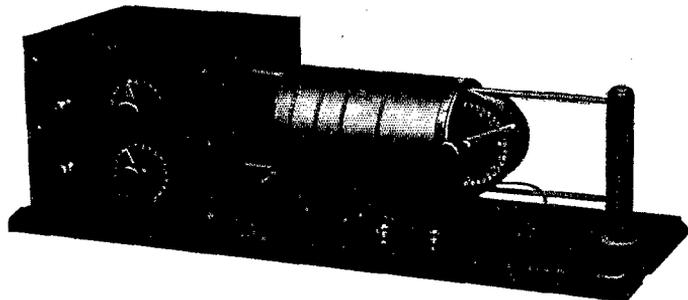
The antenna and closed circuits are **INDUCTIVELY COUPLED,** and the **COUPLING IS VARIABLE.** The component parts of the instrument are not crowded into a small cabinet. The fact that **ALL** of these things are of extreme importance has been proven by the here-to-fore unheard of **SELECTIVELY** and **AMPLIFICATION** obtained by owners of this instrument. Signals may be read from stations at extreme distances or through heavy static and interference with this instrument long after other receivers have failed and **WEAK SIGNALS MAY BE AMPLIFIED UP TO ONE HUNDRED TIMES USING ONE AUDION ONLY.** We would be glad to furnish the names of prominent members of the American Radio Relay League who have offered unsolicited testimony as to the operation of the R. A.—6—, the amplification obtainable, and the distances covered both day and night.



R. A.—6—PARAGON AMPLIFYING SHORT WAVE RECEIVER, \$35.00
Range 180 to 580 Meters

PARAGON WIDE RANGE RECEIVING TRANSFORMERS

The methods employed in winding the coils eliminate leakage due to coloring matter in the insulation, put an end to the presence of moisture in the varnish, insulation and tube. The coils of the Paragon "No-End-Loss" transformers are divided into sections and fitted with self cleaning, positive action end turn switches which connect and disconnect the winding as required, entirely cutting off from the circuit unused portions of the inductance and completely eliminating end turn effects on all wave lengths. These switches are enclosed and are automatically controlled by the primary and secondary inductance switches respectively.



PARAGON RECEIVING TRANSFORMER

TYPE "L" \$22.50 TYPE "S" \$30.00 TYPE "X" \$35.00

lengths or for use in conjunction with the AUDION DETECTOR.

SEND STAMP TODAY FOR BULLETIN "O" WHICH DESCRIBES A VARIETY OF ENTIRELY NEW TRANSMITTING AND RECEIVING SPECIALTIES OF PARTICULAR INTEREST TO THOSE WHO DESIRE THE BEST.

SEND 6c. FOR OUR 232 pp. CATALOG

Our No. 7 Catalog shows several hundred different parts and also sets of materials for building your own apparatus. We do all the difficult work in our factory and give you the benefit of machinery and equipment

Contains complete description and prices of all the latest Wireless and Electrical Goods.

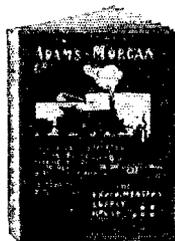
OUR PRICES WILL SAVE YOU MONEY AND OUR PROMPT DELIVERIES WILL SAVE YOU TIME.

THE BEST CATALOG OF ITS KIND IN AMERICA

Adams-Morgan Co.,

Sixteen
Alvin Place

Upper Montclair, N. J.



Always Mention "QST" When Writing to Advertisers

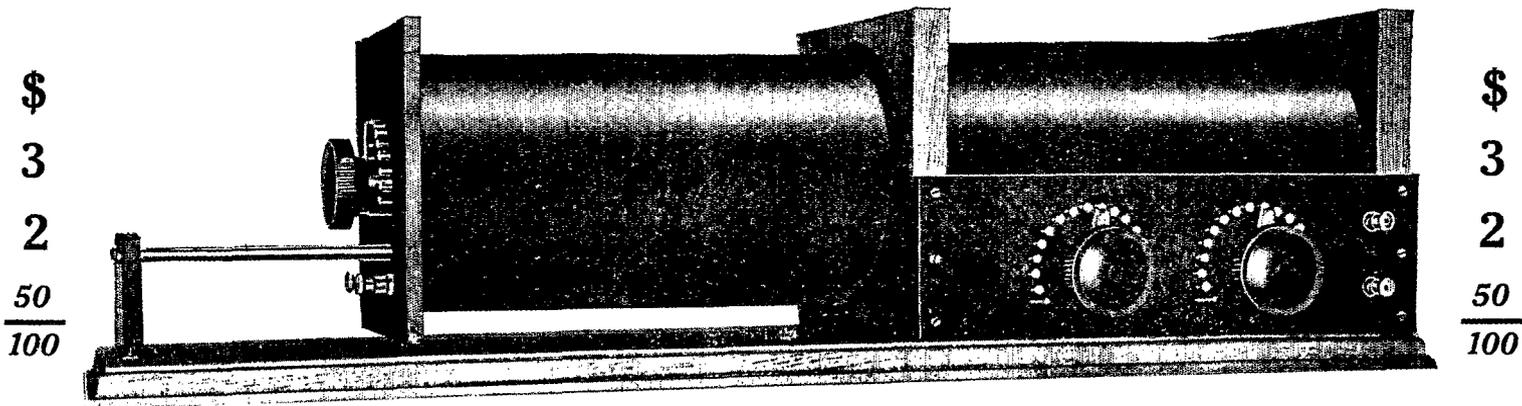
Expires Dec. 1, 1916

Special Introductory Offer

Expires Dec. 1, 1916

AUDIOTRON 15000M ULTRA LOOSE COUPLER

REGULAR PRICE \$37.50

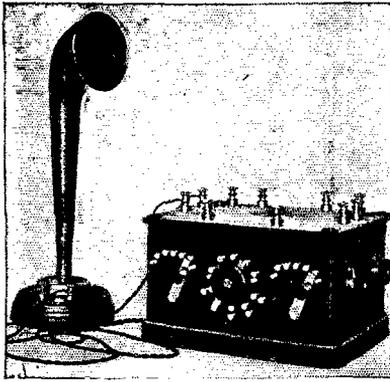


RECEIVE OUI, POZ, NBA, NAA, WGG, WSL, KET, KIE on the AUDIOTRON ULTRA

The only coupler designed along approved commercial lines for the efficient reception of long wave signals, from 2000 M up to 15000 M, without loading. Transfers maximum energy to the secondary and detector circuits. Primary and secondary wound on lathe cut fibre tubes. No enameled wire used. Secondary end, runner support and primary switch panel of genuine hard rubber. Navy type switches—self cleaning type. Extra large knots. 32 contacts on primary. 16 contacts on secondary. All metal parts polished nickel. Secondary carried on two guide rods with metal bearings entire length of secondary. Primary and secondary windings covered with black celluloid. Gives a rich, attractive finish. Mounted on handsome base of quarter sawed oak. Length over all 36 inches. Primary 9 inches diameter.

OUR SPECIAL LIMITED OFFER:—To introduce this coupler we will ship all orders mailed before December 1st at the special price of \$32.50 and will deliver it free at your door when cash accompanies order. Safe arrival and satisfaction is guaranteed. Compare this offer with what others give and your choice must be an AudioTron Ultra—as offering Ultra Value. Order To-Day and Insure Prompt Delivery.

SEND FOR FREE CATALOG—MOST COMPLETE LINE OF COUPLERS—6 TYPES \$4.00 UP
AUDIOTRON SALES COMPANY 315 LICK BLDG., SAN FRANCISCO, CALIF.



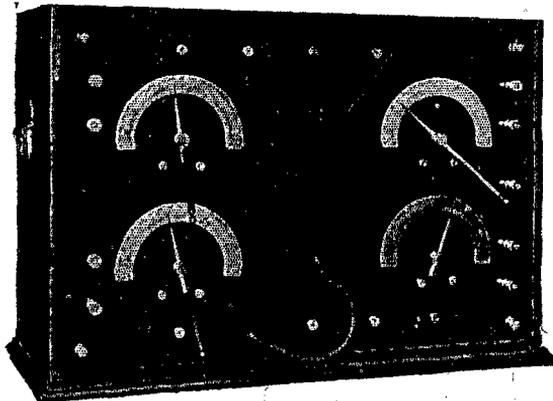
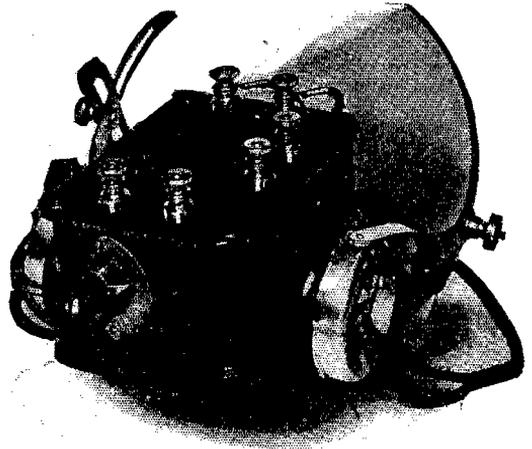
Multi-Audi-Fone

You don't know what Wireless Signals are until you have heard a Two Step M. A. F.

Price, \$75.00

If you have ever used a M. A. F. you will never be without one.

Price, \$18.00



Do you want to hear those foreign undamped stations? The undamped waver will get them for you. **PRICE, \$100.00**

M. A. F. Detector Stand \$4.25
 " Fixed Condenser 2.00
 Detectorfone 35.00

SEND FOR NEW CIRCULAR

MULTI - AUDI - FONE
 275 MORRIS AVE., ELIZABETH, N. J.

Always Mention "QST" When Writing to Advertisers

ARE YOU PREPARED

for the long winter evenings? Now is the time to fit up your station. You will need some of our parts and raw materials. Better send for our CATALOG E at once.

SWITCH POINTS

No. 626—1-4 x 3-8 inches, tapped 6-32	Doz. 0.30	50 \$1.00	100 \$1.75
No. 627—1-4 x 1-4 " 1-2 in. shank threaded 6-32 "	.36	" 1.25	" 2.00
No. 628— " " " tapped 6-32	.30	" .90	" 1.50

Prices are for plain brass finish. Nickered points furnished at 50 per cent. advance over above. Postage on 50 or less, 4c. On 100, postage on 1 lb



Maguire & Shotton

814 Lancaster Street

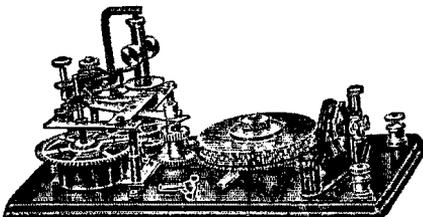
Albany - New York



"THERE'S MONEY IN IT"

AT HOME LEARN TELEGRAPHY AT HOME

MORSE AND WIRELESS



TEACH YOURSELF

in half usual time, at trifling cost, with the wonderful Automatic Transmitter, **THE OMNIGRAPH**, Sends unlimited Morse or Continental messages, at any speed, just as an expert operator would.

Adopted by U. S. Gov't. 4 Styles. Catalog Free

Omnigraph Mfg. Co. 35-39 Cortlandt St. New York

WE
TEACH
WIRELESS
BY
MAIL

You May Learn Theory, Code and Laws of Radio Communication in Our School or at Your Home.

fitting you for positions paying good salaries with wonderful chance to travel the world over. It's the most interesting profession known and the demand for skilled operators is increasing. Send stamp for catalog, which gives full information.

NATIONAL RADIO SCHOOL, 1405 U St. Washington, D. C.

LEARN TELEGRAPH

Morse and Wireless—R. R. Accounting (Station Agency) taught. Splendid opportunities. Positions secured. Marconi Co. contracts to employ graduates. We own and exclusively occupy two large modern buildings equipped with R. R. and Western Union wires and complete 2 K. W. Marconi Wireless Station. Largest school—established 42 years. Investment \$25,000. Endorsed by Railroad, Mercantile and Western Union Officials. Expert practical teachers. Low living expenses; easily earned if desired. Tuition low Easy payments. Correspondence courses also. Catalogs Free.

Dodge's Telegraph, Ry. & Wireless Institute
RADIO Street, Valparaiso, Ind.

Always Mention "QST" When Writing to Advertisers

IT TELLS YOU HOW TO BUILD YOUR OWN APPARATUS

Everyday Mechanics

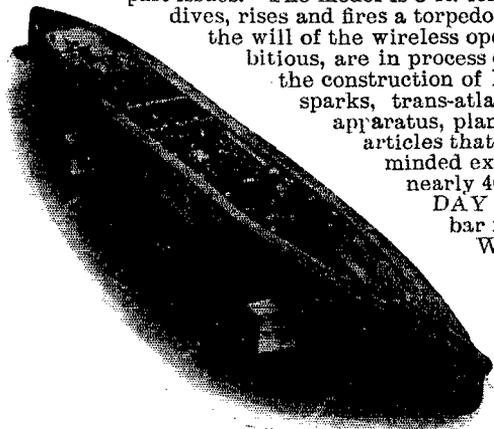


is the first and only magazine in the world devoted exclusively to constructional "how-to-make and how-to-do" material. It is edited by Thomas Stanley Curtis, whose articles and work you have known since the old days of **ELECTRICIAN AND MECHANIC**. It contains no war pictures, free write-ups of new devices, general news features. It is solidly and consistently filled, to the last of its ninety-six pages, with practical how-to-make and how-to-do articles.

EVERY FEATURE article that appears in the magazine is prepared from the data obtained in the actual construction and operation of the apparatus described. For every article, a model is constructed in the **EVERYDAY MECHANICS EXPERIMENT STATION**, Van Nest, N. Y., where it is given a practical working test. This means reliability and satisfaction.

EVERY NEW SCIENTIFIC discovery and achievement will be worked out in amateur form in the Experiment Station for the benefit of the readers of **EVERYDAY MECHANICS** in the future. A model showing the working principles will be described in detail in the magazine so that the serious experimenters of the country may strive to emulate the work done in the experiment station.

THIS MODEL SUBMARINE, CONTROLLED BY WIRELESS; has been described in past issues. The model is 5 ft. long; it is propelled by electric motor; it turns, dives, rises and fires a torpedo which explodes after leaving the boat, all at the will of the wireless operator on shore. Other models, just as ambitious, are in process of design. **OTHER FEATURES** have been the construction of high frequency apparatus to give gigantic sparks, trans-atlantic radio receiving apparatus, kicking coil apparatus, plant culture paraphernalia, and countless other articles that have delighted the hearts of the serious-minded experimenters of the country and have caused nearly 4000 of them to voluntarily write that **EVERYDAY MECHANICS** is the best practical magazine bar none, that has ever been published.



We want you to see and read **EVERYDAY MECHANICS** because we know you will need it and enjoy it. The subscription price is now 50 cents a year, but this is going to increase with the October issue to \$1.00. The news-stand price will then be 10 cents. A dollar bill pinned to the coupon brings you **EVERYDAY** for two years if sent **NOW**.

EVERYDAY MECHANICS CO., INC., 848 Aeolian Bldg., New York

Please book me for a subscription for **EVERYDAY MECHANICS** for _____

years, at fifty cents per year. I enclose \$ _____ to pay for same.

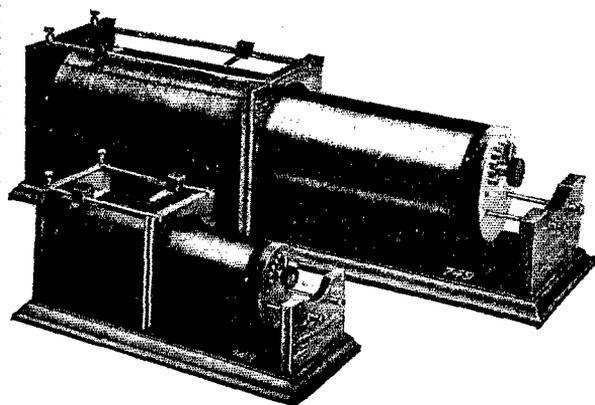
My Name is _____

My Address _____

Always Mention "QST" When Writing to Advertisers

New Undamped Wave Coupler, No. 749

Special Introductory Price, \$18.00



Our new Coupler No. 749 is 32 in. long, 9 in. wide and 10 in. high over all, and on the average sized antenna tunes up to 15,000 meters. This Coupler, used with the new CHAMBERS' SYSTEM OR CIRCUIT will bring in signals from domestic and foreign Arc Stations surprisingly loud and clear. Note the difference in size of our No. 748 and the new No. 749.

We claim to be the original inventors of a SYSTEM OR CIRCUIT, for the reception of the undamped waves without the use of Loading Coils or Oscillating Coils, as they are sometimes called; as with our system or circuit only two inductively coupled coils are necessary. Circuit supplied with each coupler.

This CHAMBERS' CIRCUIT saves you money. Think of it! No extra coils to pay for, and price of coupler only \$18.00.

Place order now so as to be in on the introductory price. Orders filled in rotation. Send for descriptive matter.

F. B. CHAMBERS & CO.

2046 Arch Street
Philadelphia, Pennsylvania

Announcing the DeForest Tubular Audion Bulb

"There is only one Audion—the De Forest"

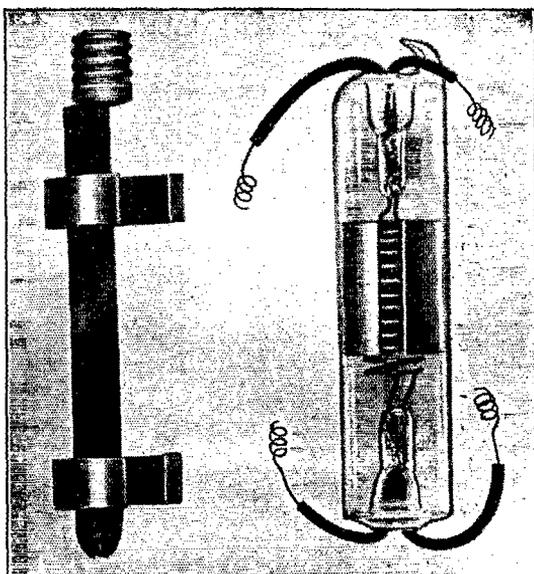
The New Type T Tubular Audion Bulb gives very loud signals from powerful stations. It has a large cylindrical plate, a spiral grid and only one filament of tungsten. As this is a long straight-line filament, it has a long life. Edison effects are completely eliminated. The plate is in contact with the heavy glass tube, preventing overheating.

Sold Separately, \$5.50 each

The special adapter fits this type to the screw base receptacles of De Forest apparatus, and is furnished at 40 cents extra.

Send stamp for Bulletins D16 and B16

**The Wireless Mfg. Co.
Canton, Ohio**



Always Mention "QST" When Writing to Advertisers

Electricity

at your fingers' ends



Know the *facts* in Electricity. They *count*—and mean more money and better position for you. You need the *exact* information, —in a practical form so that you can use it every day, to help you install electrical equipment, or make repairs, or operate machines, or do whatever else your present job —or the job ahead of you—calls for.

HAWKINS ELECTRICAL GUIDES

help you succeed through electricity

These books will answer every one of your electrical problems. They are written so that you can understand them. Arranged in the form of questions *you* would ask—and the answers to them—in plain, practical, everyday language, clear, concise and to the point. Thousands of men are using Hawkins Electrical Guides as a practical aid to greater success in the electrical field.

Read what users say:

"Every Electrician, Operating Engineer or Student who wants to advance himself in the Electrical field should have a set of these books." JOHN KELLEER, 118 Union St., Newark, Ohio.

"For the man not getting a college training, and even in that case, I can sincerely say I do not believe there is a better set of books on the market today." LLOYD D. HUFFMAN, Dayton, Ohio.

"We consider Hawkins Electrical Guides the most compact and complete set of electrical references in the market." NOGGLE ELECTRIC WORKS, Monterey, Cal.

"I think they should be in the hands of everyone who has anything to do with Electricity." T. M. MURPHY, Orange, Va.

"For the practical electrician, they are the best books published—worth many times their price." L. C. WAGNER, Wyoming, Ill.

"I have gained valuable information from them which has helped me directly in my line of work." HERMAN NODENBERG, Hoboken, N. J.

"They are wonderful value. Everything is so clear and concise. Even one who had no knowledge of Electricity would have no difficulty in grasping the facts." F. L. TAYLOR, Amesbury, Mass.

"It is the best work an apprentice can study if he wants to get ahead in his trade. As a reference for the experienced worker Hawkins Electrical Guides are unexcelled." I. MCCOLELLAN, Chillicothe, Mo.

10 Practical Volumes—3500 Pages—4700 Illustrations

\$1 A Volume—\$1 A Month

These books are a complete and up-to-date course in Electrical Engineering—the standard works on Electrical Science. Contain no useless matter—only such information as is needed.

Shipped to You FREE

Send no money. Examine the books first. Decide for yourself that they are the most complete and clearest written electrical books ever published. Every book is complete in itself but the entire set is the best bargain. Accept this unusual offer now—mail the coupon today. If you decide to keep the books you can make settlement at only \$1 per month, until paid for.

Theo. Audel & Co.
72 Fifth Ave.
N. Y.

Theo. Audel & Co.
72 5th Ave., N.Y.

Please submit me for examination Hawkins Electrical Guides (price \$1 each). Ship a once, prepaid, the 10 numbers. I satisfactory I agree to send you \$1 within seven days and to further mail you \$1 each month until paid.

GST 11-16

MAIL THIS FREE COUPON TODAY

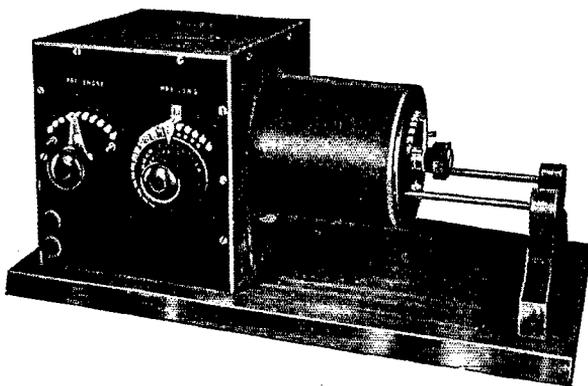
Signature.....
Occupation.....
Business Address.....
Residence.....
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Specially Arranged for Home Study and Reference

They are bound in **flexible** covers that make them a pleasure to handle or have in your library. Size 5x6½ inches and ¼ to ⅜ inches thick. You can carry each separate volume about with you until you have mastered its contents. Hawkins Electrical Guides fit your pocket and your pocket book as well. Only \$1 per volume and owners of the set say there are no better electrical books at any price.

PARTIAL CONTENTS

Magnetism—Induction—Experiments—Dynamics—Electric Machinery—Motors—Armatures—Armature Windings—Installing of Dynamos—Electrical Instrument Testing—Practical Management of Dynamos and Motors—Distillation Systems—Wiring—Wiring Diagrams—Sign Flashers—Storage Batteries—Principles of Alternating Currents and Alternators—Alternating Current Motors—Transformers—Converters—Rectifiers—Alternating Current Systems—Circuit Breakers—Measuring Instruments—Switch Boards—Fuses—Power Stations—Installing—Telephone—Telegraph—Wireless—Bells—Lighting—Railways. Also many Modern Practical Appliances of Electricity and Ready Reference Index of the 10 numbers.



TYPE X TUNER

REMEMBER--

that while our new catalog X is filled with complete radio instruments of the highest order of excellence, we also carry a complete stock of exceptionally fine electrical fittings, such as switch points, instrument switches, wire (bare, insulated and resistance) dead-end switches, etc. listed in our general catalog. We will gladly mail both books for which we ask the courtesy of 6c in stamps.

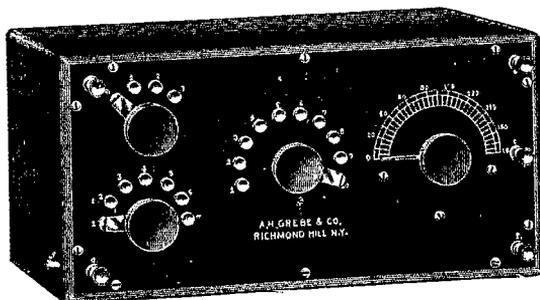
A TUNER of conventional type with many exclusive features for wave lengths up to 3000 meters. Primary dead end switch, plain "units" switch, mahogany and Bakelite throughout, rubber covered binding posts. Complete description in our new catalog X.

CLAPP-EASTHAM COMPANY

140 Main St., Cambridge, Mass.

GREBE RADIO APPARATUS

DESIGNED
BY EXPERTS
FOR THE
DISCRIMINATING
AMATEUR



EFFICIENCY
SELECTIVITY
SIMPLICITY
SERVICE

SHORT WAVE REGENERATIVE RECEIVER. TYPE AGP 101

Our new type AGP 101 Short Wave Regenerative Receiver is specially designed for long distance relay work on wave lengths of 150 to 400 metres. It embodies all the latest PRACTICAL ideas in regenerative receiver construction which have proven most satisfactory in actual operation at our testing station. Designed primarily for short wave reception, this instrument will also operate very efficiently on wave lengths up to 1000 metres. A blueprint of connections and instructions for operating in conjunction with your audion equipment is supplied with each instrument.

SHORT WAVE REGENERATIVE RECEIVER, TYPE AGP 101, \$32.50

Send 2c Stamp for Catalog "R"

A. H. GREBE & CO. 10 Van Wyck Ave., Richmond Hill, N. Y.

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Price, \$7.50. Mailing Weight, 1 lb.

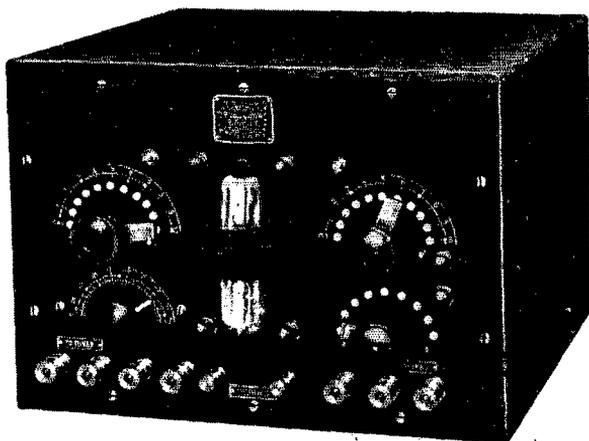
ments which stay put. Bakelite ear caps, German Silver top band, lenient back check, consequent poles and like all Turney apparatus is extremely handsome in appearance. The adjustable pressure head band affords real comfort, no matter how long you wear it. A circular giving complete information will be sent for the asking. **NOTICE**—All Turney head sets will be provided with the lenient back check which consists of a special woven canvas strap which fits the head perfectly.

The New Turney Receivers

TAKE A GOOD LOOK AT THIS HEAD SET
IT IS SURELY PERFECTION

By looking at the cut you can almost feel the real comfort this set affords

Eugene T. Turney Company, Inc., 2595 Third Avenue, New York City



R B D 8 Size 12X12X9 inches.

controlled by our nine terminal SILENT switch, one small fixed condenser, one 2 M. F. fixed condenser and one 43-plate rotary variable condenser. Duplex Rheostat for minute adjustment of Filament current by two 11-terminal switches and six Terminal Posts for the connections of Telephones, a Six Volt battery and Tuner. In addition to these are five more posts, the latter to be used only when in conjunction with the Mignon Undamped Wave System. A marvel of efficiency.

RECEIVING SET AS ILLUSTRATED TYPE R B D 8 \$35.00

We are Central Representatives of

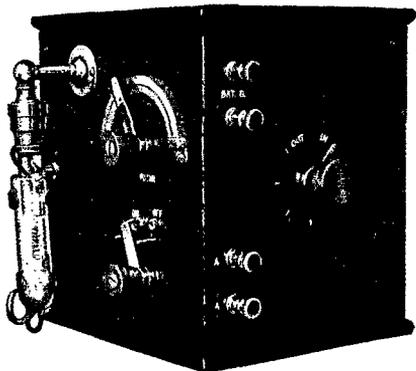
De Forest Radio Tel. & Tel. Co. Mignon Wireless Corporation. Pacific Laboratories Sales Dept.
Send 2c. Stamp for Catalog

Wm. G. Finch Company Second National Bank Bldg., Cincinnati, Ohio

Always Mention "QST" When Writing to Advertisers

The R B D 8 is the last word in Radio Signal Detectors, equipped with the famous Electron Audio Bulb. (All bulbs sold by us are manufactured specially for the Mignon System by the Electron Manufacturing Company) and is wired according to the Circuit Specification of the Mignon Undamped Wave System, including the Auto-Transformer encircling the bulb. The R B D 8 is the most efficient Detector manufactured and more than doubles the efficiency of any Radio Receiving Station. This cabinet contains, 12 3-cell flashlight batteries, controlled by our nine terminal SILENT switch, one small fixed condenser, one 2 M. F. fixed condenser and one 43-plate rotary variable condenser. Duplex Rheostat for minute adjustment of Filament current by two 11-terminal switches and six Terminal Posts for the connections of Telephones, a Six Volt battery and Tuner. In addition to these are five more posts, the latter to be used only when in conjunction with the Mignon Undamped Wave System. A marvel of efficiency.

"THERE IS ONLY ONE AUDION, THE DE FOREST"
DE FOREST ULTRAUDION DETECTOR
 FOR DAMPED AND UNDAMPED WAVES



TYPE UJI
 DeForest Ultraudion Detector
 Price, \$27.50

The new DeForest Ultraudion Detector enables every operator to receive both spark and arc signals at minimum expense. This instrument is made for private or amateur use only, and is within the means of all. Heretofore the lowest priced genuine Ultraudion cost \$110.00.

We now offer the new amateur type at \$27.50. It is equipped with potentiometer control for the "B" or high voltage circuit, arranged for external batteries to be furnished by the purchaser, has an internal rheostat like our higher priced instruments, and is equipped with the genuine DeForest Tubular Audion with adapter.

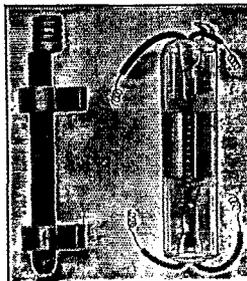
No complicated circuits for tuning are necessary or desirable. Simply a regular tuner of proper size is used. No need of spending

money on large, expensive coils to receive Darien, Nauen, Eilvese and all the undamped stations.

The genuine DeForest Tubular Audion illustrated here-with is now within the means of all amateur operators. It is sold to anyone in any quantity without the return of the old one.

Fully 50 percent more sensitive than any other known form of detector and thoroughly reliable. Tests show an operating life of at least 800 burning hours when properly used, equal to at least a year's service.

With it the maximum receiving range can be covered. Suitable for receiving arc and spark signals and also for amplifying. Each equipped with a static shunt to prevent paralyzing from static and loud signals. Guaranteed to be delivered to you in perfect condition.



Genuine DeForest Tubular Audion
 Price, \$5.50, delivered
 Adapter, 40c extra

ACCEPT NO INFRINGING IMITATIONS. INSIST ON THE GENUINE ARTICLE

Send stamp for Bulletins R16 on the Audion Detectors, Audion Receiving Sets
 the Tubular Audion and the Ultraudion

"WARNING—You are entitled to the genuine Audion, guaranteed by the owners of the Audion patents, when making an investment of this kind. Any evacuated detector having a filament, a grid and a plate, as well as other types, are covered by our patents, and several irresponsible infringers are being prosecuted. To be safe and get full value for your money, insist on the genuine DeForest Audion."

DeForest Radio
Telephone & Telegraph Company
 101 PARK AVENUE

New York, N. Y.

Makers of the Highest Grade Receiving Equipment in the World

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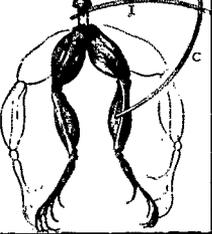
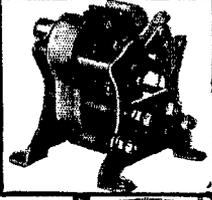
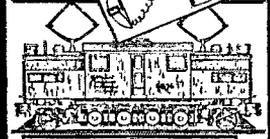
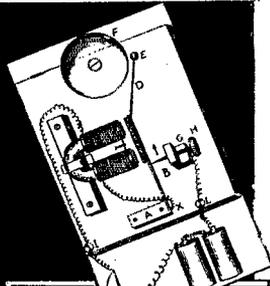
Gee! That's Great!



Hello, Boys! Surprise your friends with your knowledge of electricity, and ability to do more than a hundred intensely interesting electrical experiments that will open their eyes with wonder. Get

Gilbert's ERECTOR

Electrical Set



With this marvelous new toy, you will be able to build your own motor that will operate forward and backward, and control its speed so that you may operate perfectly your Erector models, mechanical toys, electric trains, etc.

The wonderful, big book containing an elementary course in electricity, which comes with each set, will show you how to build your motor, make magnets, wire door bells and electric lights, construct switches, and do more than 100 mystifying electrical experiments.

You'll have the finest kind of fun! Who knows but that you may have great talent and that by playing with this set, you will be encouraged to

make a thorough study of electricity and become famous as a man, like Edison, Marconi, Volta, Tezla, Steinmetz!

Ask your dealer today to show you the wonderful Erector Electrical Set. Price, \$5.00 Canada, \$7.50

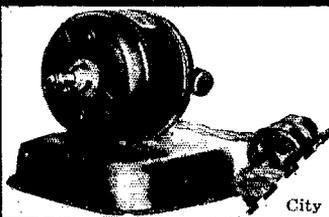
Erector Toy Engineering

Mail back the coupon for my handsome book which tells all about my new, big idea—The Gilbert Institute of Erector Engineering, how you can get free membership in it, and win diplomas, honors and valuable prizes.

GET THESE ERECTOR ELECTRICAL ACCESSORIES

P. 60—ERECTOR TRANSFORMER—For alternating current only, 110 volt, 60 cycle. Delivers either 4, 8 or 12 volts, open circuit. Keeps cooler than any other. High grade insulation prevents shock. Five ft. cord and plug attached, \$3.00. Canada, \$4.50.
P. 65—ERECTOR MOTOR—Either alternating or direct 110 volt house current. Self-lubricating—easily replaced. Self Starter. Motor is series wound. Well ventilated. Runs cool. 5 ft. cord and plug attached, \$5.00. Canada, \$7.50.

P. 58—ERECTOR MOTOR—Current:— Battery. Tubular holder with copper gauze brushes easily replaced. Self-starter. Four terminals to which separate Reverse Switch Base can be attached. \$1.50. Canada, \$2.25.
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Send me your book which tells the complete story of the "Gilbert Institute of Erector Engineering."
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In Clear, Cold Winter Air or in Static Charged Atmosphere of July

You get the same clear, velvety tone when
you use the

Holtzer-Cabot



Radio Phones

and don't forget the comfort.
They fit perfectly, and weigh
but 10 1-2 ounces. SEND FOR
LATEST BOOKLET 1687Q.

THE HOLTZER-CABOT ELECTRIC CO.
BOSTON, MASS.
1102 LINDEN TRUST BLDG.
CHICAGO NEW YORK BALTIMORE

SWITCH POINTS and LATHE WORK for WIRELESS. Switch points made only of brass, highly polished, lacquered, and guaranteed to stay bright. Size 1-4 x 1-4 in, or smaller, \$.03 each. Prices for larger sizes on application. All switch points tapped for 4-36 machine screws which are furnished with the points.

Lathe work, bushings, loose coupler parts, rotary discs, etc. at moderate prices. WRITE FOR INFORMATION

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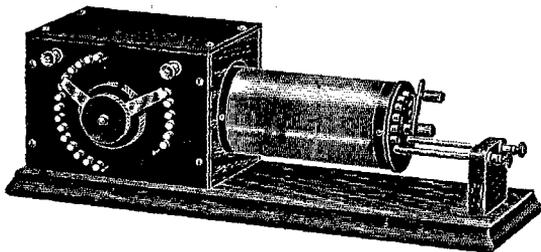
BRANDES RECEIVERS
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TRANSFORMERS
WIRELESS EXPERT IN
CHARGE.

Southern California Electric Co.
LOS ANGELES, CAL.

625 S. Main

316 W. 7th St.

Arnold Navy Type Loose Coupler Price, \$15.00



PLEASE NOTE NEW ADDRESS

SEND 2c STAMP FOR BULLETIN No. 1

J. F. ARNOLD, 327 East 119th St., New York City

Perhaps you have noticed I specialize and this instrument is my specialty. One must excel when efforts are concentrated on a single instrument. These instruments are not and never were ground out in quantities and the personality of the maker lost. I make every instrument myself, test it and know just what enters into its construction.

With suitable inductance in conjunction with an Audion Detector, this instrument has proven very efficient for receiving undamped waves. This Hook-up will be furnished to prospective purchasers. I also carry the finest line of Switch Points, Rubber Knobs Cabinets and Accessories on the market.

ATTENTION "QST" READERS !!

SAVE MONEY by purchasing your apparatus from me. Clapp-Eastham, "Radio," Turney, De Forest, Brandes, Thordarson, Multi-Audi-Fone, Mignon and all other reliable makes of STANDARD radio instruments at money saving prices. Send a 2c. stamp for the new catalog of Mignon System Radio Receptors for damped and undamped waves.

SPECIAL FOR THIS MONTH:—A pair of mounting clips for tubular audion and wiring diagrams FREE with every detector order @ \$5.00. Write for particulars.

ARTHUR B. CHURCH

131 Hyland Ave., Ames, Iowa.

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APPLICATION BLANK

American Radio Relay League, Inc.

INCORPORATED

Hartford - Connecticut

Your name Address
(Street, City and State)

Your Age Your Station Call Letters

Are you a member of any Radio or Wireless Club, and if so give its name and address:

Length of your Aerial Height above ground

Number of wires in Aerial and space between

SENDING EQUIPMENT

Do you obtain your power from Batteries or City Current?

Do you use a Spark Coil or a Transformer?

What is your Power Input?

Is your Spark Gap Rotary, Fixed or Quenched?

What Tone has your Spark? Approximate Wave Length

Give names and addresses of the FIVE most distant stations you communicate with:

State distance in miles

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(OVER)

Describe your Receiving Set

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.....

Do you use an Audion Detector?

What is your approximate receiving range in miles?

Are you troubled by interference?

What are your usual listening hours and how many evenings a week do you
average at your instrument?

Have you telephone connection in your house, or convenient?

Do you keep your station practically constantly in running order?

Can you copy Press News?

About how many words per minute can you receive with certainty?

What is the nearest Commercial or Government Station to you?

Have you a Government license, and if so what Grade and No.

Please make any remarks or comments which you think will be of help in
perfecting a chain of Amateur Radio Relay Stations throughout the country.
The object of the League is strictly confined to facilitating the relaying of radio
messages among amateurs.

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I HEREBY OFFER TO RELAY OR DELIVER ANY AMATEUR RADIO
MESSAGES THAT ARE SENT TO ME.

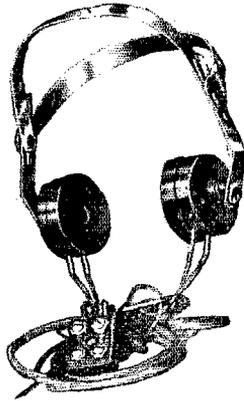
Signature..... Date

MURDOCK "FIFTY-FIVE"

2000 Ohm Complete

Double Set

\$4.00



3000 Ohm Complete

Double Set

\$5.00

ALL AMATEUR STATIONS

now equipped with MURDOCK 'PHONES are getting ALL the signals, ALL the time. We want every amateur to know that we GUARANTEE these remarkably low priced 'phones to be equal in EVERY RESPECT to any for which you may pay DOUBLE the money. We could not, in justice, make such a guarantee, unless we had the goods to deliver. If YOU have never tried the MURDOCK 'PHONES, why not ORDER A SET TODAY? Your money back at once, if you don't care to keep them.

Other MURDOCK APPARATUS for amateur use, right in price and in performance:

Moulded Transmitting Condenser, per section..\$2.00
Oscillation Transformer No. 424..... 4.00
Variable Condenser No. 366, .001 mfd..... 4.00
Variable Condenser No. 368, .0005 mfd..... 3.00

The best stations are equipped with some MURDOCK instruments. How about YOURS? Our catalog is FREE to those interested.

Wm. J. Murdock Company
20 Carter St., Chelsea, Mass.

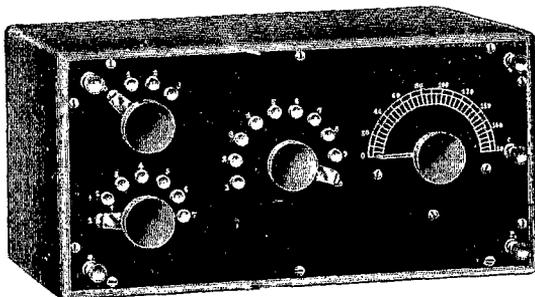


Mesco Short Wave Regenerative Receiver

This short wave regenerative receiver or receiver set is particularly recommended for long distance relay work on wave lengths approximating 180 to 450 meters. It is possible, however, to receive wave lengths up to nearly 1,000 meters efficiently with reduced amplification.

The circuit employed is of the well known Armstrong regenerative type with constants accurately calculated for the wave lengths referred to above when employed in conjunction with any of the audion detectors described in this manual.

With this set it is possible to receive undamped and damped waves. When listening



List No. 8467 MESCO Short Wave Regenerative Receiver
PRICE, \$32.50

to the latter, although the tone of the incoming spark signal is somewhat changed, it is amplified many times when adjusted properly.

It is possible then, under these circumstances, to hear and read stations that would be totally inaudible with ordinary receiving sets. It will increase the receiving range of any station over 100 times.

The receiver is complete in every detail and ready for operation when connected to an aerial, ground, audion detector and telephone receivers. The cabinet is made of weathered oak having all connections brought out on a genuine hard rubber panel which decreases insulation losses.

A blue print of connections with detailed instructions for setting up and operating this receiver is supplied with each instrument. Both tube and round type audion detectors can be used successfully with it.

The metal parts are of brass, nickel polished.

SEND FOR OUR NEW CATALOG H28

It is pocket size, 8x4½ inches, contains 248 pages, with over 1,100 illustrations, and describes in plain, clear language all about Bells, Push Buttons, Batteries, Telephone and Telegraph Material, Electric Toys, Burglar and Fire Alarm Contrivances, Electric Call Bells, Electric Alarm Clocks, Medical Batteries, Motor Boat Horns, Electrically Heated Apparatus, Battery Connectors, Switches, Battery Gauges, Wireless Telegraph Instruments, Ignition Supplies, Etc.

There exist a thousand and one ways where electrical devices may be used, and to know what is best for your purpose you need this catalog. It costs you nothing.

Send 10c for copy of our Wireless Manual H9. You get your money back on an order of \$1.00

It contains 180 pages and tells how to erect and maintain wireless telegraph stations. Shows a number of diagrams. Has the Morse and Continental Telegraph Codes. Illustrates the best instruments to use; tells what they are for and how to use them. Has many new diagrams and other valuable information not contained in any other book. Do not wait. Send your request now. Get the best 10c. value you will ever buy.

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