

**Radio Telegraph  
Apparatus**

**Clapp - Eastham  
Company**

**Catalog S**

**139 MAIN STREET  
CAMBRIDGE, MASSACHUSETTS**

# Radio Telegraph Apparatus

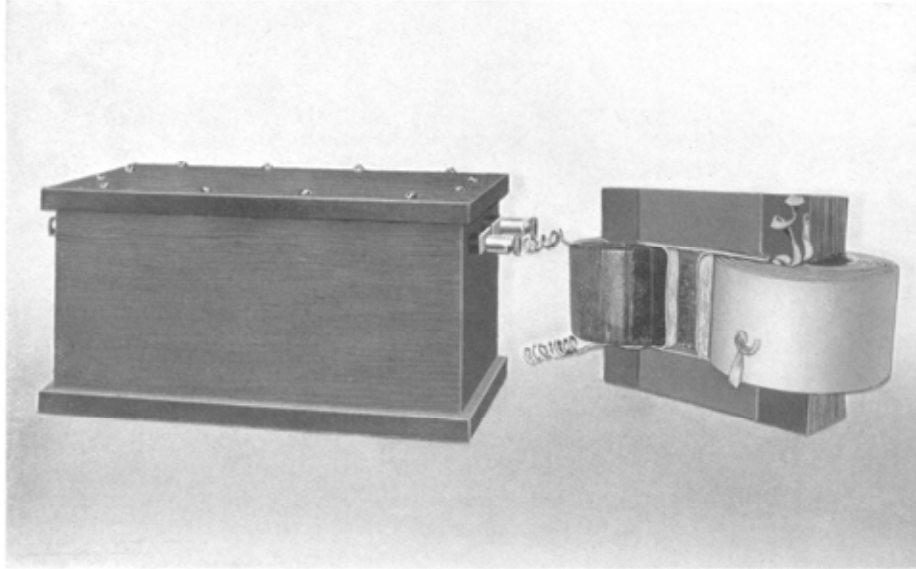
MANUFACTURED IN THE  
Clapp-Eastham Shops  
IN THE  
Clapp-Eastham Way

"A little better than the best"

Clapp-Eastham Company  
139 Main Street, Cambridge, Massachusetts

## High Tension Magnetic Leakage Transformers

Self Controlling. Power factor 80 to 90%. High Efficiency. Spark Gap troubles reduced to a minimum. Secondary arranged to permit their use on a 200 meter wave.



The "Blitzen" Transformer, Mounted and Unmounted

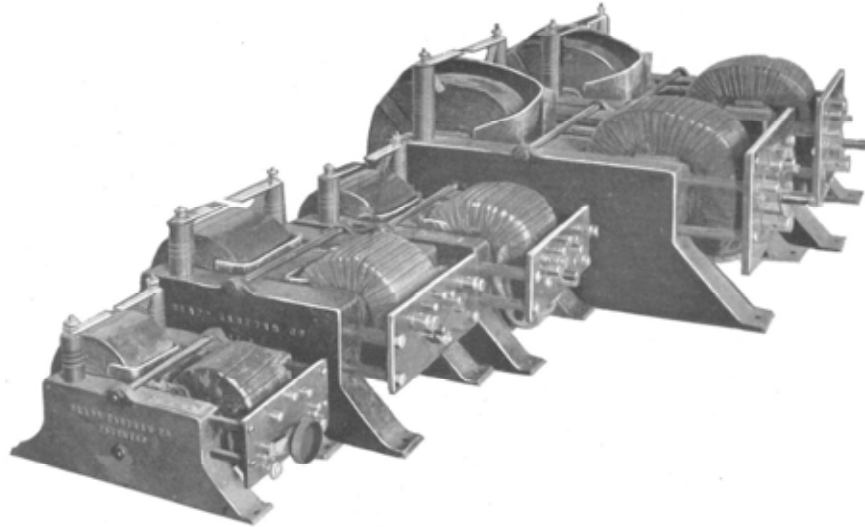
Magnetic leakage resonance transformers were originated by us, and are covered by broad U. S. patents, and are in use in all parts of the world for operating Tesla and X-Ray Coils, for spectroscopic work, and particularly in radio telegraph stations. These transformers have been purchased, and are in use by the United States Army and Navy, leading radio telegraph companies, and in a host of leading research and experimental laboratories too numerous to give here.

The success of this type has brought many inferior imitations, and we urge you to insist on a genuine "Type E" or "Blitzen" for your own protection. We have priced our transformers as low as is consistent with good quality material and workmanship, and our large manufacturing facilities and long experience convince us that it is impossible for the purchaser to secure a satisfactory transformer at a lower price, while a higher price is unnecessary and unjustified.

Every transformer is self controlled, requiring no impedance coil or rheostat, and may be connected directly to 110 volt 60 cycles alternating current mains without danger.

Each transformer of  $\frac{1}{4}$  K. W.,  $\frac{1}{2}$  K. W. or 1 K. W. is designed to operate on a condenser of .01 M. F., and for the information of those wishing to construct their own condensers, this capacity is approximately that of twelve 8" x 10" photographic plates coated on both sides with tinfoil to within one inch of the edges, all plates connected in multiple.

Transformers of above 1 K. W. operate on a condenser of .03 M. F. capacity.



$\frac{1}{4}$ ,  $\frac{1}{2}$ , 1, 2 and 3 K. W. Type E Transformers

The secondary potentials of our transformers are as follows:

- $\frac{1}{4}$  K. W., approximately 6,000 volts
- $\frac{1}{2}$  K. W., approximately 8,000 volts
- 1 K. W., approximately 12,000 volts

Larger sizes to suit requirements of installations.

These potentials are best adapted for *efficient operation* with the respective power, and while transformers having higher potentials will give an impressively loud and brilliant spark at the spark gap, at the expense of efficiency, the considerable energy which goes into sound, light and heat is absolutely lost to radiation.

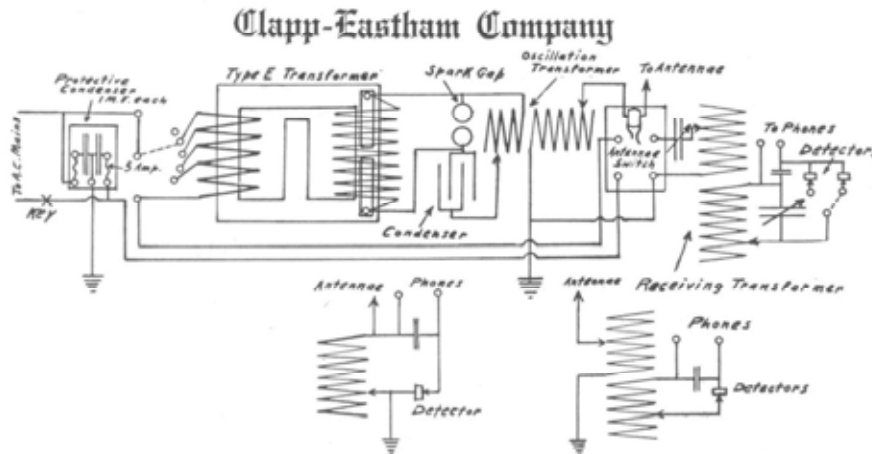
Unless otherwise specified, 110 volt 60 cycle transformers will be supplied on all orders; 25 cycle transformers will be supplied at the price of a sixty cycle transformer of the next larger size; 125 cycle transformers at no additional cost.

All Type E transformers have a switch for giving four variations of power, and their general construction is shown in the illustration herewith.

Blitzen transformers operate at full power only, and are mounted in highly finished solid mahogany cases.

Both types of transformer are equally efficient, are constructed on the magnetic leakage, resonance principle, and are fully guaranteed for one year, but the Blitzen type is of less expensive construction, and has not the feature of variable power.

Type E Transformer	Blitzen Transformer	Unmounted Blitzen Transformer
$\frac{1}{4}$ K. W. ....	\$ 30.00	\$ 9.00
$\frac{1}{2}$ K. W. ....	45.00	15.00
1 K. W. ....	60.00	24.00
2 K. W. ....	120.00	.....
3 K. W. ....	150.00	.....
5 K. W. ....	262.00	.....



The above diagrams of connection show the method of using our instruments to the best advantage.

In using our  $\frac{1}{4}$  and  $\frac{1}{2}$  K. W. transformers *with a helix*, it is *very important* to note that the *secondary* terminal, marked G, be used in connection with the *lower or grounded* end of the helix. If inductive coupling is employed, this point may be ignored.

## Protective Device

There is always great danger to wiring, lamps and other electrical instruments in the building where a wireless set is installed as well as to the wireless transformer itself, due to "kick backs" and induction between wires carrying oscillating currents and other metallic circuits in the building, especially the line wires feeding the transformer itself.

High potentials are thereby induced in such circuits, which are almost certain destruction to all low-potential instruments as well as to the primary of the wireless transformer.

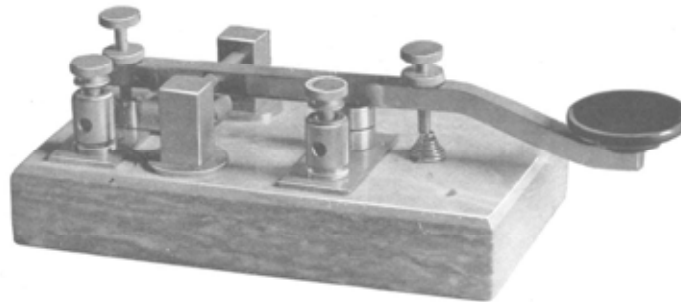
Trouble from this source may be avoided by connecting two 2 M. F. condensers joined in series across the primary terminals of the transformer, and across any other circuit at which sparking occurs.

The central point of this condenser should also be grounded with a separate wire from that used in grounding the wireless set.

We can supply protective devices of this description at five dollars each, consisting of two condensers mounted in a box and provided with connections and fused at each terminal with five-ampere fuses to prevent short circuit, should the condenser break down.

We will not guarantee our transformers against burnout unless a device similar to the above is used.

## Wireless Keys



The "Boston" Key

The "Boston" Wireless Key is manufactured with contact points and conductors adapted to sets of all powers, is beautifully finished and bears the stamp of quality at every point.

All metal parts except the steel pins of the center bearings are of solid brass, nickel plated; the button is of genuine hard rubber, and the whole is mounted on a polished Italian dove marble base  $3\frac{1}{2}$  inches by 6 inches, combining a high degree of insulation and solid stability with a pleasing appearance.

The action of the lever is resilient, preventing fatigue, and the contacts are of silver of large diameter, in every case about double the size required for the power at which they are rated.

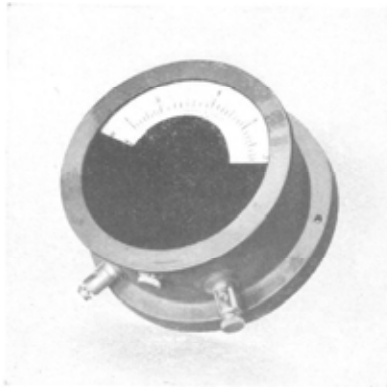
As shown in the illustration, the current from the lever is not conducted through the bearings, but is carried by a heavy conductor direct to the binding-post base.

This key is constructed entirely in our own factory, exclusively for wireless use, is unusually attractive, and a number have been purchased from us by the foremost wireless company in this country for use in their stations.

Your order will prove to you that this key is better made, and more attractive than any offered for general use.

"Boston" Key for use on currents up to 10 amperes	..... \$ 6.50
"Boston" Key for use on currents up to 20 amperes	..... 7.75
"Boston" Key for use on currents up to 30 amperes	..... 9.00
"Boston" Key for use on currents up to 50 amperes	..... 12.50

## The Precision Hot Wire Meter



In supplying hot wire meters with our transmitting sets, we have always found it next to impossible to secure an instrument of reasonable accuracy sufficiently quick in action and permanent in adjustment to make its use simple and convenient.

We can now offer a meter of our own manufacture, designed for use and calibrated on both low and high frequency currents, and constructed especially to overcome the faults common to all instruments of this class which have come to our notice.

**Construction.** This meter is of the highest grade, the case being of satin finish aluminum, plain glass cover, black figures on white dial, nickel binding posts, zero scale adjustment of novel design, the case measuring 6 inches in diameter by  $2\frac{3}{4}$  inches high, and the weight is 3 lbs.

**Permanency.** The instrument has unusual permanency, and does not require resetting of the zero point except in case of accident or misuse.

**Accuracy.** The inductance of the shunt circuit and expanding wire being properly proportioned, the instrument will read correctly on all frequencies.

**Quick Action.** This meter is remarkably quick in action, so that readings may be quickly taken without the tedious waits for the needle to reach its maximum deflection and return to zero.

**Resistance.** The resistance of the meter is very low in comparison with others of this type. A high resistance meter will so affect your circuit that the fine tuning necessary for maximum radiation and distance cannot be secured.

Time required for full scale deflection, 5 seconds.

Damping: Absolutely dead beat.

Scale, 160 degrees. Wide open scale.

Voltage drop,  $\frac{1}{4}$  volt.

Overload—meter will stand 100% overload.

Bearings—finest quality sapphires.

Front connected, standard, back connected to order.

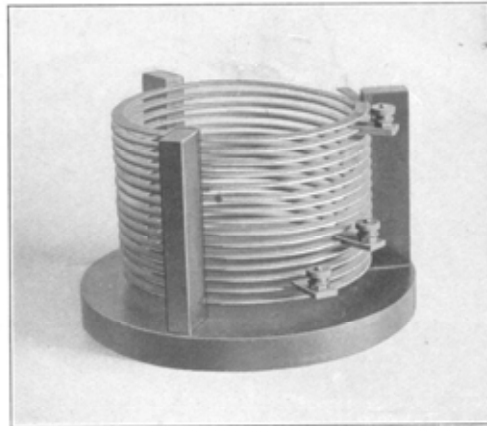
Practically perfect temperature compensation.

### PRICES

0— 5 amperes or less .....	\$10.00
0—10 amperes or less .....	11.00
0—15 amperes or less .....	12.00

**Blitzen Helices**

$\frac{1}{4}$  K. W.



Helix

This helix is the one employed on our well-known Blitzen transmitting sets, is moderate in price, simple and rugged in construction, as well as unique in employing edgewise-wound copper strip. Base is of highly finished mahogany, while supports are of hard rubber. Three clips are provided, so that varying degrees of coupling may be used.

Blitzen Helix $\frac{1}{4}$ K. W. ....	\$ 5.00
Blitzen Helix $\frac{1}{2}$ K. W. ....	12.00
Blitzen Helix 1 K. W. ....	12.00

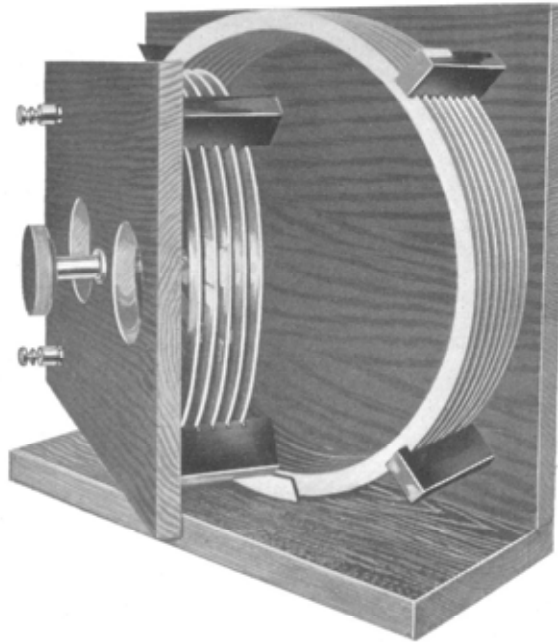
$\frac{1}{2}$  and 1 K. W.



Helix



## Blitzen Radiocoupler



Inductances of this type while commonly used in commercial practice have heretofore been beyond the reach of the experimenter, due to their high cost.

The Blitzen Radiocoupler is offered at a moderate cost, and provides all the advantages found in the more expensive types. The framework is of oak in dull black finish, the stationary frame carrying the secondary of eight turns of edgewise-wound copper strip  $10\frac{3}{4}$  inches inside diameter. The swinging member carries the primary of five turns of edgewise-wound copper strip  $7\frac{1}{2}$  inches inside diameter, and both windings are supported by slotted uprights of Bakelite.

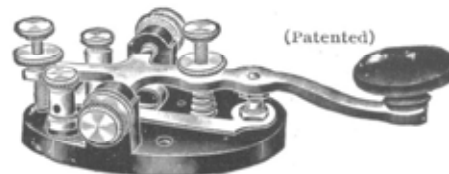
The primary is continuously adjustable by means of a projecting handle as shown in the illustration, while helix clips of the usual type are fitted to the secondary.

The instrument is  $13\frac{1}{2}$  inches long, 12 inches high, and  $4\frac{1}{2}$  inches deep when fully closed. Net weight 10 lbs., shipping weight 15 lbs.

Price .....\$12.00

## The Blitzen Key

The base is of polished black composition, the lever of phosphor bronze, and other metal parts are finished in gold lacquer. Ample current carrying capacity for  $\frac{1}{4}$  K. W. is provided, and removable contacts are of No. 6 B. & S. hardened silver.



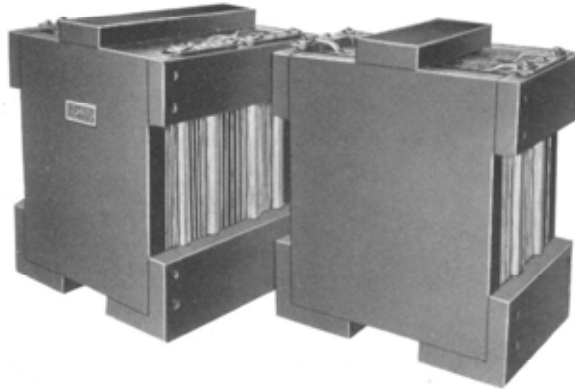
Price .....\$2.00

Price of same with Nickel-plated Lever, brass frame ..... 1.65

## High Potential Condensers

Many different forms of transmitting condensers are in use, but we believe the glass plate type, introduced by us seven years ago and continued without a single important constructional change, has proven its worth above all others.

For the season of 1915, however, we have greatly improved the form of mounting, although still retaining the fundamental characteristics upon which their success has been based.



These sections are built of the finest selected glass, coated with foil on both sides by a special process, which insures close adhesion of the metal to the glass.

A sufficient number of plates are assembled together to form a unit of .01 M. F. ( $\frac{1}{4}$  K. W. .005 M. F.) with a wooden slab in the center which projects on all sides. These projecting edges slide in grooves in the rack, forming a convenient mounting, readily accessible and with sections easily removable.

The sections, when assembled, are boiled for a considerable time in a non-hygroscopic compound with which they become thoroughly impregnated, thus preventing brushing at the edges with its attendant loss of power.

A condenser acts merely as a storage tank for the energy derived from your transformer, which is rapidly filled and emptied as sparks occur at the spark gap.

You would not consider storing valuable liquids in a leaky vessel or one which slopped over, and yet this is exactly what occurs with most types of condenser. The most evident signs of leakage are heating and (if the condenser is transparent) brushing or spraying at the edges.

Owing to a rearrangement of the glass and mounting, we are able to offer these condensers in a greatly improved form at a material reduction in cost, without sacrificing the quality or reliability for which they have become noted.

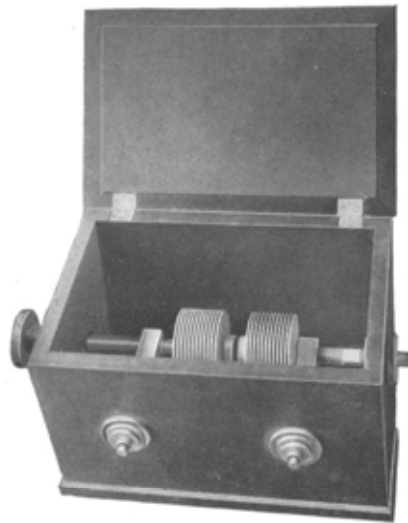
The  $\frac{1}{4}$  K. W. and  $\frac{1}{2}$  K. W. and 1 K. W. condensers have a capacity of .01 M. F. to permit the use of a 200 meter wave length.

The  $\frac{1}{4}$  K. W. condenser consists of two of the improved type sections connected in parallel, the  $\frac{1}{2}$  K. W. four of the improved type sections connected two sets in series, each set two sections in parallel, and the 1 K. W. consists of nine sections connected three sets in series, each set three sections in parallel.

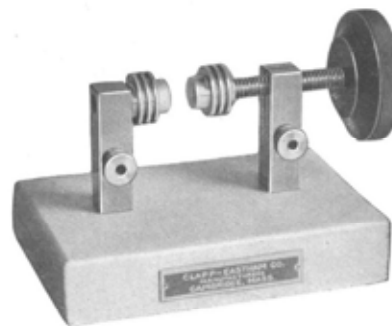
Condensers larger than 1 K. W. have a capacity of .03 M. F. unless otherwise specified, and have a series multiple connection. All racks are dull black finish.

$\frac{1}{4}$ K. W. Condenser, complete, in rack	\$ 8.00
$\frac{1}{2}$ K. W. Condenser, complete, in rack	13.00
1 K. W. Condenser, complete, in rack	27.50
2 K. W. Condenser, complete, in rack	55.00
3 K. W. Condenser, complete, in rack	110.00
5 K. W. Condenser, complete, in rack	200.00

## Adjustable Spark Gaps



1, 2, 3 and 5 K. W. Spark Gap



$\frac{1}{4}$  and  $\frac{1}{2}$  K. W. Spark Gap

A well constructed Spark Gap is a necessity in every radio station, and we continue our models for the present season without change, except in prices, which are reduced in some instances.

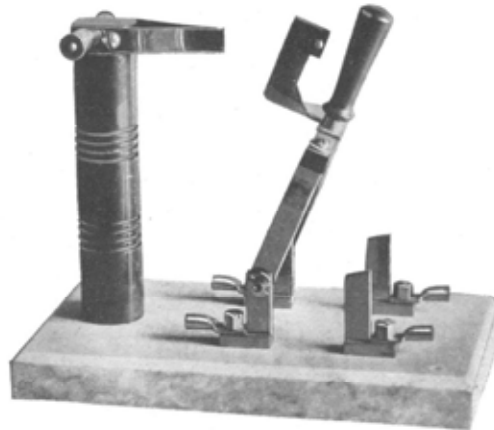
Our Spark Gaps are of ample proportions, are fitted with radiators in all sizes, and will give the satisfaction to be expected from well made, carefully designed apparatus.

Quarter and half K. W. Spark Gaps have zinc spark points carried on copper plated uprights with hard rubber adjusting handle. Mounting is on a Holland Blue polished marble base.

All gaps of 1 K. W. and over are mounted in cabinets with hinged cover for muffling the noise of the discharge, which becomes unpleasant as the higher powers are reached.

$\frac{1}{4}$ K. W. Spark Gap .....	\$ 3.00
$\frac{1}{2}$ K. W. Spark Gap .....	4.00
1 K. W. Spark Gap .....	15.00
2 K. W. Spark Gap .....	32.00
3 and 5 K. W. Spark Gap .....	60.00

## Antenna Switch



When thrown to the upward or receiving position, this switch disconnects the antenna from the helix, at the same time connecting it to the tuning coil of the receiving set and open-circuiting the source of current supply, so that damage to the receiving instruments through accidental pressure of the key is impossible. When thrown down to the sending position, the antenna is disconnected from the receiving set and connected to the sending helix, the current supply circuit is closed and the receiving coil is short-circuited and grounded.

This switch is built in several sizes for use on various powers, and is mounted on a polished dove marble base. The post which carries the high potential terminals is of hard rubber. This switch will be found of great convenience, and will fully protect your receiving instruments.

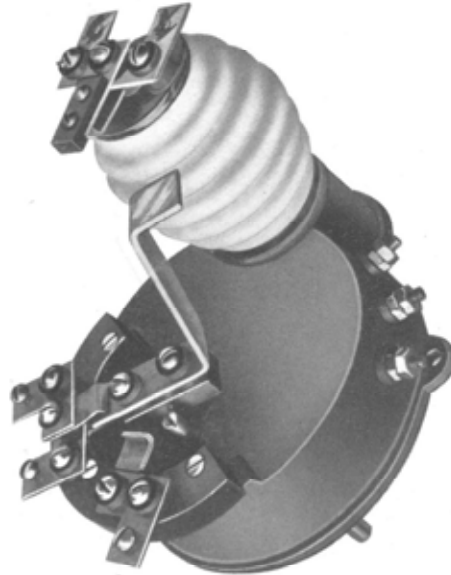
The antenna connects to the right-hand binding post at top of hard rubber post, while the helix connects with other or left-hand binding post. The front right-hand switch terminal connects both to the ground wire and ground connection of the receiving tuner, while the right-hand rear switch terminal is for connection to antenna connection of the receiving tuner.

One of the line wires runs direct to the primary of the transformer while the other runs to the front left-hand binding post of the switch, and the rear left-hand binding post of the switch connects to the remaining binding post of the transformer. A diagram of these connections will be found on a previous page.

### PRICES

1 K. W. ....	\$ 7.50
2 K. W. ....	10.00
3 K. W. and 5 K. W. ....	20.00

## Solenoid Operated Antenna Switch



You can now sit at your operating table and push a tiny button located in any convenient position near your transmitting key when "click"—and you have changed all your connections from transmitting to receiving. After receiving the message you push another tiny button, and another "click" and you have changed back instantly all connections to transmitting, and proceed to send your reply without moving more than a finger. This solenoid operated antenna switch may be used on all sets up to and including one K. W., and consists of a cast-iron case containing the actuating magnets, a high-tension insulator mounted on the same, carrying the high-tension terminals and a rotary knife switch whose upper blade connects the antenna to transmitting and receiving circuits respectively, and whose lower blade opens and closes your power circuit and starts and stops your rotary gap if you wish.

The convenience and fascination of thus automatically controlling your circuits will appeal to you as almost magical, and is a source of much satisfaction to those who appreciate the possession of those refinements which serve to distinguish the high grade commercial station, and are seldom found in the amateur station.

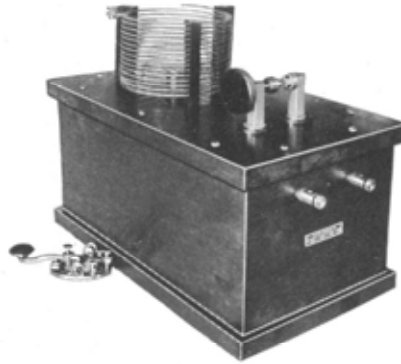
The instrument is designed with the main shaft projecting at the back so that if mounted on a switchboard a handle may be fitted to this shaft and the switch be operated manually as well as electrically. The switch may be mounted equally well, however, on a table, or otherwise, to suit the convenience of the purchaser.

Unless otherwise specified a standard switch is furnished on all orders, which operates on both 110 volts 60 cycles A. C. and 24 volts D. C., in the local or controlling circuit, but this instrument can be furnished to order for any voltage specified at no additional charge.

Height, bottom of base to top of insulator .....	5½ inches
Greatest diameter .....	6½ inches
Shaft projects on bottom .....	3 inches
Net weight 9 lbs., shipping weight 12 lbs.	
Price .....	\$24.00

Note: We also furnish this switch in larger sizes up to 10 K. W. Prices on application.

## The Blitzen Transmitting Set



The Blitzen transmitting set, while inexpensive, is fully up to our usual standard of quality, and is in no sense cheap in the common meaning of the term. In material and workmanship, as well as in efficiency and pleasing appearance, we will welcome comparison with anything on the market. You will be justly proud of this equipment, both for its businesslike and handsome appearance and its remarkable performance, giving loud, clear signals, with a fine spark, readable at unusual distances.

**The Transformer.** Our well-known Blitzen transformer is employed in this set and the cordial reception and instantaneous popularity attest to its quality better than any written description can do.

**The Condenser.** A plate-glass condenser of correct proportions is mounted in a compartment of the cabinet and is permanently connected in circuit. This is the same type of condenser built by us for over five years with well known success.

**The Helix.** The helix is of new design, being constructed of edgewise-wound copper strip, mounted in slotted, hard rubber supports. This form gives at once the greatest simplicity and convenience, combined with high conductivity and insulation. Two movable clips allow for accurate tuning and inductive or direct coupling.

**The Spark Gap.** A special zinc spark gap designed for this set is used, having a fine screw adjustment for accurate work. The zinc electrodes are  $\frac{3}{4}$  inch in diameter and may be renewed at a cost of fifty cents per pair. With ordinary use, however, they will last indefinitely.

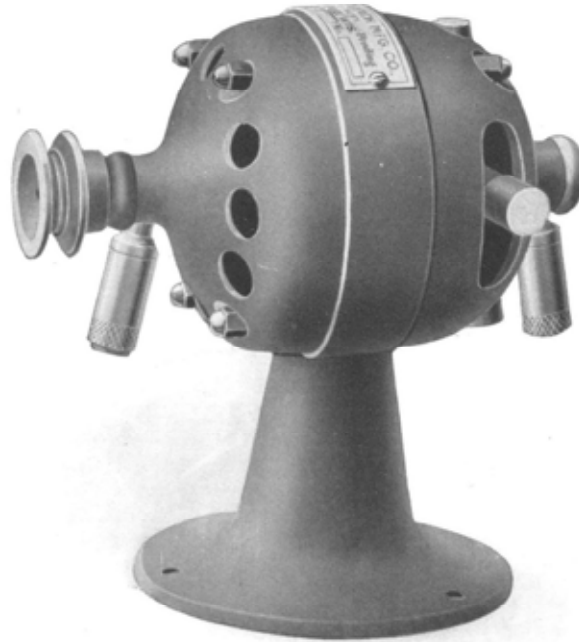
**The Key.** The base or frame is of polished brass, the lever is nickel plated, and other metal parts finished in gold lacquer. Ample current carrying capacity is provided, and contact points are removable to facilitate renewal, and are of No. 6 B. & S. hardened silver.

**The Set.** The entire set, except the key, is mounted in and on a very attractive mahogany cabinet, with binding posts provided for line and ground wires. Every detail of construction will bear the closest inspection. Our product is standard and universally known and respected.

### PRICES

$\frac{1}{4}$ K. W. as illustrated .....	\$35.00
$\frac{1}{4}$ K. W. equipped with Blitzen Rotary Spark Gap and Motor in place of stationary gap .....	47.50

## Variable Speed Motor



The small motor shown above is designed to operate on 110 volts alternating current, and has adjustable brushes giving a wide variation in speed. It is useful for a wide variety of purposes, such as driving small machines, operating moving window displays, driving rotary spark gaps, and, in fact, all purposes which do not require a great amount of power.

The motor is rated at  $\frac{1}{8}$  H. P., is mounted in a frame of polished aluminum, and measures  $4\frac{3}{4}$  inches from end of shaft to back of motor, 3 inches from side to side, and  $5\frac{1}{4}$  inches from top to bottom of base.

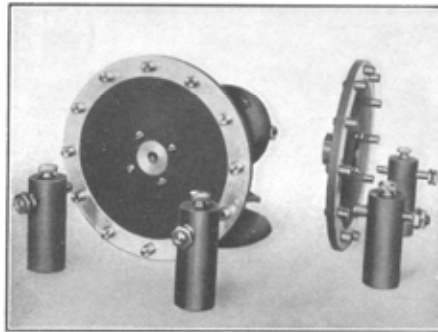
Six variations of speed are provided, ranging from 4000 to 9000 R. P. M., and also depending on the load.

This motor is not a toy motor, but is a standard commercial article, and many thousand are in daily use for a wide variety of purposes.

Net weight  $2\frac{1}{4}$  lbs.; shipping weight 5 lbs.

Price, complete, with seven-foot cord and plug .....\$7.50

## Blitzen Rotary Spark Gap



The Blitzen Rotary Spark Gap comprises a Bakelite disc  $5\frac{3}{4}$  inches in diameter, fitted with twelve zinc spark points  $1\frac{3}{8}$  inches apart on centers and about  $\frac{5}{16}$  of an inch in diameter. A cast-iron hub is fitted with a set screw for fastening to motor shaft, and can be supplied to fit shafts  $\frac{1}{4}$  inch,  $\frac{5}{16}$  inch or  $\frac{3}{8}$  inch. Be sure to specify shaft diameter with order.

Two hard rubber posts carry the stationary zinc electrodes which are adjustable and held in place with a knurled thumb screw.

This spark gap may be adjusted to give a fine, clear note, and a considerable increase in efficiency is claimed by many users.

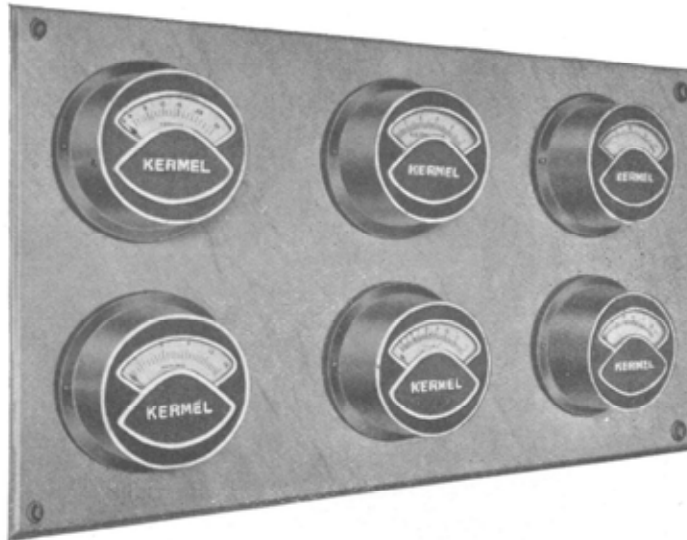
This gap may be used with any transmitter up to 1 K. W., but will not operate with spark coils.

This rotary spark gap is furnished complete with our variable speed motor shown on the previous page, the disc being fitted to the motor shaft and the motor and hard rubber standards mounted on a solid marble base.

Price of Rotary Spark Gap and Motor completely mounted on marble base .....	\$15.00
Price of Rotary Disc only .....	4.00
Price of Hard Rubber Posts and Stationary Electrodes ....	1.50
Zinc Spark Gap Points with Screws, each .....	.05



## Switchboard Material



### Alternating Current Voltmeters

RANGE	PRICE		
	MODEL G	MODEL L	PORTABLE
0-75 volts	\$16.50	\$16.00	\$23.50
0-150 volts	16.75	16.25	23.50
0-300 volts	20.50	20.00	28.00

Any intermediate range can be furnished at next higher price.  
Higher ranges furnished to order.

### Alternating Current Ammeters

RANGE	PRICE		
	MODEL G	MODEL L	PORTABLE
0-5 amperes	\$15.50	\$15.00	\$22.50
0-12 amperes	15.50	15.00	22.50
0-24 amperes	15.50	15.00	22.50
0-60 amperes	15.75	15.25	23.50
0-100 amperes	15.75	15.25	23.50

### Single Phase Wattmeters

MAXIMUM VOLTS	MAXIMUM AMPERES	KILOWATTS	PRICE		
			MODEL G	MODEL L	PORTABLE
150	5	.5	\$36.50	\$36.00	\$40.50
150	12	1.5	36.50	36.00	40.50
150	24	2.5	36.50	36.00	40.50
150	60	6.	36.50	36.00	40.50
150	100	10.	38.50	38.00	42.50 <sup>d</sup>
300	5	1.	40.50	40.00	44.50
300	12	2.5	40.50	40.00	44.50
300	24	5.	40.50	40.00	44.50
300	60	12.	40.50	40.00	44.50
300	100	20.	42.50	42.00	46.50

**Switchboard Material—Continued**  
**Hot Wire Instruments**

RANGE	PRICE		
	MODEL G	MODEL L	PORTABLE
0-5 amperes	\$19.00	\$19.00	\$24.00
0-10 amperes	19.00	19.00	24.00
0-15 amperes	22.00	22.00	27.00
0-25 amperes	31.00	cannot supply	36.00

All Model G instruments,  $7\frac{7}{8}$  inches diameter.

All Model L instruments,  $5\frac{1}{8}$  inches diameter.

All portable instruments are mounted in walnut carrying cases, 6 inches x 6 inches x 3 inches.

Marble panels, either square or rectangular, for mounting apparatus can be furnished as follows with all holes drilled, bevel edges, crated, F. O. B. Boston, as follows:—

**Blue Vermont Tablets**

**White Italian Tablets**

1 in. thick . . . . . \$3.00 per sq. ft.  
 1½ in. thick . . . . . 3.30 per sq. ft.  
 1¾ in. thick . . . . . 4.00 per sq. ft.

\$3.30 per sq. ft.  
 3.60 per sq. ft.  
 4.25 per sq. ft.

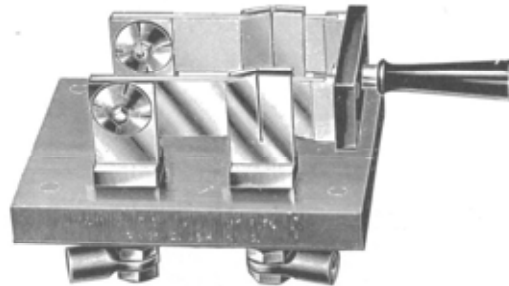
The above prices do not apply to pieces of less than 2 sq. feet or to small pieces with an extraordinary amount of drilling.

The approximate weight of Tablets can be figured on the basis of 15 lbs. per sq. foot one inch in thickness.

A drawing showing size and location of all holes must accompany your order.

**Knife Switches, Unmounted, Back Connected**  
**125-250 Volts, Not Fused**

SINGLE THROW				AMPERES	DOUBLE THROW			
S. P.	D. P.	3 P	4 P		S. P.	D. P.	3 P	4 P
\$1.00	\$1.50	\$2.25	\$3.00	25	\$1.50	\$2.30	\$3.50	\$4.60
\$1.20	\$1.80	\$2.70	\$3.60	35	\$1.90	\$2.90	\$4.40	\$5.80
\$1.45	\$2.20	\$3.25	\$4.40	50	\$2.20	\$3.30	\$5.00	\$6.60
\$1.90	\$2.90	\$4.35	\$5.80	75	\$2.90	\$4.35	\$6.50	\$8.70

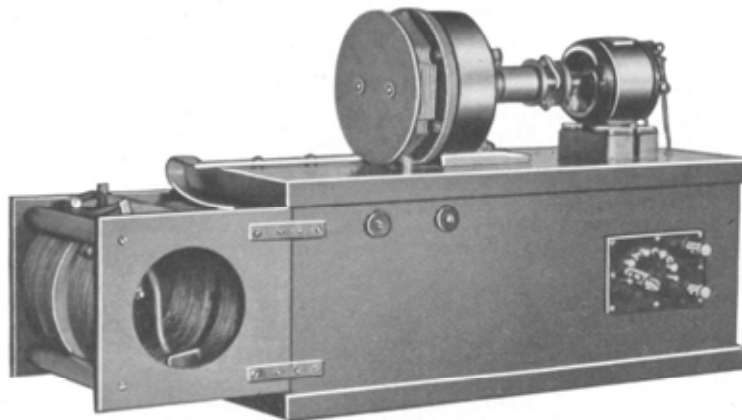


**Motor Generators and Rotary Converters**

For changing 110 or 220 volts direct current to 60 cycle alternating current necessary for our transformers.

¾ K. W. Rotary Converter	1800 R. P. M.	4 Pole	.....\$ 60.00
¾ K. W. Rotary Converter	1800 R. P. M.	4 Pole	..... 92.00
1 K. W. Rotary Converter	1800 R. P. M.	4 Pole	.....150.00
2 K. W. Rotary Converter	1800 R. P. M.	4 Pole	.....190.00
1 K. W. Motor Generator			.....200.00
2 K. W. Motor Generator			.....250.00

## "The Hytone" Rotary Quenched Spark Transmitting Set



### 1 K. W. "Hytone" Transmitter

#### General Description

Quenched spark transmitting sets have been adopted by the United States, and nearly if not all foreign governments, to the practical exclusion of all earlier types. While the many advantages of the quenched spark are generally well understood, the unique form which this company has developed and patented has a number of distinct advantages in addition to those possessed in common with other quenched spark transmitters.

**Efficiency.** The efficiency of our "Hytone" Quenched Spark set is from sixty to seventy per cent with an antenna having a radiation resistance of 10 ohms. Good sets of the non-quenching type seldom have an efficiency of thirty-five per cent.

**Tone or Pitch.** The tone produced by these sets is very high and piercing, resembling a clear whistle, easily read through static or other interference. The familiar and characteristic low and unsteady tone produced by non-quenching transmitters is easily confused with static or interfering signals.

**Noise of Set in Operation.** The spark of our Hytone set is practically noiseless even in high powers, and is invisible, being entirely enclosed in an iron casting. This is a great contrast to the loud reports and blinding flashes of sets of standard spark type.

**Potentials.** The potentials of the Hytone set are very low in all parts, rendering electrical breakdown unknown. The potential on the antenna is very low, making its insulation an easy matter and permitting the use of long waves and high power on small antenna without the production of corona or brush.

**Adjustments.** The only adjustments required are the setting of the spark gap and tuning of the oscillation transformer. The spark gap when once adjusted does not require attention again, even though the power be changed. The only attention required by the set is an occasional filling of the oil cups on the spark gap and motor. The adjustment of the spark is made through a self-contained, self-aligning, double row radial and thrust imported ball bearing on sets of 1 K. W. and over;  $\frac{1}{2}$  K. W. set has plain bearings.

The spark gap is very short, about two one-thousandths of an inch; and is the shortest gap to which the electrodes can be adjusted without touching.

**Source of Current.** A point of tremendous importance possessed by our equipment and by no other, is its operation on *60 cycle or other commercial frequency of any voltage that may be available*. All other quenched spark sets require a special 500 cycle motor generator, adding greatly to the cost and complication of the installation as well as the difficulty and expense of maintenance, and of securing renewal parts, should the occasion arise.

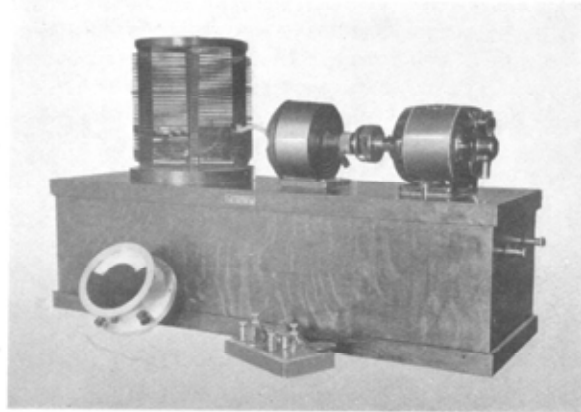
Bear in mind that our "Hytone" equipment operates on alternating current, almost universally used for lighting and power purposes.

Where direct current only is available, a standard 60 cycle motor generator (see price list) or rotary converter must be installed to change the current to alternating. Such a machine is not complicated, and may be installed or repaired by any electrician.

The alternating current supplied to these sets is stepped up to about 1700 volts in the one-half and one K. W. sets (and in higher powers to about 1000 volts for each kilowatt of energy taken by the apparatus) by means of a transformer of special type having its magnetic leakage carefully adjusted. A condenser of the glass-plate type is charged to this potential, and discharges across two spark gaps in series, formed by the two semi-circular stationary electrodes placed in front of the circular rotating electrode, the spark occurring between one stationary electrode and the rotating electrode, and thence to the remaining stationary electrode. The faces of the electrodes have slots milled in their surfaces, leaving radial projections from which sparking occurs at the rate of 25,000 condenser discharges per second. The purpose of the radial projections on the electrodes is to break these discharges into groups corresponding to the tone desired from the set, as the discharge rate is so high as to approach the limits of audibility.

It will be seen that by varying the speed of rotation, and thus the rate at which sectors pass, any desired tone is produced.

On account of extremely high spark frequency, the potential is extremely low, and the current correspondingly high. This requires the use of an oscillation transformer of large conductivity, which we employ in coupling the primary circuit to the antenna.



$\frac{1}{2}$  K. W. "Hytone" Set

### $\frac{1}{2}$ K. W. Experimental Set

This set includes a 10 ampere Boston Key, Transformer, Condenser, "Hytone" rotary quenched spark gap, Oscillation Transformer, and 5 ampere "Precision" Hot Wire Meter. Mounting is in a quartered oak cabinet 25 inches long, 10 inches wide, 9 $\frac{3}{4}$  inches high. Total height, 19 inches.

Price .....\$110.00  
 Price, without meter ..... 100.00

For the benefit of those desiring the advantages of the quenched rotary spark in connection with stations already installed, we can furnish our  $\frac{1}{2}$  K. W. spark gap motor and transformer only.

Price .....\$60.00

Parts of these sets will not be sold except as noted, and these gaps positively will not operate with ordinary wireless transformers, our special transformer being necessary in all cases.

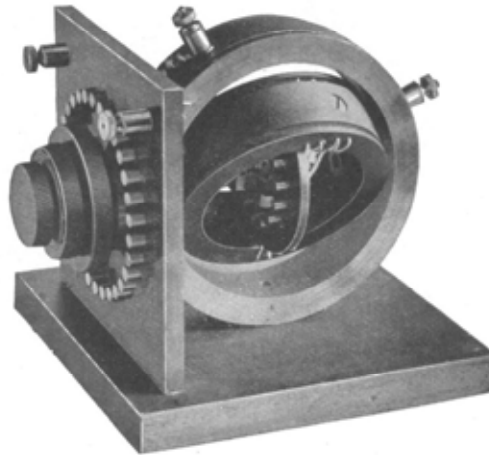
### 1 K. W. Transmitter

This set is illustrated, and consists of the same instruments as the  $\frac{1}{2}$  K. W. set above. A switch mounted on the front of the cabinet provides for four variations of power. Mounting is in a highly finished cabinet 38 inches long, 12 inches high and 12 inches wide, total height, 20 inches.

Price of set, complete .....\$275.00

Details and prices of high power installations furnished on request.

## The Blitzen Receiving Transformer



### Your Ideal Tuner

In order to satisfy your ideal, the perfect tuner must be something more than a mere combination of wood, metal and rubber, although it must be of the best materials. It must not be clumsy, but at the same time rugged and strong, it must be capable of fine tuning and loose coupling, and at the same time permit of very close coupling when listening in. It must not have contacts sliding directly on the wire, and yet a large number of changes in inductance should be available. It should be capable of receiving wave lengths such as are in common use by commercial and government stations, but should not run up to excessive amounts as this will cut down the strength of signals of higher periods. All adjustments should be accessible with the least effort, and it should be pleasing in appearance. Above all, it should produce results, not the ordinary results obtainable with your ordinary loose coupler, but the unusual kind of results, results which have been beyond your reach before.

In building our Blitzen tuner piece by piece, we have had your ideal in mind; we have considered the strictest requirements of your ideal in every part. Such a tuner as your ideal requires nothing but the finest material, so we constructed it entirely of hard rubber and finely nickel-plated brass and mounted it on a highly finished mahogany base. We knew that your ideal tuner could not have two cylindrical coils, one sliding in and out of the other; it must be something new and better; so we wound our coils on two hard rubber rings, one inside the other, and arranged the inner one to rotate so that the coupling could be varied with the greatest ease. As our ideal must not have sliding contacts on the wire, we have brought out taps from both coils to switch points, thirty on the primary and twelve on the secondary. We could have gotten along with less, but our ideal demands finer tuning than can be accomplished with the less number. As we desire the greatest convenience, we arranged that all adjustments be made on the front of the instrument and placed

upon the square hard rubber front three knurled concentric handles, one for tuning the primary, one for the secondary, and one for varying the coupling. We then mount binding posts in the most convenient and accessible positions and after a careful test by an expert tester, we find the instrument complete; we have accomplished our ideal. We have accomplished an ideal, but is the cost prohibitive?

We will ship you your ideal tuner in a box specially made to carry it safely to any part of the world for

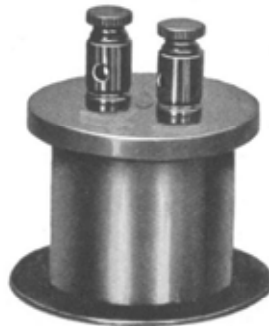
Price .....\$15.00

### SPECIFICATIONS

Weight, 24 ounces; shipping weight, about 2 lbs.; dimensions, 4 inches wide, 4 inches high, and 6 inches deep; wave length up to about 1500 meters, with average antenna; number of primary contact points, 30; number of secondary contact points, 12; switches, edgewise-instrument type; all connections soldered to lugs under heads of screws.

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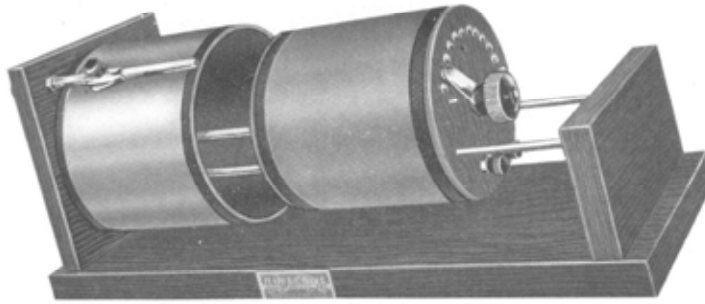
### Fixed Condenser



The most approved methods of connecting a modern receiving station require a small condenser of fixed capacity in addition to the variable condensers used for tuning purposes. Our tubular condenser is offered to meet this want and is mounted in a nickel-plated brass cylinder, fitted with hard rubber top carrying binding posts. Its capacity is about .003 M. F.

Price .....\$1.50

## “Radion” Receiving Transformer



Good materials, exceptional design, and extraordinary value enter into the construction of this receiving transformer, or loose coupler, as it is often called, in full measure.

The instrument is designed for those who prefer a tuner having the conventional cylindrical coils to the more compact rotary Blitzen type.

The coils are wound on black rubber finished composition forms which will not shrink or expand with atmospheric changes. The primary coil is wound with bare copper wire evenly spaced apart, while the secondary is wound with double silk covered green wire. A sliding contact is used to tune the primary, as shown in the illustration.

The secondary is equipped with a ten-point switch connecting to as many taps brought out from various points on the secondary winding.

All metal parts are brass, nickel plated, and wooden parts are highly finished mahogany. Binding posts are hard rubber composition.

This instrument will give unusually fine tuning and freedom from interference, will receive wave lengths up to 1800 meters with an average antenna, and is very efficient. For longer wave length we advise the use of our Blitzen duplex loading coil, which may be easily cut out of circuit by a short-circuiting switch.

Tuners wound for very long wave lengths without the use of a load coil are not manufactured or recommended by us for the reason that such coils are extremely inefficient on normal wave lengths, in common use, on account of the great number of dead ended or unused turns, which tend to reradiate the energy.

The coils are each  $4\frac{1}{2}$  inches long and  $4\frac{1}{2}$  and  $5\frac{1}{4}$  inches in diameter respectively.

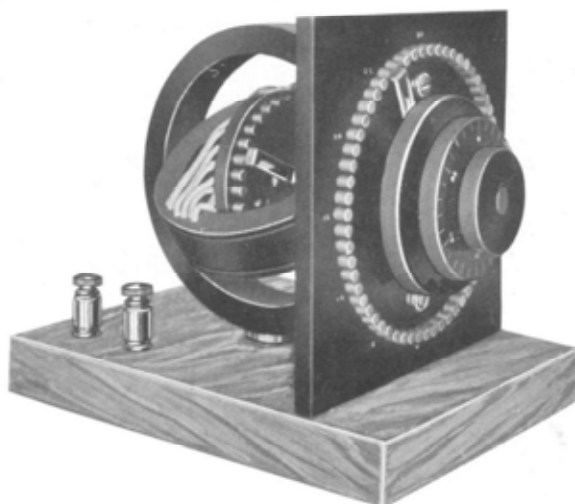
The mahogany base measures  $5\frac{1}{2}$  inches x  $13\frac{1}{2}$  inches x  $\frac{3}{4}$  inch.

The value of this instrument should not be judged by its moderate price, as it has a grade of finish and workmanship, which will greatly add to the attractiveness and range of your receiving set. In short, it is an instrument you will be proud to own and use.

Price, complete .....	\$7.50
Shipping weight .....	10 lbs.



## Type "D" Receiving Transformer De Luxe



In offering our product to the public we seldom talk price; we prefer to talk quality. The reduction in price of this tuner from \$55.00 to \$25.00 at a single step without reduction in quality, however, merits your careful consideration, and is only possible by quantity production, the full benefit of which is offered to the purchaser.

This receiving transformer is of similar type to our Blitzen, previously described in detail but is of finer construction and is larger. The materials are the finest that the markets supply, genuine hard rubber, marble base, metal parts of brass heavily nickeled and double silk covered wire.

Primary and secondary coils are wound in slotted hard rubber concentric rings rotating one within the other to vary the coupling. The inductance of the primary is varied by a sixty point rotary switch of the edgewise-instrument type. A similar switch having thirty points varies the inductance of the secondary with a movement of remarkable smoothness.

With an antenna of normal proportions the tuner will respond to all wave lengths between 200 and 2000 meters.

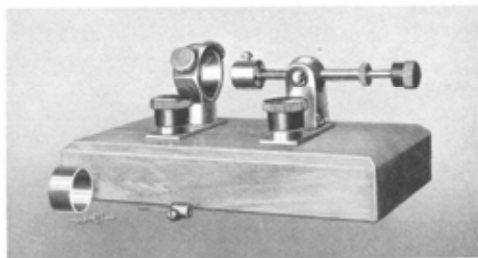
The wide variation of inductance available in the secondary renders it most efficient for use with all types of detectors including the Audion.

The marble base measures 8" x 6". The net weight of instrument is 7 lbs., and the shipping weight is 15 lbs.

The skill of our designers and artisans is evident in this tuner to a superlative degree.

Price .....\$25.00

## New Universal Type Ferron Detector



Even a casual glance at the illustration of this detector mounting will reveal its convenience, its beauty, and the universal nature of its uses. The large standard has an opening  $\frac{3}{4}$  inch in diameter, provided with two knurled set screws for holding any substance desired. The brass cup fits into this, and crystals may be mounted in fusible metal in this cup. All parts of the material in the cup or standard may be reached by the contact point which is held by a ball and socket joint, providing a neat and convenient means of adjustment. Suitable pressure is given by a fine coiled spring, the tension of which may be varied by sliding the sleeve in and out of the ball.

The movable contact is shown in the illustration fitted with a cup in which any desired substance may be held by means of the set screw. This may be unscrewed, however, and either the needle point or cat whisker point substituted.

The instrument is mounted on a base of Holland Blue marble 3 inches x  $5\frac{1}{2}$  inches, giving great stability and freedom from vibration. All metal parts are brass, nickel plated, and rubber composition covered binding posts and adjusting knob are fitted.

This detector mounting is one you will be proud to add to your station, and is adapted to every possible use for those who wish to experiment with various substances.

Shipping weight 3 lbs.

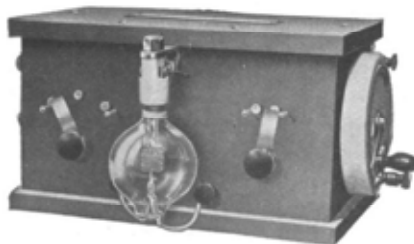
Price of Detector Stand, complete, with all parts shown in the illustration.....	\$3.25
Additional Stationary Cups to fit Holder, each.....	.15
Fusible Metal, per ounce.....	.30

We can also supply the universal detector stand fitted with the famous Ferron Detector mineral, the sensitiveness of which can be testified to by thousands of satisfied purchasers. This mineral will hold its adjustment wonderfully well under strong signals, and does not require potentiometer and battery for its efficient operation. It is sold under license from the patentee, and is licensed by them only for private use.

Price of Detector Stand, complete with Ferron crystal .....\$5.00

Any defective crystal returned to us within two weeks from date of purchase will be replaced without charge. Crystals worn out in use will be replaced as often as desired at a charge of one dollar *upon return of old crystal only*. Crystals not sold separately.

## De Forest Audion Detector



Improved Type R. J. 4

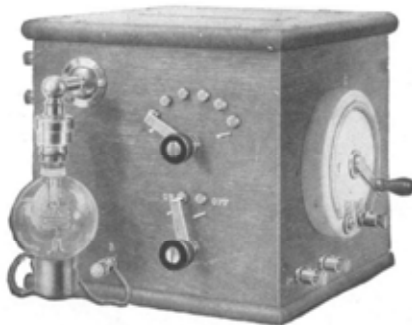
One of the highest developments of detecting apparatus known to science is the Audion Detector.

This class of detector has a number of advantages peculiar to itself; two of its most prominent features being its reliability and extreme sensitiveness, seldom, if ever, equalled by crystal or other types of detector. Its adjustment is almost instantaneous, and is unaffected by mechanical or electrical disturbances.

Each instrument is complete in itself, and all connections are plainly marked on the box. Tests conducted by the United States Bureau of Standards show this instrument to be remarkably sensitive (Bulletin, Bureau of Standards, Vol. VI, No. 4, p. 540).

The R. J. 4 type is now furnished with a five-point battery switch in place of the three-point switch shown in the illustration. As there is nothing to lose its adjustment, not only is the annoyance of frequent attention avoided, but the novice can not fail to secure its satisfactory action at the first attempt and always be certain of freedom from detector troubles.

These detectors require for their operation either a four or six-volt storage battery or three dry cells; but for best results a storage battery must be used. Each detector is tested before shipment, and is guaranteed to leave the factory in first-class condition.



Improved Type R. J. 5

To get the very best results the following instructions must be followed explicitly.

Do not connect over six volts storage battery to the binding posts marked + and —, and note that the positive pole of battery is connected to binding post marked + and negative pole of battery to binding post marked —.

The two-point switch lights the filament of the lamp, and before turning this on see that the rheostat switch is on the "in" position. Then adjust the rheostat until the lamp burns at normal brightness. Then adjust both battery switch and rheostat until signals come in with maximum sensitiveness.

Never keep the lamp burning when not using the instrument. After once adjusting the detector as above, it is only necessary to throw the two-point storage battery switch on and off to place the detector in and out of service, and other adjustments need not be disturbed.

In connecting up the Audion Detector, connect the grid to G and the wing to W as marked below the binding posts. The grid is the zigzag wire, and the wing is the plate, and if the bulb is capped the green wire leads to the grid and the red to the wing.

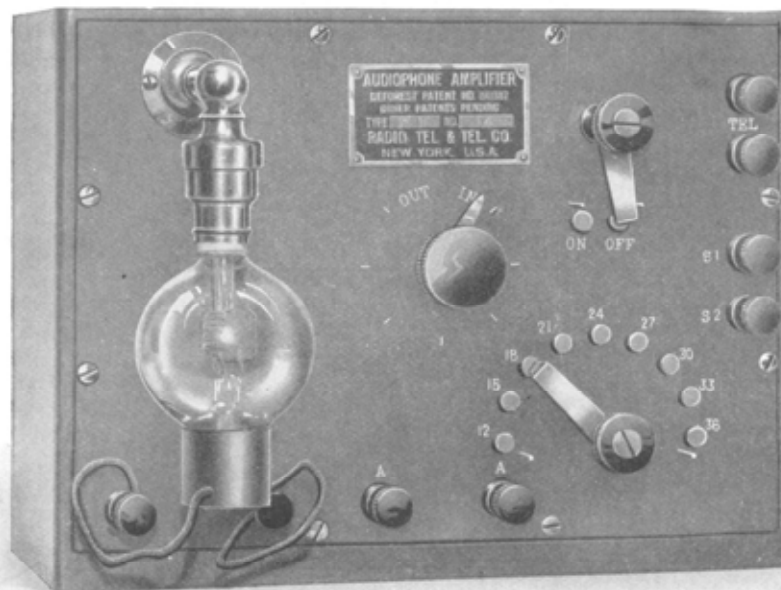
Each bulb has two filaments, so that after one burns out the other may be used, thereby doubling the life of the bulb. To connect in the second after the first has been consumed, wind the little copper wire tight around the brass base of the lamp underneath the rubber band.

If too much battery current is applied between the grid and wing, a blue glow will appear in the bulb, causing a decrease in sensitiveness. This glow can be removed by readjusting the five-point switch on the R. J. 4 or the six-point on the R. J. 5.

Never burn the filament at excessive brilliancy.

It makes some difference which of the two terminals marked "tuner" is connected to either terminal of the receiving transformer, and these connections should be reversed to observe which connection gives the louder signal.

## The Audion One Step Amplifier



This instrument is particularly designed for telephone and telegraph amplification up to five to ten times original intensity. It will render signals easily read, which would be otherwise entirely inaudible, and also will so increase the volume of sound that much looser coupling than usual may be employed, thereby cutting out interference, which it would otherwise be impossible to do.

This amplifier while particularly adapted for use with the Audion Detector may be used with any detector with good results. Please note, however, that the amplifier is not itself a detector and can not be used as such.

#### PRICE LIST

R. J. 4 Audion Detector, as illustrated .....	\$ 18.00
R. J. 5 Audion Detector, as illustrated .....	25.00
P. J. 1 One Step Amplifier .....	65.00
P. 2 Two Step Amplifier .....	300.00
P. N. Audion Detector, licensed for commercial work ....	50.00
4-volt 30 ampere hour storage battery .....	5.00
6-volt 60 ampere hour storage battery (recommended by us)	12.00

#### Audion Bulbs for Renewals

With all De Forest Audion Instruments we recommend the use of "Hudson Filament" bulbs, the life of which is from three to five times that of the ordinary filament.

They can be furnished with R. J. 4 Detectors at an additional cost of \$1.50, and with the R. J. 5 at an additional cost of \$2.50 in place of bulb regularly supplied. Audion bulbs are sold only as renewals, and upon the return of old bulbs, and are furnished in two grades, S or Standard, and X or Extra Sensitive. The same two grades are also furnished with the Hudson Filament.

Renewal Bulbs, S grade, each .....	\$ 3.50
Renewal Bulbs, X grade, each .....	5.00
Renewal Bulbs, S grade, Hudson Filament, each .....	5.00
Renewal Bulbs, X grade, Hudson Filament, each .....	7.50
Renewal Bulbs, Amplifier, each .....	7.50
Renewal Bulbs, Amplifier, Hudson Filament, each .....	10.00

## Holtzer-Cabot Wireless Head Receivers



We can recommend these receivers to our customers without reservation, not only as being very sensitive to weak signals and for long distance work, but also for their high quality and general excellence in every particular.

The ear pieces are of hard rubber, and the binding posts are covered with hard rubber, and placed external to the case so that cords can be replaced without opening the receiver. The cases and headbands are of metal, covered with hard rubber, the headbands being adjustable by two large knurled thumb nuts. The screws which clamp the bands are non-turning, and the liability of catching the hair is reduced to a minimum. Special attention has been paid to "pitch" as well as to sensitiveness in the design of these receivers. It has been determined that the human ear is more responsive to higher pitched notes than to lower ones, and for this reason these receivers are given a high natural period, bringing in weak signals clear and strong. We believe that comfort, light weight and sensitiveness are found in this set to a greater extent than in any other.

The total weight is only  $10\frac{1}{2}$  ounces. The resistance is 3000 ohms to the set, or 1500 ohms to each receiver, and receivers are carried on the headband by a ball and socket joint.

Shipping weight,  $1\frac{1}{2}$  lbs.

Price, complete, for two receivers, hard rubber covered headband and green silk cord .....\$10.00

### Type "A M" Receivers



These receivers have hard rubber composition cases, magnets of high grade steel, and are wound with enameled copper wire preferred by many. Each complete set is furnished with a German silver, split headband and a five-foot best quality cord.

#### PRICES

200 ohms, per set.....	\$4.50
1000 ohms, per set.....	5.50
1500 ohms, per set.....	6.50
2000 ohms, per set.....	7.50
3000 ohms, per set.....	8.50

### "Long Distance" Type Receivers

These receivers are very sensitive, with particular attention given to the quality of the tone produced. They have metal cases with hard rubber ear caps, designed to fit the ear with comfort. The magnets are wound with silk insulated wire .002 inches in diameter to a resistance of 2800 ohms to the set. The receivers are suspended from the hard rubber covered split headband by ball and socket joints, and are fitted with a six-foot green silk cord.



New Model Trans-Atlantic

Price Trans-Atlantic Model Tele-  
phones, complete.....\$9.00

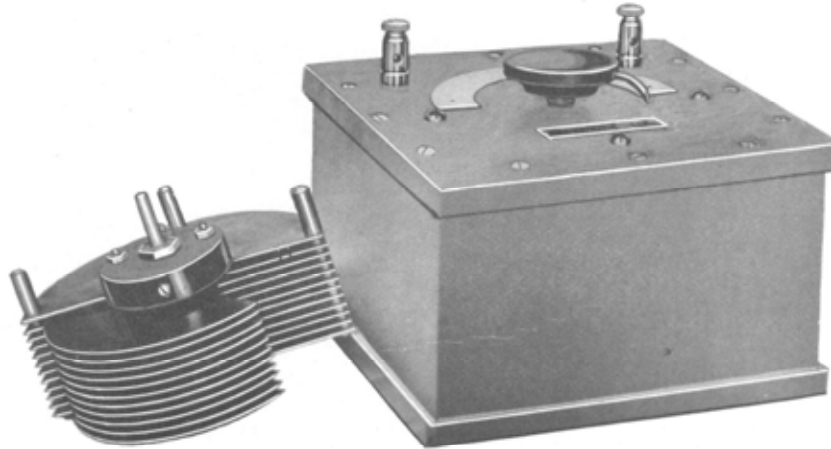


"Superior" Model

These receivers have aluminum cases, hard rubber ear caps, and thin diaphragms, and are wound with No. 40 enameled copper wire to a resistance of 1000 ohms to each receiver, or 2000 ohms per set. They are extremely efficient for a low-priced instrument and will give excellent service.

2000 ohm Superior Set, as illus- trated.....	\$5.00
2000 ohm Superior Set, Leather Covered Headband.....	4.50

## "The Cambridge" Variable Condenser



Variable condensers having large plates and a great clearance between plates offer some advantages in that they are more rugged and are less liable to a change in capacity. The Cambridge condenser has eleven rotary plates  $4\frac{1}{2}$  inches in diameter, and twelve stationary plates  $5\frac{1}{4}$  inches in diameter. The plates are of aluminum, and mounting is in a mahogany cabinet seven inches square. The condenser has a capacity of .00075 M. F., and its construction is clearly shown in the diagram.

Net weight,  $3\frac{1}{4}$  lbs. Shipping weight, 5 lbs.

Price of Cambridge Variable Condenser, as illustrated . . . . . \$7.50

We can supply an individually calibrated curve with the above condenser, giving its capacity in microfarads at \$1.00.

We can also furnish to order condensers similar to the above of larger capacities, mounted in oil-tight metal cases, for a wide variety of purposes, such as experimental work with oscillating arcs, etc., at the following prices:

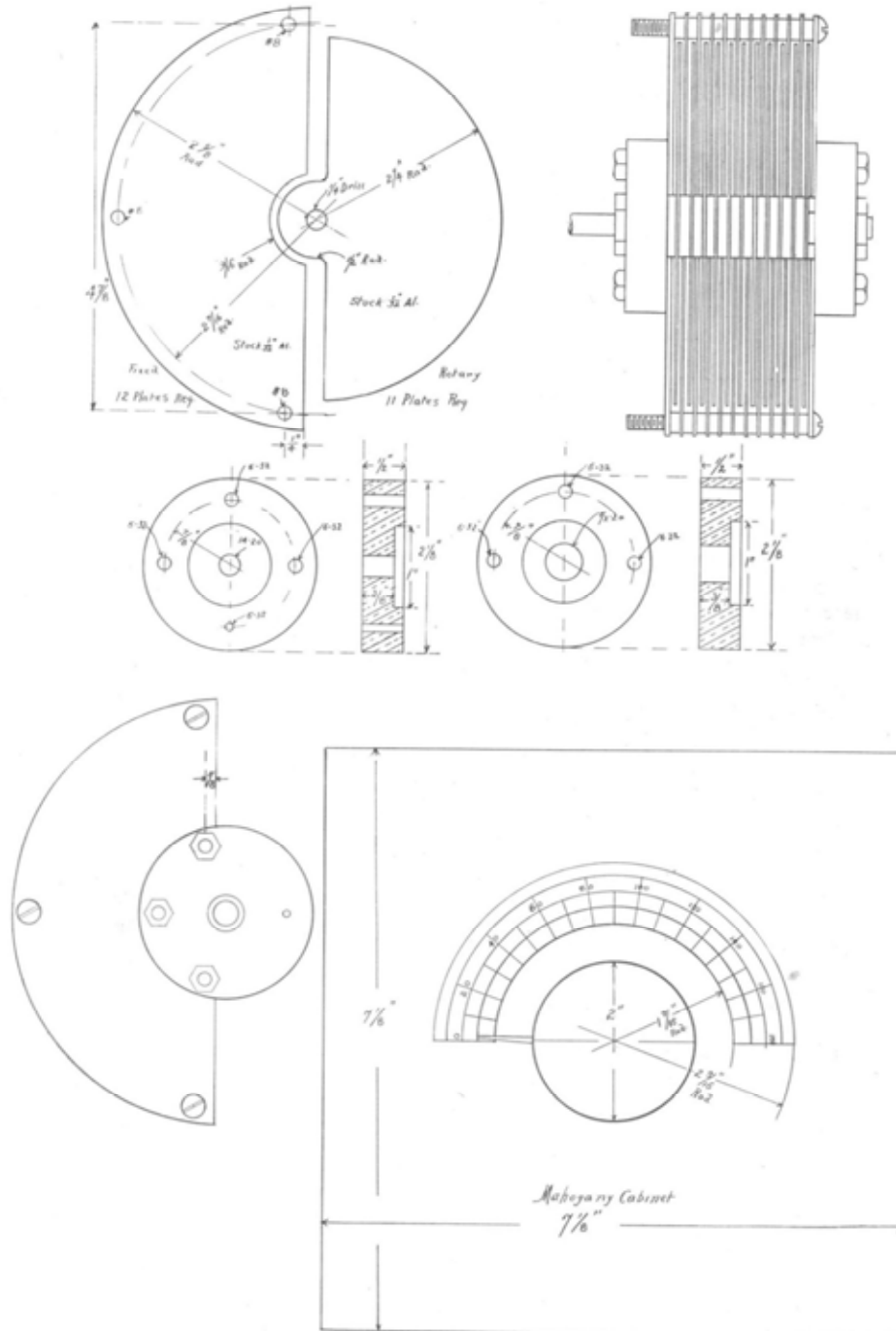
.001 M. F. . . . .	\$18.00
.002 M. F. . . . .	24.00
.003 M. F. . . . .	32.00

### Large Size Rotary Variable Condenser Parts

No. 420	Celluloid protractor scales, semicircular, divided into 180 degrees, outside diameter $4\frac{3}{8}$ inches, each . . . . .	\$0.30
No. 421	Rotary Condenser Plates, aluminum, each . . . . .	.09
No. 422	Stationary Condenser Plates, aluminum, thin, each . . . . .	.09
No. 423	Stationary Condenser Plates, aluminum, thick end plates, each . . . . .	.10
No. 424	Complete set of parts for constructing large Rotary Variable Condenser, consisting of 11 Rotary and 12 Stationary Plates, Shaft, Bearings, Separators, Handle, Scale, Mahogany Box, etc. . . . .	5.75
No. 425	Mahogany Cabinet only, for mounting Rotary Variable Condensers, drilled for Shaft and Screws, inside dimensions $5\frac{3}{4}$ inches x $5\frac{3}{4}$ inches x $3\frac{1}{2}$ inches high, each . . . . .	1.25
No. 426	Complete set of parts to make Condenser as above, without cabinet . . . . .	5.00

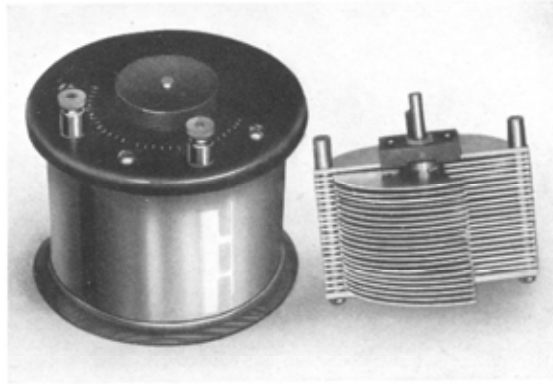
See next page.





Scale-drawing of Cambridge Variable Condenser Parts

## The New Blitzen Rotary Variable Condenser



Before purchasing consider carefully the following points of extreme importance, and give the rest of your receiving set a chance by purchasing a Blitzen condenser. Don't chase the small amount of energy in a weak signal away from your tuner, telephones and detector with a condenser that leaks or is otherwise inefficient. Blitzen condenser plates do not slide in grooves as the grooves provide a large surface over which the current will surely leak, and leak badly if damp.

The capacity has been increased to .001 M. F.—sufficient for all ordinary purposes.

As air is used for a dielectric, a spark from a transmitting set will do no damage, while other types are either punctured or burned.

Although we have made a notable reduction in the price of this instrument, its quality and appearance have been greatly improved, making it easily the greatest value ever offered in variable condensers. The metal shaft is of the highest grade tool steel made, the plates are genuine aluminum, and the separators are machined to an accuracy of one half of one thousandth of an inch. The number of plates has been increased from 31 to 43 (21 rotary and 22 stationary).

The metal case previously used has been replaced by a cylinder of the clearest flint glass of great strength, having an aluminum base. This renders the mechanism of the condenser visible, and gives the instrument an exceedingly attractive appearance.

The top and adjusting knob are moulded from a special insulating material, which will not lose its high polish or soft black color. The binding posts are covered with the same material, giving an exceptional finish to the instrument.

As a result of the tremendous popularity of our original Blitzen condenser, many inferior imitations are being offered, and you will avoid disappointment by insisting on a genuine Blitzen unless you believe that a manufacturer without sufficient originality to vary the size of the plates used in our older type by as much as a hair's breadth, is capable of designing an instrument which will measure up to your requirements.

We manufactured and marketed the first rotary variable condenser offered in this country.

Shipping weight, 2 lbs.

Price .....\$4.00

NOTE. Since making the above illustration several improvements have been incorporated, which add greatly to its attractiveness and convenience.

## The Blitzen Wave Meter



The Blitzen wave meter shown above is a reasonably accurate instrument designed for rapidly ascertaining the wave length, not only of your own transmitter, but also of any incoming signals. It consists of a Blitzen Rotary Variable Condenser with indexed scale and a special inductance coil wound on a hard rubber spool, having two separate coils for long and short waves. The wave meter has a range from 150 meters minimum to 650 meters maximum, and is arranged for use with your own detector and telephones.

Full directions for use and an individually calibrated curve sheet are furnished with each instrument. The condenser may be used with your receiving set in the usual way when the wave meter is not in use.

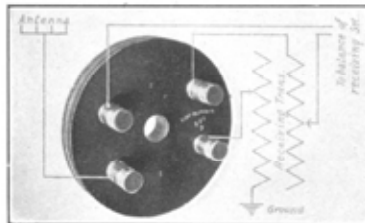
While not intended as a precision instrument, the Blitzen is accurate within three per cent, which is sufficient for all ordinary purposes.  
Shipping weight by Parcel Post or Express, 2 lbs.

Price .....\$8.00

We can also furnish an additional inductance coil and curve with this meter to increase its range to 2000 meters, *if ordered at the same time*, at an additional cost of \$3.00.

Please note. The Blitzen condensers used in this instrument are constructed with special care for this purpose, and we can not equip our regular Blitzen condenser listed elsewhere as a wave meter, although either condenser is equally satisfactory for the usual purpose of a condenser.

## The Blitzen Duplex Loading Coil



Duplex Loading Coil, Showing Connections

Most of the larger high power radio stations employ a long wave length, beyond the range of receiving transformers or loose couplers in common use. We have designed the Blitzen loading coil to increase the range of standard receiving sets, without the decrease in efficiency generally apparent when a loading coil of the ordinary sort is used.

We particularly urge the use of a load coil in preference to using a tuner wound for extremely long wave lengths, for the reason that such a tuner, while entirely satisfactory on wave lengths at or near its maximum capacity, is extremely inefficient on the shorter wave lengths commonly employed by government and commercial stations, and which are in the great majority.

The loading coil may be furnished either plain or fitted with a double pole knife switch, which short circuits both coils of the loader and cuts it out of circuit when it is not desired to use the same.

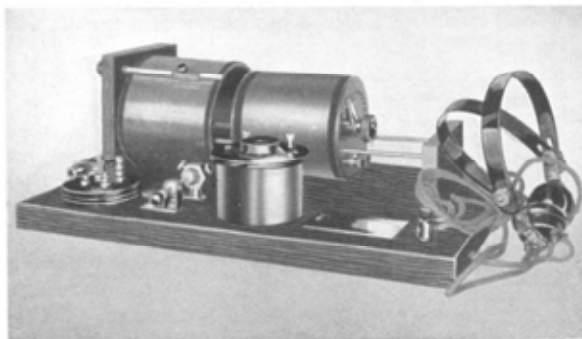
The Blitzen loader has two coils wound in a slotted hard rubber disc, each fitted with a pair of binding posts for connection in the primary and secondary circuits respectively. These two coils *have coupling between them*, so that the coupling is not unduly loosened as is the case where ordinary loading coils are employed. They are furnished in four sizes, as follows:

- "A" coil adds approximately 1000 meters to any receiving transformer
- "B" coil adds approximately 1400 meters to any receiving transformer
- "C" coil adds approximately 2000 meters to any receiving transformer
- "D" coil adds approximately 2500 meters to any receiving transformer

Two of these coils may be used, connected in series for longer wave lengths. Shipping weight,  $\frac{1}{2}$  lb.

Price of each coil ..... \$2.00  
 Price of each coil, with short-circuiting switch ..... 4.00

## The Radion Receiving Set



The past year has brought us many requests for an inexpensive receiving set mounted on a base, completely wired ready for use, and we believe our Radion set meets the most exacting requirements of the discriminating purchaser of such a set.

The instruments consist of the Radion Receiving Transformer, Universal Detector Stand, Fixed Condenser, New Rotary Variable Condenser, and a double telephone head set with all wiring—all as described individually on other pages, except the fixed condenser, which is of different type.

This set, when equipped with Blitzen Duplex loading coil and switch, has a range of wave lengths covering all stations in the United States, and is particularly well adapted for the use of jewelers and others interested in Radio Time Service for receiving time signals from the U. S. Government Station at Arlington, Va.

The entire set, which is mounted on a mahogany base 10½ inches wide x 14 inches long, not only makes a most attractive and imposing appearance, but its performance will give you a real surprise by its ready response to signals at great distances, and by its fineness of adjustment so necessary for cutting out interference and fine tuning.

Radion Set, complete, without telephones or detector crystal .....	\$20.00
Radion Set, complete, without telephones, with Ferron Crystal .....	21.25
Radion Set, complete, with 2000 ohm Head Set and Ferron Crystal .....	26.00
Radion Set, complete, with 2000 ohm Head Set, without crystal .....	25.00
Radion Set, complete, with 3000 ohm Holtzer-Cabot Head Set and Ferron Crystal .....	29.00
Radion Set, complete, with 3000 ohm Holtzer-Cabot Head Set, without Ferron Crystal .....	28.00
Radion Set, complete, with 3000 ohm Holtzer-Cabot Head Set and R. J. 4 Audion Detector in place of Ferron Detector .....	46.00
For Duplex Loading Coil and Switch completely wired to set, add to any of the above .....	4.00

Net weight, 8 lbs. Shipping weight, 15 lbs.

## Blitzen Receiving Set

This perfect combination of instruments mounted in a highly finished mahogany cabinet with hinged cover has justly earned an enviable reputation from its past performance. We have this year added a number of refinements without increasing our price.

The set includes a Blitzen Receiving Transformer fixed condenser and rotary variable condenser mounted in a cabinet 9 inches long, 5 inches high, and 5½ inches wide. On the outside of the cabinet are mounted binding posts for antenna and ground connection, binding posts for telephone receivers, and two pairs of binding posts to which any two detectors may be connected. On the left-hand end of the cabinet is mounted a detector switch for connecting either of the two detectors at will.



When so ordered, this set may be furnished with a Blitzen duplex loading coil and switch mounted on the right-hand end of the cabinet, which will increase the wave length of the set to include all wave lengths at present in use in the United States. The switch on the loading coil when in the down or closed position short circuits the loading coil for receiving wave lengths up to 1500 meters, thus removing the large number of dead ended turns, so fatal to good work, from circuit. Hundreds of these receiving sets are in use by jewelers and others for receiving time signals, and they are used and endorsed by the Waltham Watch Co., have been officially approved by the Elgin National Watch Co., and are also used by the Illinois Watch Co., Seth Thomas Clock Co., Harvard College Observatory, Yerkes Observatory, and a host of others.

The discriminating or experienced purchaser will readily appreciate the value, efficiency and convenience of this set, unequalled at a moderate price.

### PRICES

Blitzen Receiving Set, without telephones or detector .....	\$24.00
Blitzen Receiving Set, with Holtzer-Cabot 3000 ohm Head Set and Universal Detector Stand (no crystal) .....	35.00
Blitzen Receiving Set, with Holtzer-Cabot 3000 ohm Head Set and Ferron Detector, complete, with crystal .....	36.00
Blitzen Receiving Set, with high grade 2000 ohm Head Set, no detector .....	29.00
Blitzen Receiving Set, with high grade 2000 ohm Head Set and Universal Detector Stand (no crystal) .....	32.00
Blitzen Receiving Set, with high grade 2000 ohm Head Set and Ferron Detector complete, with crystal .....	33.00
Blitzen Receiving Set, with Holtzer-Cabot 3000 ohm Head Set and Audion Detector .....	50.00
Blitzen Receiving Set, with high grade 2000 ohm Head Set and Audion Detector .....	47.50
For Duplex Loading Coil and Switch completely wired to the set, add to any of the above .....	4.00
Net weight, 4 lbs. Shipping weight, 8 lbs.	

## Commercial Receiving Set, Type "D"



This set is a strictly commercial product, combining all the features found in equipment of the latest and most up-to-date stations. The set comprises a tuner, a fixed condenser, two rotary variable condensers and telephone receivers, all mounted in a single mahogany cabinet with binding posts and switches.

**The Cabinet.** Finest mahogany is used, a hinged cover is provided, and dimensions are length, 21 inches, height, 6 inches, width, 7 inches.

**The Tuner.** This is the loose coupled type and consists of two concentric hard rubber rings, carrying primary and secondary windings respectively. This tuner is described in detail on a previous page.

**The Variable Condensers.** These are of conventional rotary type with semi-circular metal plates. The capacity of each is approximately .0015, and rotary plates are counterbalanced, and will remain in any position.

**The Fixed Condenser.** This is of mica, and of suitable capacity for best results.

**Telephone Receivers.** Our best type of telephone receiver is included, and these are for connection to binding posts on the outside of the cabinet.

**Binding Posts.** Four pairs of binding posts are provided as follows:

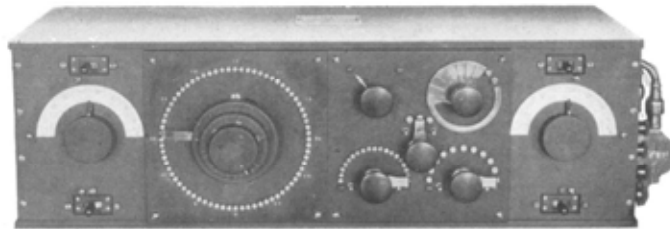
- 2 pairs for connecting any two detectors to the set.
- 1 pair for connecting telephone.
- 1 pair for connecting antenna and ground.

**Switches.** Three switches of the telephone type are mounted on the front of the cabinet, one for connecting either of the two detectors, one for connecting the primary variable condenser in series or parallel, and one for connecting and disconnecting the antenna.

Type D Receiving Set .....	\$ 90.00
Type D Receiving Set, with Ferron Detector .....	95.00
Type D Receiving Set, with Pericon Detector, licensed for commercial use .....	140.00

Any other detector may be furnished at regular prices.

## Type "A F" Receiving Set



Our Type A F Receiving Set is the highest grade equipment which we manufacture, and is capable of results second to none. It goes without saying that the material, construction, workmanship and design are beyond improvement.

These sets are supplied only to order, and changes to suit the desires or requirements of the purchaser can be made at a corresponding change in price.

The instruments comprise a large rotary type tuner having 72 primary and 30 secondary contact points, two large Rotary Variable Condensers, fixed condenser, load coil test buzzer, Audion Detector, with two bulbs licensed for commercial use, Crystal Detector, and two 3000 ohm head sets. Flush type telephone switches are used for changing the different circuits, as shown in the illustration.

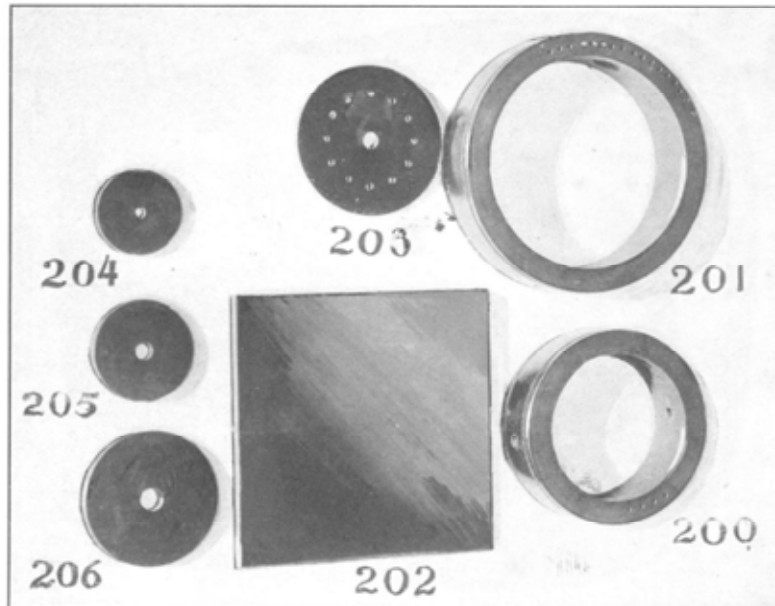
The set will respond to all wave lengths between 200 and 7000 meters, with an average commercial antenna.

The case is of dull finish black "Bakelite," which is not affected by extremes of temperature, moisture, or high tension currents, and which will not warp, shrink or lose its color or otherwise change with age or use.

Price of A F Receiving Set, as described .....\$550.00



## Parts



No. 200	Hard rubber inductance rings, polished, $2\frac{1}{4}$ inch inside diameter, 3 inch outside diameter, 1 inch wide, without machining . . . . .	\$0.65
No. 200a	Same, machined with two winding grooves, holes for 12 taps and bearing holes . . . . .	1.15
No. 201	Hard rubber inductance rings, $3\frac{1}{4}$ inch inside diameter, 4 inch outside diameter, 1 inch wide, without machining . . . . .	.90
No. 201a	Same, machined with two winding grooves, holes for 30 taps and bearing holes . . . . .	1.40
No. 202	Polished rubber face plates, 4 inches square, $\frac{1}{4}$ inch thick, polished all over . . . . .	.65
No. 202a	Same, machined with 2 holes tapped $\frac{5}{32}$ in one edge for attaching to base, 2 holes for binding posts, 30 holes for switch points, stamped in white, with numerals 0-5-10-15-20-25 . . . . .	1.05
No. 203	Hard rubber disc, polished all over, $2\frac{1}{4}$ inch diam., $\frac{1}{8}$ inch thick . . . . .	.15
No. 203a	Same, drilled with 12 holes for switch points . . . . .	.30
No. 204	Hard rubber handles, $1\frac{1}{4}$ inch diam., knurled . . . . .	.15
No. 205	Hard rubber handles, $1\frac{1}{2}$ inch diam., knurled . . . . .	.20
No. 206	Hard rubber handles, 2 inch diam., knurled . . . . .	.25
No. 207	Polished mahogany base, 6 inches long, $4\frac{3}{4}$ inches wide, $\frac{3}{8}$ inch thick . . . . .	.60


Parts—Continued

No. 208 Cord tip  .....per 100 \$.60

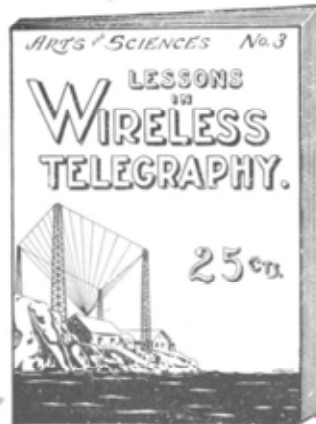
No. 209 Spade tip  .....per 100 .80

No. 210 Composition handle,  $1\frac{1}{4}$  inch diam.,  $\frac{1}{8}$  inch high  each .20

No. 211 Same as 210,  $2\frac{1}{4}$  inch diam., 1 inch high..... each .35

No. 212 Knurled knob,  $\frac{1}{4}$  inch diam.,  $\frac{1}{8}$  inch high   $\frac{9}{32}$  thread, each .04

No. 213 Knurled knob,  $\frac{1}{8}$  inch diam.,  $\frac{1}{8}$  inch high   $\frac{9}{32}$  thread, each .05



Price, 25 Cents, Postpaid

## Lessons in Wireless Telegraphy

Written So That You Can Understand Them

Our new book contains a systematic elementary course in the principles of Wireless Telegraphy and the electrical laws upon which it depends. It contains more reliable and practical information than any other book of its kind.

If you own a Wireless Outfit, it will give you a thorough grounding in the principles and care of each instrument and will enable you to greatly improve the efficiency of your apparatus.

## The Amateur's Wireless Handy Book

It contains over 2200 calls of Wireless Stations, including all land stations, ship stations, the U. S. Army and Navy, and all amateurs licensed to date of publication. Every registered station of the U. S. is included. They are all there. All the calls are classified alphabetically. The list is the most reliable and complete in existence. All obsolete stations have been abolished. All corrections and changes have been made from the official lists.

BUT, THAT IS NOT ALL.

Pages with spaces to fill in names, call letters, etc., make it possible to keep an accurate record of nearby amateur stations.

The Codes, both Morse and Continental, are shown in the form of two large full page charts printed in heavy black type so that they can be read from a distance.

A Beginner's Speed Chart of both Codes so arranged that the codes may be quickly learned or consulted, is provided.

All the Abbreviations used so constantly by the wireless operator to save time and labor, are included. There are a couple of pages of them.



Price, 25 Cents, Postpaid



Price, 25 Cents, Postpaid

## Operation of Wireless Apparatus

By A. B. COLE

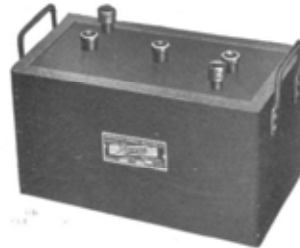
*It shows how to obtain the very highest efficiency from any station, and how to comply with the law. How to tune, adjust your detector, spark gap, phones, etc.*

IT SHOWS HOW to receive or send on long or short wave lengths with highest efficiency, to tune for longest distance, reception of messages, to use the buzzer test, how to test and connect condensers, receivers, etc., how to use receiving transformers, variometers, etc., all with highest efficiency in view.

IT ALSO DESCRIBES the construction and use of a simple, inexpensive wave meter to tune the station to any desired wave length, and tells how to obtain a sharp wave and a pure wave.

EXTRACTS FROM THE LAW are also given in such a manner that they are easily understood.

## Storage Batteries



The mechanical construction of this battery is designed to stand hard service to which it may be subjected in automobiles, motor boats, or similar portable work. Extra heavy plates are used, insuring long life and full capacity.

The jars are of pure Para rubber, and the treated oak cases are so constructed as to allow for temperature changes, preventing leaky batteries.

Batteries are supplied in two types, the sparking batteries, being intended for gas engine ignition, small wireless spark coils, and all purposes where only a small current is used, while the lighting batteries will supply heavy currents for small lighting and power purposes without injury to the battery and for a much greater time at one charge.

We guarantee this to be a good battery at a moderate price, and that it will give satisfaction if used with ordinary care.

### Lighting Batteries

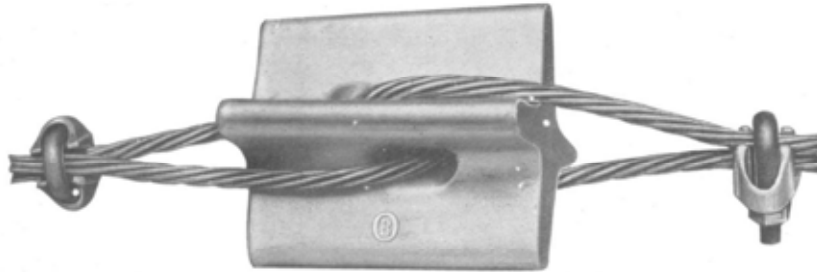
TYPE AND NO. PLATES	NO. OF CELLS	VOLTS	AMPERE HOURS	DIMENSIONS OVERALL OF BATTERY			WEIGHT IN POUNDS	PRICE F. O. B. CAMBRIDGE, MASS.
				HEIGHT	WIDTH	LENGTH		
K-7	3	6	60	9 $\frac{1}{4}$	6 $\frac{1}{2}$	9 $\frac{1}{2}$	33	\$18.00
K-9	3	6	80	9 $\frac{1}{4}$	6 $\frac{1}{2}$	11 $\frac{1}{2}$	42	22.00
K-11	3	6	100	9 $\frac{1}{4}$	7 $\frac{3}{4}$	13 $\frac{1}{2}$	58	26.00
K-13	3	6	120	9 $\frac{3}{4}$	7 $\frac{3}{4}$	15 $\frac{1}{2}$	62	30.00
K-15	3	6	150	9 $\frac{3}{4}$	7 $\frac{3}{4}$	17 $\frac{1}{2}$	68	34.00

### Ignition Batteries

Hard Rubber Jars				Wood Cases				
TYPE AND NO. PLATES	NO. OF CELLS	VOLTS	AMPERE HOURS	HEIGHT	WIDTH	LENGTH	WEIGHT IN POUNDS	PRICE F. O. B. CAMBRIDGE, MASS.
ASB1	3	6	60	8 $\frac{1}{4}$	6	8	26	\$12.00
ASB2	3	6	80	8 $\frac{1}{4}$	7 $\frac{3}{8}$	9	35	16.00
ASB3	3	6	100	8 $\frac{1}{4}$	8 $\frac{1}{4}$	9 $\frac{5}{8}$	43	20.00

*Note.* Storage Batteries will be shipped freight prepaid to any point east of the Mississippi River.

## Antenna Insulators



This is an entirely new design of porcelain strain insulator, and the character of material used, and its unique shape, give it features particularly desirable in an insulator for guy wires and antenna wires. These insulators are made of high tension porcelain, having high mechanical strength and a very long leakage path. You will note that the insulator is under compression when in use, greatly increasing its effective strength, and also should the insulator ever break, the aerial structure which it supports will not fall as the wires are crossed and will still support it.

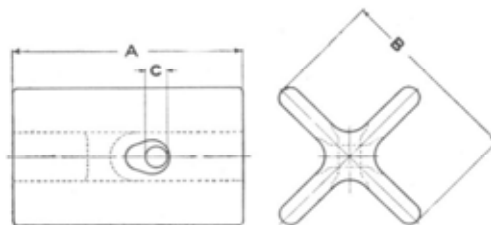
We recommend the use of the No. 8984 insulator with sets of  $\frac{1}{2}$  K. W. standard spark type, and up to  $\frac{1}{2}$  K. W. for quenched spark sets and for all receiving sets.

For  $\frac{1}{2}$  K. W. standard spark sets and 1 K. W. quenched spark sets, we recommend two of these insulators connected in series, and for 1 K. W. standard spark sets and 2 K. W. quenched spark sets, three connected in series.

The larger insulators should be used for very large antennae, and for their guy wires where great mechanical strength is required, although the No. 8984 has an ultimate strength in excess of 20,000 lbs.

These insulators are also practically non-absorbent, and have a very low electrostatic capacity.

From a cost standpoint they not only reduce the cost below any other insulator on the market, but at the same time provide better insulation and greater mechanical strength at a lower price.



CATALOG NO.	DIMENSIONS IN INCHES			WEIGHT EACH	PRICE PER 100	PRICE EACH LESS THAN 100
	A	B	C			
8984	3 $\frac{3}{4}$	3 $\frac{7}{8}$	5 $\frac{5}{8}$	1 $\frac{1}{4}$ lbs.	\$15.00	\$0.20
11629	5	4 $\frac{3}{8}$	5 $\frac{3}{8}$	2 lbs.	40.00	.45
11630	6 $\frac{1}{2}$	5 $\frac{3}{8}$	5 $\frac{3}{8}$	3 $\frac{1}{4}$ lbs.	50.00	.55

## It Is Well To Remember

That a government license is required for all transmitting sets, for which there is no charge, but that no license or other formality is required for a receiving set. Full information regarding licenses may be obtained from the Department of Commerce and Labor, Washington, D. C., or by addressing Radio Inspector, Custom House, at whichever of the following cities is nearest you: San Francisco, Cal., Savannah, Ga., Boston, Mass., New York City, New Orleans, La., Baltimore, Md., Chicago, Ill., Seattle, Wash., Cleveland, Ohio.

That in general the longer and higher your antenna, the greater will be the radius of communication or strength of signals almost in direct proportion thereto.

That radius of communication for a receiving set depends not alone upon the quality of your apparatus and its antenna, but also upon the following: the power of the transmitting stations from which signals originate; the nature of the intervening country; the season of the year; the time of day or night and whether the distance is over land or water, not to mention the skill with which your apparatus is used.

That the radius of communication for a transmitting set depends largely upon the same factors.

That no one can honestly guarantee the probable range of apparatus. A low estimate does his product an injustice; a fair estimate may be considered a misrepresentation by the purchaser, if unfavorable conditions prevent its fulfillment.

That a good ground connection is fully as important as a good antenna. Try connecting to several grounds at once and see if your results are not improved.

That the energy radiated by a transmitter is proportional to the square of the current in the antenna as shown by your hot wire meter. Thus a current of four amperes in the antenna represents four times the output that two amperes would represent.

That the maximum height of antenna that can be used with a 200 meter wave length without a series condenser is approximately 200 feet for one vertical wire or a length of 150 feet for a single horizontal wire. In practice, using an antenna of usual type composed of several parallel wires, the greatest length permissible is about 100 feet.

That if a series condenser is used in the antenna, the smaller its capacity, the greater the decrease in wave length, but the wave length can never be reduced by this means to as little as one half its original value. Never connect a condenser in the ground wire.

That we have been exclusively engaged in the manufacture of high grade radio telegraph apparatus since 1907 and value your good will above all else. If you are not absolutely satisfied in any dealings with us, tell us; if we have been able to please you and give what some of our customers call a "fair deal," tell your friends. It is the greatest courtesy you can possibly show a business house, and is always appreciated.

That every electrical connection in a receiving set should be as near perfect as possible. A single unsoldered joint in your antenna may cause a lot of trouble and is not easily located.

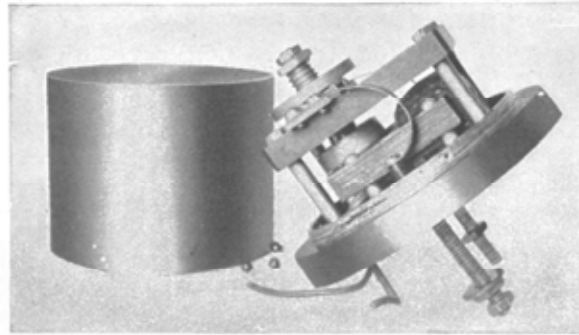
That you can not get satisfactory results from the ordinary type of transmitter unless it is accurately tuned. Use a hot wire meter and one which responds quickly to slight variations in the current.

That you can not accurately estimate your wave length; it must be measured by a wave meter if you would know.

That good materials and skilled labor command a fair price; the use of inferior material or poor workmanship will cost you a dollar in results for every penny saved.

That no transmitter should ever be used without the ground connected. You will be certain to burn out your transmitter if a good ground is not used at all times.

## Special Apparatus



10 K. W. Relay

It is perhaps not generally known that a considerable portion of our product comprises special instruments and apparatus manufactured by us for other electrical and radio companies as well as individuals. We are very glad at all times to undertake the construction of any special electrical or mechanical apparatus, either in quantity or in single items, built to the specifications of our customers, and for this purpose we offer not only ample manufacturing facilities but also the services of a skilled engineering department with a wide experience in the design of apparatus with a special view to practical manufacturing methods.

We briefly mention below a few of the many special items which we have supplied in the past, and solicit your inquiries for any special apparatus you may require.

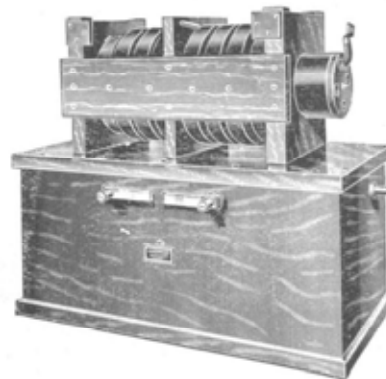
**Relays.** We have designed and constructed relays for large currents, and illustrate one type which operates on both A. C. and D. C., and satisfactorily breaks upwards of 10 K. W.

**Transformers.** We have specialized in transformers for many years, and are particularly well equipped to supply any needs for either open or closed core types for a wide variety of purposes, either air or oil cooled, mounted or unmounted.

Some of the uses for which we have supplied them in the past comprise high voltage testing, spectroscopic work, ozone generators, X-Ray machines, radio telegraphy, and general experimental transformers.

**Spark Frequency Indicators.** We have manufactured many rotating, sensitive vacuum tubes for studying high frequency spark discharges from any source.

**Other Instruments.** Other instruments comprise reactance regulators, electro magnets, resistances and inductances, both fixed and variable, special condensers, both fixed and variable capacities, special solenoid operated switches of various types, and many similar forms of apparatus.



20 K. W. Open Core High  
Tension Transformer

### TERMS

Strictly net cash with order, or orders of five dollars or over will be sent C. O. D. upon receipt of one-half purchase price, return charges to be paid by consignee.

We make no charges for boxing or packing, but freight or express charges and cartage must be paid by the purchaser.

Remit by draft, express or postal money order or by registered mail. We cannot assume responsibility for currency sent by mail.

### GUARANTEE

We guarantee all our apparatus to be free from defects in material or construction or against electrical breakdown not due to misuse or abuse, and will make good any piece of apparatus having such defects without charge if returned to our factory, transportation charges prepaid, within one year from date of purchase.

### REFERENCES

We shall be glad to refer any prospective customers to banks and others with whom we do business, as to our reliability and unbroken record of fair dealing. Hosts of satisfied and loyal customers are our best references.





