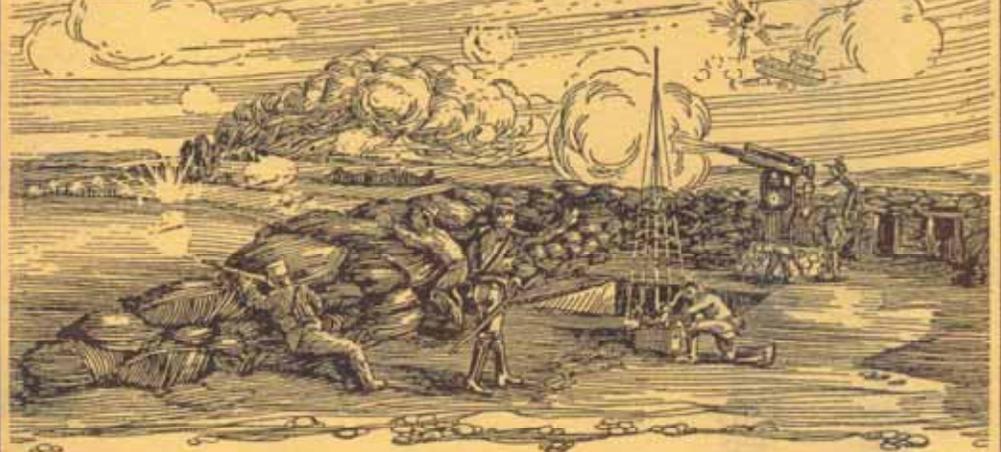
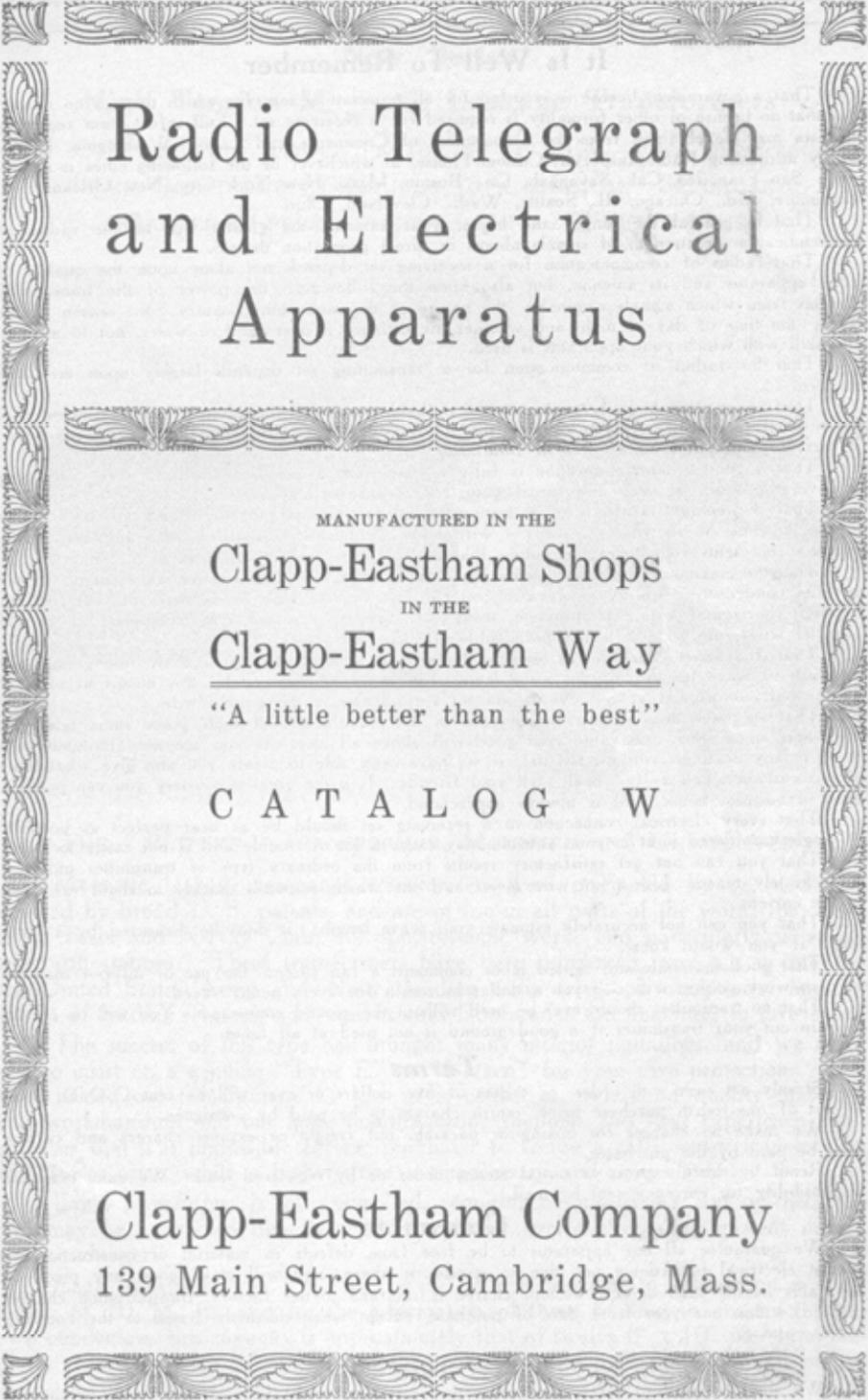


CATALOGUE-W.
RADIO-TELEGRAPH
APPARATUS



CLAPP-EASTHAM ©
CAMBRIDGE ▲ ▲ ▲ MASS.



Radio Telegraph
and Electrical
Apparatus

MANUFACTURED IN THE
Clapp-Eastham Shops
IN THE
Clapp-Eastham Way
"A little better than the best"

C A T A L O G W

Clapp-Eastham Company
139 Main Street, Cambridge, Mass.

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.

Terms

Strictly net cash with order, or orders of five dollars or over will be sent C.O.D. upon receipt of one-fourth 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, except when distinctly stated to the contrary in this catalog.

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.

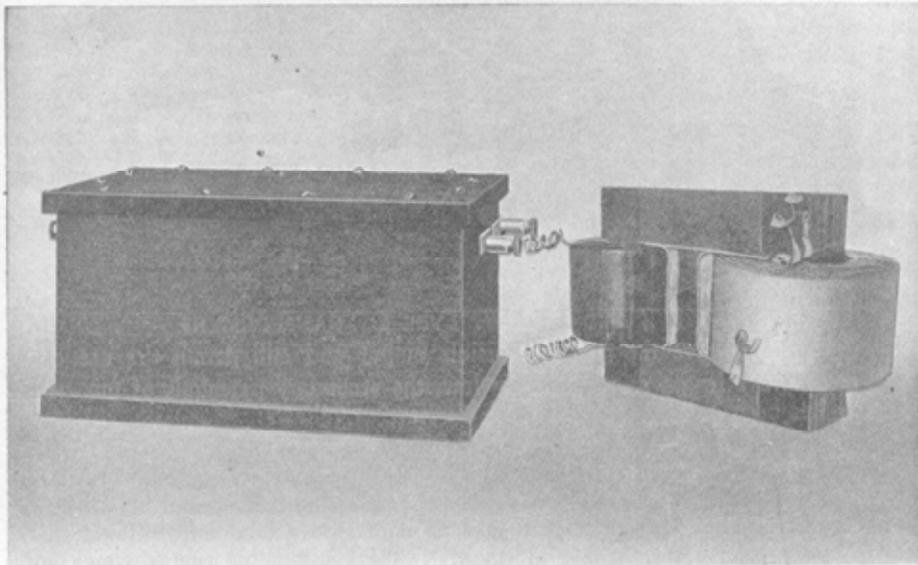
New Series

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.



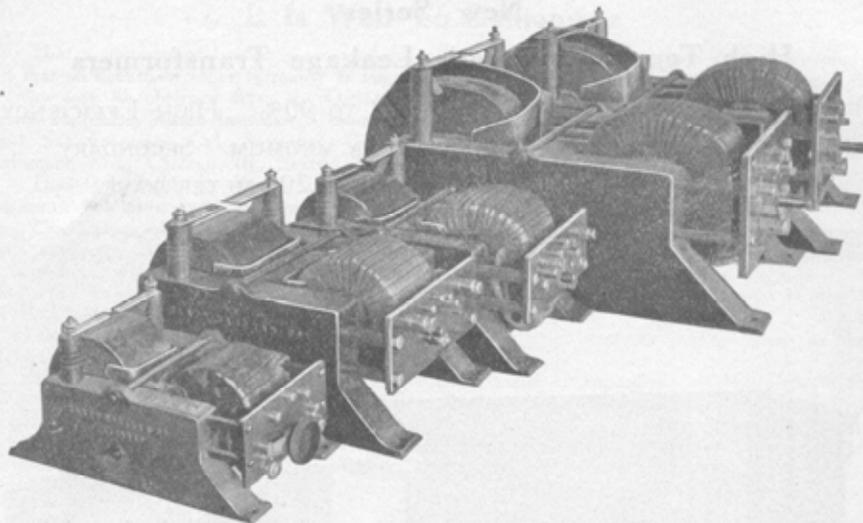
THE "BLITZEN" TRANSFORMER, MOUNTED AND UNMOUNTED

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. 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.



$\frac{1}{4}$, $\frac{1}{2}$, 1, 2 AND 3 K. W. TYPE E TRANSFORMERS

In order to give the greatest possible output and still permit the use of a 200 meter wave length as required by law, the secondary potentials of our transformers has been greatly increased and are now as follows:

- $\frac{1}{4}$ K. W. 9,000 volts,
- $\frac{1}{2}$ K. W. 11,000 volts.

These potentials are best adapted for *efficient operation*, 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. In addition to this, the higher the potential the greater the number of turns in the secondary and the smaller the wire which also increase the losses still further, due to the added resistance of the circuit.

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 60 cycle transformer of the next larger size, 125 cycle transformers at an additional cost of 10%.

All Type E Transformers have a switch giving four variations of power and their general construction is well shown in the illustration.

Blitzen transformers operate at full power only and are mounted in highly finished solid mahogany cases. Our Blitzen reactance regulators may be used in series with our Blitzen Transformers to give variable power as may also our rheostats. Both types of Transformers are equally efficient, are constructed on the magnetic leakage, resonance, principle and are fully guaranteed for one year.

Parts assembled by the purchaser cannot be guaranteed but will give perfect satisfaction if properly handled.

TYPE E TRANSFORMERS	
Cat. No. W636.	$\frac{1}{4}$ K. W. ....\$30.00
Cat. No. W637.	$\frac{1}{2}$ K. W. 45.00
BLITZEN TRANSFORMERS	
Cat. No. W638.	$\frac{1}{4}$ K. W. ....\$15.00
Cat. No. W639.	$\frac{1}{2}$ K. W. 22.00

UNMOUNTED BLITZEN TRANSFORMERS	
Cat. No. W640.	$\frac{1}{4}$ K. W.\$ 9.00
Cat. No. W641.	$\frac{1}{2}$ K. W. 15.00

Renewal Transformer Parts

TYPE E TRANSFORMERS

Cat. No.		
W636A.	$\frac{1}{2}$ K. W. Core	\$2.00
W636B.	$\frac{1}{2}$ K. W. Primary	4.20
W636C.	$\frac{1}{2}$ K. W. Secondary	4.75
W636D.	$\frac{1}{2}$ K. W. Mica Insulation ...	1.00
W636E.	$\frac{1}{2}$ K. W. Side Castings machined	2.00
W636F.	$\frac{1}{2}$ K. W. Hard Rubber switch plate and five point switch	3.00
W637A.	$\frac{1}{2}$ K. W. Core	3.00
W637B.	$\frac{1}{2}$ K. W. Primary	5.20
W637C.	$\frac{1}{2}$ K. W. Secondary	6.00
W637D.	$\frac{1}{2}$ K. W. Mica Insulation ...	1.65
W637E.	$\frac{1}{2}$ K. W. Side Castings machined	4.00
W637F.	$\frac{1}{2}$ K. W. Hard Rubber switch plate and five point switch	4.00

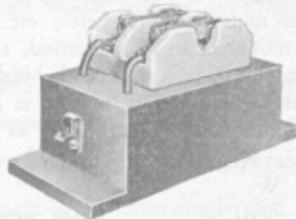
BLITZEN TRANSFORMERS

Cat. No.		
W638A.	$\frac{1}{2}$ K. W. Core	\$1.50
W638B.	$\frac{1}{2}$ K. W. Primary	2.80
W638C.	$\frac{1}{2}$ K. W. Secondary	4.00
W638D.	$\frac{1}{2}$ K. W. Mica Insulation ...	1.00
W638E.	$\frac{1}{2}$ K. W. Terminals .....	.72
W638F.	$\frac{1}{2}$ K. W. mahogany cabinet..	3.00
W639A.	$\frac{1}{2}$ K. W. Core	2.50
W639B.	$\frac{1}{2}$ K. W. Primary	3.10
W639C.	$\frac{1}{2}$ K. W. Secondary	6.00
W639D.	$\frac{1}{2}$ K. W. Mica Insulation ..	1.65
W639E.	$\frac{1}{2}$ K. W. Terminals .....	.72
W639F.	$\frac{1}{2}$ K. W. Mahogany cabinet.	4.00

NOTE: Our mounted transformers are equipped with a safety gap, as shown in the illustration, and our guarantee expires if this gap is removed or changed. On transformers sold unmounted the proper safety gap to use is $\frac{7}{16}$ inch on the $\frac{1}{2}$ K.W and $\frac{9}{16}$ on the $\frac{3}{4}$ K.W. and we do not guarantee our unmounted transformers unless such a safety gap is left permanently across the secondary.

In using our $\frac{1}{2}$ and $\frac{3}{4}$ 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. Terminal "G" is connected to the secondary winding at the end which comes out nearest the core.

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.

Our protective device consists of two condensers mounted 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.

Cat. No. W 642. Protective Device Price \$4.00

Motor Generators and Rotary Converters

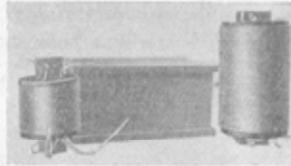
For changing 110 or 220 volts direct current to 60 cycle alternating current necessary for our transformers.

Cat. No. W665.	$\frac{1}{2}$ K. W. Rotary Converter	1800 R.P.M. 4 Pole	.....\$ 60.00
Cat. No. W666.	$\frac{1}{2}$ K. W. Rotary Converter	1800 R.P.M. 4 Pole	..... 92.00
Cat. No. W667.	1 K. W. Rotary Converter	1800 R.P.M. 4 Pole	..... 150.00
Cat. No. W668.	2 K. W. Rotary Converter	1800 R.P.M. 4 Pole	..... 190.00
Cat. No. W669.	1 K. W. Motor Generator		..... 200.00
Cat. No. W670.	2 K. W. Motor Generator		..... 250.00

The Blitzen Reactance Regulators or Impedance Coils

Provide Variable
Power.

Save their cost
by reducing current
consumption.



For use only on
Alternating Cur-
rent.

Better than a
Rheostat for most
purposes.

These reactance regulators may be used for controlling any alternating current circuit and will vary the input to any alternating current apparatus such as spark coils, transformers, series motors, lamps, etc., etc.

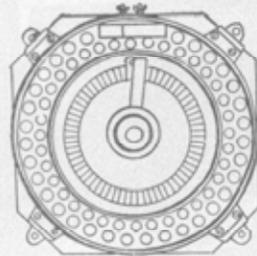
They are furnished both mounted and unmounted, and when ordered mounted are enclosed in a highly finished mahogany box with binding posts giving six variations of power. When furnished unmounted the coil is left with taps brought out from the winding with leads about six inches in length as shown in the illustration.

Cat. No. W 623.	Reactance Regulator for circuits consuming not over $\frac{1}{4}$ K. W.	
Price mounted	.....\$ 7.50	Price unmounted 4.00
Cat. No. W 624.	Reactance Regulator for circuits consuming not over $\frac{1}{2}$ K. W.	
Price mounted	..... 9.00	Price unmounted 5.50
Cat. No. W 625.	Reactance Regulator for circuits consuming not over 1 K. W.	
Price mounted	..... 11.50	Price unmounted 7.75
Cat. No. W 626.	Reactance Regulator for circuits consuming not over 2 K. W.	
Price mounted	..... 30.00	Price unmounted 25.00
Cat. No. W 627.	Reactance Regulator for circuits consuming not over 5 K. W.	
Price mounted	..... 60.00	Price unmounted 52.00

Rheostats

Save Current.

Prevent Flickering
of Lights.



Place any circuit
under perfect control.

For use on both
A. C. and D. C.

Since our last catalog was issued, we have received many requests for an instrument to connect in circuit with electrical apparatus to reduce the current and to provide variable power. We are, therefore, offering a line of rheostats herewith which are suitable for connecting in series with any apparatus which does not consume more than the rated current of the rheostat and which may be used for a wide variety of purposes such as reducing and varying the power of wireless transmitting sets, regulating spark coils, dimming lamps, changing the speed of motors, for use in series with electrolytic rectifiers, to limit and vary the current, and a host of other purposes which will be apparent to the user.

These rheostats consist of a circular base plate of insulating material to which is attached the resistance wire, contacts and lever, the whole being enclosed in a ventilated japanned iron case of attractive design as shown in the illustration. The large number of contacts gives exceedingly fine regulation and this instrument may be used on any voltage not to exceed 150 either direct or alternating current.

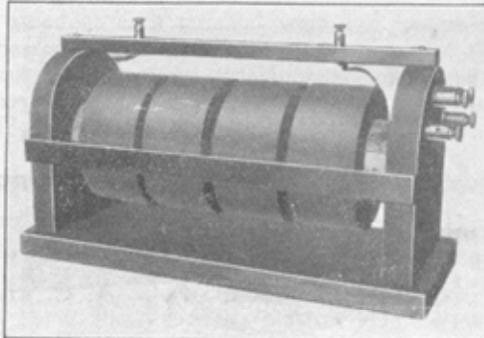
Cat. No.	Maximum current with which it may be used.	Total ohms of Rheostat	Size Diameter	Price
W 1169	4 amperes	37.5	9 inch	\$6.80
W 1172	8 amperes	18.8	12 inch	9.40
W 1173	10 amperes	15.	15 inch	11.80
W 1177	25 amperes	6.	15 inch	25.00

Blitzen Spark Coil

50,000 volt secondary.

Hot caterpillar spark.

The coil with a "punch."



Gives three times the energy of the ordinary 3-inch spark coil.

Built like a 42 centimeter gun.

While there are many makes and types of spark coils on the market designed to give long sparks from a very small amount of energy, usually a few dry batteries, we know of no coil which is designed for moderate spark lengths and at the same time to give a large output and with a large power rating. The usual form of 3 inch vibrator coil operates on eight or ten dry batteries which supply a watt or two each at most so that a power rating of 15 watts would be liberal in most cases. This is all right for experimental purposes where the sole object is the production of a 3 inch spark, but for the production of X-Rays, for wireless telegraphy, for the operation of Tesla Coils, and for similar purposes, the results achieved are in proportion to the amount of energy supplied at the secondary terminals of the coil. The Blitzen spark coil is rated at 100 watts, more than six times the power rating of the usual three inch spark coil and in place of the usual thin hair line spark between needle points, will give a heavy, flamelike caterpillar spark, three inches in length when operated at its full capacity.

Wherever 110 volt lighting current is available, we recommend the use of our electrolytic interrupter with which it will give exceptionally fine results. On battery currents our mercury jet interrupter will operate the coil very nicely.

Remember that it is not spark length alone that counts, as current counts fully as much and this coil will send from three to six times as far as the ordinary three inch coil when used for wireless, will give from three to six times as intense X-rays, will give from three to six times as long a spark on a Tesla coil.

When used with our electrolytic interrupter, plate condenser and $\frac{1}{4}$ K. W. Tesla Coil, it gives a heavy spark 8 inches long on 110 volt lighting current.

When used with our Blitzen X-ray tube and electrolytic interrupter on 110 volt lighting current, it will make a clear photograph of the hand in 20 seconds or less.

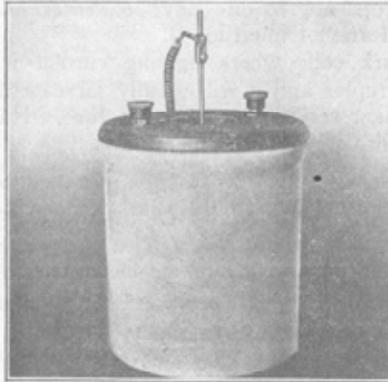
The coil itself is of the highest grade construction, is mounted in highly finished mahogany with primary and secondary binding posts and will please the eye as well as giving satisfaction in use. To those who appreciate high quality, an abundance of power, and the value of energy versus spark length only, we offer this coil with the greatest confidence of retaining their good will as our most valuable asset.

Cat. No. W 616. Blitzen Spark Coil complete as above without interrupter Price \$22.00
(Specify with order the voltage on which coil is to be used.)

The Blitzen Electrolytic Interrupter

**More power
from your old
spark coil.**

**Works from
any lamp socket,
A. C. or D. C.**



**Quickly saves
its cost in bat-
teries.**

**Price only
\$2.25**

Small vibrating interrupters may be satisfactory for small powers and for use on battery currents but where 110 volt lighting current, either direct or alternating, is available the output of any coil will be greatly increased by the use of this electrolytic, or Wehnelt, interrupter as it is often called. In contrast to the thin feeble discharge at the secondary, usually obtained, this interrupter will transform the spark into a flaming caterpillar spark of much greater length and intensity. This interrupter cannot be used on less than 50 volts and for lower voltages we recommend our mercury jet type interrupter.

The Blitzen Electrolytic Interrupter is contained in a stone ware jar $5\frac{3}{4}$ inches in diameter and 6 inches high fitted with a wooden cover impregnated with an acid proof insulating compound.

The cover supports the lead electrode and the special glass tube for the active electrode. The active electrode is composed of an alloy rod which feeds automatically by gravity as it is consumed.

Our Blitzen Spark Coil is particularly well adapted for use with this interrupter but with spark coils having a vibrating interrupter the contact on this interrupter must be screwed down tight so that it will not vibrate. For use, the interrupter is merely connected in series with the spark coil and any lamp socket and it should be noted that when the service is *direct current* the electrolytic interrupter will operate only in one direction which can usually be best determined by experiment, although if a polarity indicator is at hand, the proper connection is, negative wire to lead electrode, positive wire to alloy rod. On alternating current the wires may be connected in either direction.

The jar should be filled to a depth of about $3\frac{1}{2}$ inches with a 10% solution of sulphuric acid, and should always be filled to a sufficient depth so that the point of the alloy rod and the lower part of the lead electrode are well covered.

This solution may be obtained from any drug store for a few cents and is not furnished with the instrument on account of the difficulty of shipping.

By connecting a $\frac{1}{2}$ K. W. Blitzen Reactance Regulator in series with the interrupter, different powers may be used and the rate of interruption varied over quite a wide range.

This interrupter does not require any condenser connected across it, as is the case with all other forms of interrupters.

For operating spark coils where lighting current is available nothing can equal this form of interrupter and it will greatly increase the output and efficiency and give the most brilliant results whether used for X-Rays, Radio Telegraphy, for operating Tesla Coils, or for any other purpose.

We urgently recommend that a fuse be installed on the circuit supplying this interrupter to prevent damage to the spark coil in case of accidental short circuit.

It is also well to lift the rod out of the electrolyte when not in use to avoid waste, although this is not necessary as the waste is very slight unless left for a long period of time.

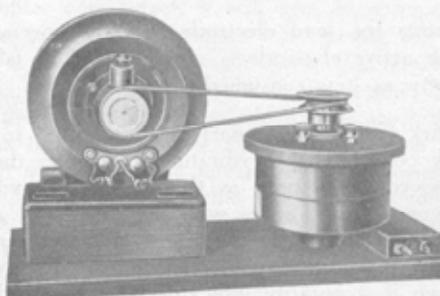
	Price
Cat. No. W 611. Blitzen Electrolytic Interrupter, complete as above.	\$2.25
Cat. No. W 612. 10 foot double cord with attachment plug for connecting interrupter to any lamp socket . . . . .	.65
Cat. No. W 613. Extra Glass Tube for Rod, each . . . . .	.60
Cat. No. W 614. Extra Alloy Rods, each . . . . .	.05
Cat. No. W 615. Double Pole single throw knife switch on slate base equipped with 5-ampere fuses, each	1.05
Cat. No. W 611A. Blitzen Electrolytic Interrupter, large size, with genuine platinum rod, for 12 inch spark coils and larger	20.00

Mercury Jet Interrupter

No vibrator to stick.

Handles heavy currents.

Never requires adjustment.



Gives a heavier spark.

Works on any voltage up to 110.

For Direct Current Only.

A really good interrupter is usually most difficult to secure, yet we believe such an instrument would meet with a ready sale among those who want something really good and have had their patience sorely tried with sticking vibrators and burnt out platinum contacts.

The mercury jet interrupter illustrated above consists of a cast iron chamber which serves both as a mercury chamber and as a case for the instrument. An insulating oil tight cover carries the bearing for the rotating parts, which comprise a rotary mercury pump which draws the mercury from the chamber in the

bottom and throws it out in a stream. This stream of mercury makes electrical contact by striking vanes or electrodes arranged at suitable points and gives a very rapid break at the point where the stream leaves the electrode. The mercury falls to the bottom and is used over and over again. About 12 ounces of mercury is required and is not furnished with the instrument as it may be obtained at any druggists and is very difficult to ship.

The surface of the mercury must be covered with alcohol nearly to the top of the chamber or in any event to a sufficient depth to cover the point where the mercury stream strikes the contacts. The purpose of the alcohol is to prevent the mercury becoming oxidized and also to quench the spark which would otherwise occur at the break. It is also necessary to connect a condenser of about 2 M. F. across the two terminals of the interrupter to reduce the sparking at the contacts and when desired we can furnish our #ES 355 condenser for this purpose at an additional cost of 90 cents.

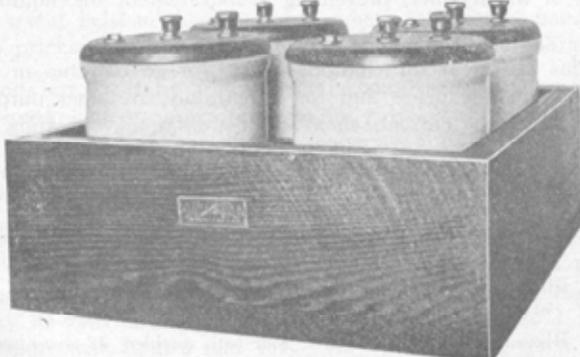
The Interrupter has a maximum capacity of 200 watts and may be used for breaking currents up to eight amperes on circuits of six volts, five amperes on twenty-four volts and two to three amperes on 110 volts.

Each instrument is furnished with a grooved iron pulley for round leather belt and may be operated from a small electric motor or other source of power. Its maximum speed is 1200 R.P.M. beyond which it will not operate satisfactorily. At this speed it gives 160 breaks per second and if desired it may be run at somewhat slower speed with corresponding decrease in the number of breaks.

This Interrupter should not be used on alternating current, but on all direct current circuits it will give much satisfaction, particularly with our Blitzen Spark Coil.

- Cat. No. W 631. Mercury Jet Interrupter as above Price \$ 9.00
 Cat. No. W 631A. Mercury Jet Interrupter mounted on wooden base with direct current motor and belt and condenser connected; ready to operate except for mercury and alcohol (state voltage of motor when ordering) 18.00

Blitzen Electrolytic Rectifier



The image shows a Blitzen Electrolytic Rectifier, which consists of a wooden base with two cylindrical electrolytic cells mounted on top. Each cell has a metal cap with a small handle. The device is designed for converting alternating current (A.C.) into direct current (D.C.).

Charges Storage Batteries
Electroplates
Changes A. C. to D. C.

Run Direct Current Apparatus and Motors from A. C. Lighting Circuit.

Price only \$7.50

Many of you who have alternating current in your house or workshop frequently need a source of direct current for charging a storage battery, performing experiments, and operating many devices which require direct current for their use.

CLAPP-EASTHAM COMPANY CAMBRIDGE, MASS.

The electrolytic rectifier shown above is designed to fill such a need and will operate on alternating current of 110 volts or less and practically any frequency. The outside or lead electrode extends entirely around the central electrode thus utilizing both sides of the center one and giving the greatest possible output for its size. The containing jar is heavy glazed stoneware, almost indestructible and measuring six inches high and five and three-quarters inches in diameter. The wooden cover is impregnated with a black insulating compound and rubber composition covered binding posts are provided.

The single cell rectifier will pass about one ampere without overheating and may be used up to two amperes for short periods of time. The temperature of the rectifier must be kept below 120 degrees Fahrenheit for satisfactory operation. The single cell rectifier is connected directly across the 110 volt circuit with the device to be operated in series with the line and the rectifier. If such a device has not in itself sufficient resistance to limit the current to the above amount, an additional resistance such as a rheostat must be used to limit the current. A 100 watt lamp makes a fine resistance and allows just about one ampere to flow. The four cell rectifier is recommended by us and will operate continuously at 2 amperes.

The difference between the single and four cell rectifier lies not only in the increased output of the latter but also in the rectified current, the four cell type utilizing both positive and negative sides of the alternating current wave, giving pulsating direct current, while the single cell type rectifies only one half the wave and gives intermittent unidirectional current.

The four cell rectifier is furnished with a 200 watt resistance lamp wired in the alternating current side of the line which always limits the direct current to about two amperes and renders the use of any outside regulating device unnecessary.

Each jar of the rectifier should be filled with clean water to within about one and one-half inches of the top and the contents of one package of rectifier salts dissolved therein. Before using, the plates must be "formed" by operating the rectifier for a short period after which it will act as a rectifier of about 75% efficiency.

A light film of machine oil poured over the surface of the liquid will greatly increase the life of the rectifier, preventing evaporation of the liquid and creeping of the salts.

These outfits are ideal for charging small storage batteries in the laboratory or garage at very small expense and for a multitude of other purposes requiring a small amount of direct current, such as electroplating, operating direct current motors, etc.

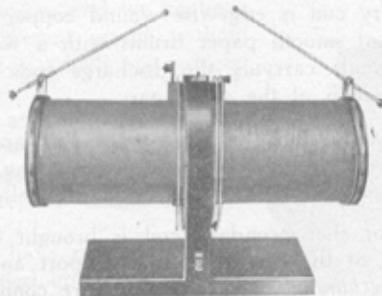
The electrolyte is inexpensive and may be easily renewed when required, which is very seldom.

		Price
Cat. No. W617.	Blitzen Electrolytic Rectifier complete as above, including one charge of chemical salts, Single cell	\$1.50
Cat. No. W618.	Blitzen Electrolytic Rectifier, four cell, complete as above with chemical salts, resistance lamp, porcelain socket, and wooden rack	7.50
Cat. No. W619.	Renewal charge of chemical. Price per cell .....	.25
Cat. No. W620.	Ten foot double cord and attachment plug to fit any standard lamp socket Each .....	.65

Blitzen Tesla High Frequency Coils

Give sparks up to
30 or more inches
long.

Electricity's greatest
wonder:



Low in price; high
in quality.

Place hundreds of
mystifying experi-
ments within your
reach.

Probably the most amazing and spectacular of all electrical apparatus is the Tesla Coil and no experimental laboratory is complete without such an equipment. Your friends will open their eyes in astonishment when they see you draw coiling, flaming, burning sparks nine inches or more in length through your body without the slightest injury or discomfort.

You can perform hundreds of the most interesting experiments such as lighting large numbers of vacuum tubes of various brilliant colors by merely holding them in your hand near the coil without any wires whatever. The ordinary incandescent lamp when held near the coil or connected to it, will glow with a pale greenish light. Various minerals and many precious stones will glow with strange lights and colors under its influence. Its sparks when occurring over large flat areas produce a large quantity of ozone. By balancing a wire bent in the shape of a letter "S" so that it will rotate from its center on the point of a pin or needle and connecting the pin to one pole of the coil, it will rotate as a static motor and have the appearance of an electric pin wheel with flames shooting in a stream from revolving points. All of these experiments and many more may be performed without the slightest danger as the frequency of the current is so high as to render it harmless. You cannot even feel the spark when it is allowed to jump to a piece of metal held in the hand, but where the spark jumps directly to the skin it gives a pricking sensation only on the spot where the spark strikes.

These coils are built by us in several sizes, the smallest of which may be used on any spark coil or transformer up to $\frac{1}{4}$ K. W. capacity and is designed to operate on a condenser of .01 M. F. capacity. It has a movable contact on the primary for tuning the primary to the secondary which is very necessary for securing the greatest spark length.

The $\frac{1}{4}$ K. W. Tesla Coil will give a nine inch purple flame when operated at its full capacity and when the electrodes are separated at a greater distance, each is surrounded by a fan of coiling sparks several inches in length. The next larger size may be used on any spark coil or transformer up to 1 K. W. capacity and is listed below with both $\frac{1}{2}$ and 1 K. W. outfits. It gives a spark 16 inches long and is designed to operate on a condenser of .02 M. F. capacity.

The larger coils of 2 and 3 K. W. capacity are designed to operate on a condenser of .03 M. F. capacity, will produce sparks thirty inches or more in length and are designed principally for lecture and stage performances.

CLAPP-EASTHAM COMPANY CAMBRIDGE, MASS.

These Tesla coils are well constructed and particular attention is given to guarding against breakdown from the very high potentials present.

The entire frame work is of well seasoned wood covered with a black insulating paint, the primary coil is edgewise wound copper ribbon, the secondary coils are wound on special smooth paper drums with a wire specially made for this purpose. The terminals carrying the discharge rods have ball and socket joints for adjusting the length of the spark gap.

The workmanship and entire construction of this apparatus is high grade and should not be confused with much smaller coils giving feeble sparks and intended only for use on spark coils operating from dry cells.

The central point of the secondary coil is brought out to a small spring binding post on the back of the central upright support and *it is very important that this binding post be grounded* by means of a wire connected to a water pipe, radiator, or other ground such as a metal plate buried in the earth. Care should also be taken not to allow the high frequency current to jump from the secondary coil to any part of the primary circuit as such a spark is very apt to cause a burned out transformer or a broken down condenser.

All of this apparatus is positively as well constructed as it is possible to make it and will not break down electrically if properly used, but owing to the impossibility of our guarding against careless use, we cannot make any guarantee except that it leaves our factory in perfect condition and will give the utmost satisfaction if properly used.

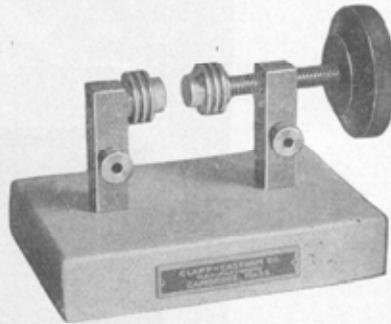
Cat. No. W 600.	$\frac{1}{2}$ K. W. Tesla High frequency coil as above, suitable for any transformer or spark coil of not over $\frac{1}{2}$ K. W. capacity	\$10.00
Cat. No. W 601.	1 K. W. Tesla High frequency coil as above, suitable for any transformer or spark coil of not over 1 K. W. capacity	16.00
Cat. No. W 602.	Complete $\frac{1}{2}$ K. W. High frequency outfit consisting of the Blitzen $\frac{1}{2}$ K. W. Tesla Coil, $\frac{1}{2}$ K. W. Spark Gap, Blitzen $\frac{1}{2}$ K. W. Transformer and $\frac{1}{2}$ K. W. Glass Plate Condenser, for use on 110 volt 60 cycle alternating current	35.00
Cat. No. W 603.	Complete High frequency outfit consisting of the Blitzen $\frac{1}{2}$ K. W. Tesla Coil, $\frac{1}{2}$ K. W. Spark Gap, $\frac{1}{2}$ K. W. Glass Plate Condenser, Blitzen Electrolytic Interrupter and Blitzen Spark Coil, for use on 110 volt current, either alternating or direct	45.00
Cat. No. W 604.	Complete High frequency outfit consisting of 1 K. W. Tesla Coil, $\frac{1}{2}$ K. W. Blitzen Transformer, $\frac{1}{2}$ K. W. Glass Plate Condenser, and $\frac{1}{2}$ K. W. Spark Gap, for use on 110 volt 60 cycle alternating current	55.00
Cat. No. W 605.	Complete High Frequency outfit consisting of 1 K. W. Tesla Coil, 1 K. W. Blitzen Transformer, 1 K. W. Glass Plate Condenser, and 1 K. W. Spark Gap, for use on 110 volt 60 cycle alternating current	89.50
Cat. No. W 606.	2 K. W. Tesla High Frequency Coil as above, suitable for any transformer or spark coil of not over 2 K. W. capacity	50.00
Cat. No. W 607.	Complete High Frequency outfit consisting of 2 K. W. Tesla Coil, 2 K. W. Transformer, 2 K. W. Glass Plate Condenser, and 2 K. W. Spark Gap, for use on 110 volt 60 cycle alternating current	195.00
Cat. No. W 608.	3 K. W. Tesla High Frequency Coil as above, suitable for any transformer or spark coil of not over 3 K. W. capacity	75.00
Cat. No. W 609.	Complete High Frequency outfit consisting of 3 K. W. Tesla Coil, 3 K. W. Transformer, 3 K. W. Glass Plate Condenser and 3 K. W. Spark Gap, for use on 110 volt 60 cycle alternating current	310.00

Adjustable Spark Gaps

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 both sizes, and will give the satisfaction to be expected from well made, carefully designed apparatus.

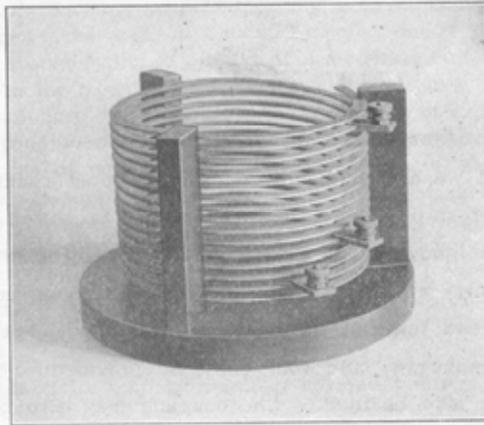
These Spark Gaps have zinc spark points carried on copper plated uprights with hard rubber adjusting handle. Mounting is on a Holland Blue polished marble base.



$\frac{1}{4}$ AND $\frac{1}{2}$ K. W. SPARK GAP

Cat. No. W 656.	$\frac{1}{4}$ K. W. Spark Gap	.....	\$3.00
Cat. No. W 657.	$\frac{1}{2}$ K. W. Spark Gap	.....	3.50

Blitzen 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.

Cat. No. W 650.	Blitzen Helix $\frac{1}{4}$ K. W.	\$5.00
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Blitzen Oscillation Transformer



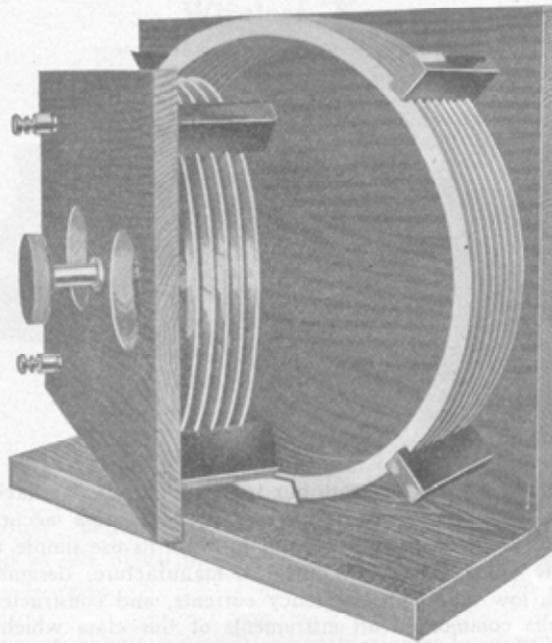
This Oscillation Transformer introduced by us about one year ago has met with great favor and we are continuing the same without change. It is wound with edgewise copper strip $1/16$ inch by $1/2$ inch in a spiral, $7\frac{1}{2}$ inches inside diameter. The convolutions are supported by four hard rubber uprights polished and slotted. The turns are divided near the bottom leaving eight turns for the primary and twenty-two turns in the secondary winding. The top and bottom are highly finished mahogany and four clips are provided so that either direct or inductive coupling may be used. The coupling may also be varied to some extent by using those secondary turns nearer or further removed from the primary as a considerably greater number of turns are provided than will be required in practice.

The wire has sufficient conductivity for transformers up to 1 K. W.

Cat. No. W 651. Blitzen Oscillation Transformer Price \$12.00

Cat. No. W 651A. Helix Clips with rubber covered binding screw; each .25

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.

Cat. No. W 652. Price \$12.00
 Cat. No. W 651A. Helix Clip with rubber covered binding screw25

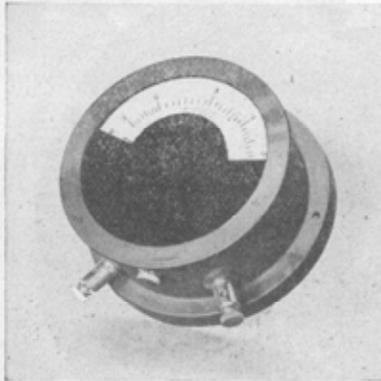
The Blitzen Key

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.



Cat. No. W 653. Price \$2.00
 Cat. No. W 653A. Price of same with Nickel-plated Lever, brass frame. 1.65

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 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, 1/4 volt.

Overload—meter will stand 100% overload.

Bearings—finest quality sapphires.

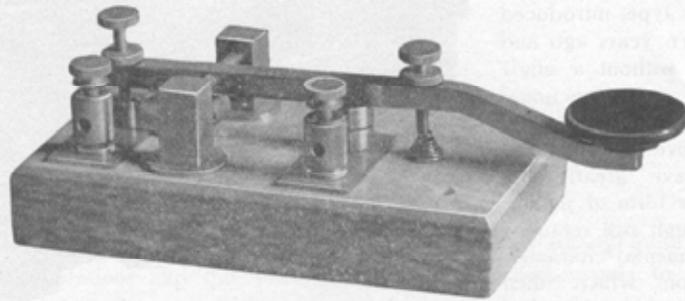
Front connected, standard, back connected to order.

Practically perfect temperature compensation.

PRICES

Cat. No. W 647.	0— 5 amperes or less	.....\$10.00
Cat. No. W 648.	0—10 amperes or less	..... 11.00
Cat. No. W 649.	0—15 amperes or less	..... 12.00

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 a foremost wireless company in this country for use in their stations as well as by the United States Navy Department.

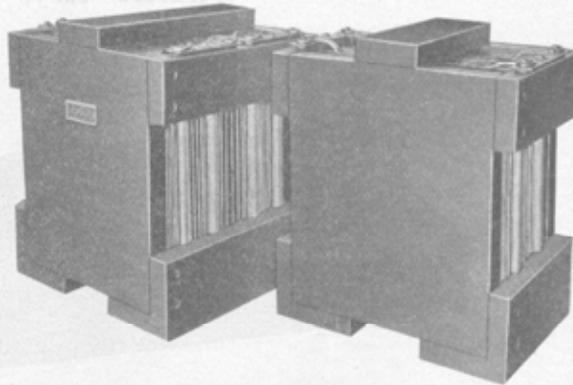
Your order will prove to you that this key is better made, and more attractive than any offered for general use.

- | | | |
|-----------------|---|---------|
| Cat. No. W 643. | "Boston" Key for use on currents up to 10 amperes | \$ 6.50 |
| Cat. No. W 644. | "Boston" Key for use on currents up to 20 amperes | 7.75 |
| Cat. No. W 645. | "Boston" Key for use on currents up to 30 amperes | 9.00 |
| Cat. No. W 646. | "Boston" Key for use on currents up to 50 amperes | 12.50 |

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.

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 condensers. The most evident signs of leakage are heating and (if the condenser is transparent) brushing or spraying at the edges.

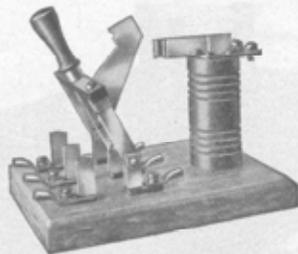
Owing to a rearrangement of the glass and mounting, we are able to offer these condensers in a greatly improved form at a material reduction in cost, without sacrificing the quality or reliability for which they have become noted.

The $\frac{1}{4}$ K. W. Condenser has a total capacity of .01 M. F., just right for a 200 meter wave length, consisting of two sections of .005 M. F. each connected in parallel. The $\frac{1}{2}$ K. W. Condenser consists of four sections of .01 M. F., each connected two in series and two in parallel, giving a total capacity of .01 M. F. with the strength of all four sections.

The above condensers are intended for use on our Blitzen transformers and where desired we can furnish condensers of units of .01 M. F. each, connected three in parallel, three in series, four in parallel, four in series, etc., to give greater strength but having the same total capacity. All racks are dull black finish. These condensers have given wonderful satisfaction in the past and will stand up staunchly if they are not abused. Owing to the fact, however, that we have no means of knowing whether the condensers are used on greater than their rated power or with transformers of inferior construction or otherwise abused, we cannot guarantee these condensers against electrical breakdown and new sections can be supplied only at regular prices.

	Price
Cat. No. W 654. $\frac{1}{4}$ K. W. Condenser complete in rack	\$ 8.00
Cat. No. W 655. $\frac{1}{2}$ K. W. Condenser complete in rack	13.00
Cat. No. W 655A. Condenser of nine units, three in series and three in parallel complete in rack	27.50
Cat. No. W 655B. Condenser of 16 units, 4 in series and four in parallel, complete in rack	55.00
Cat. No. W 655C. Unmounted Condenser sections, each having a capacity of .01 M. F. or .005 each, impregnated as above; each	2.50

Improved Antenna Switch



These Antenna Switches have proven very popular among those who take pride in their stations and this year we have added another pole to the switch leaving an additional circuit for stopping and starting the motor of a rotary spark gap or for any similar purpose desired.

When thrown to the upward or receiving position, the switch disconnects the antenna from the helix, at the same time connecting it to the receiving set and opening the power circuit so that damage to the receiving instruments through accidental pressure of the key is impossible. When thrown to the down or sending position, the antenna is disconnected from the receiving set and connected to the transmitting set, the current supply circuit is closed to the transmitter, the receiving set is short circuited and grounded and the right hand switch blade closes the circuit to the motor of the rotary spark gap or any other circuit desired.

The switch is mounted on a Blue Marble Base six inches by nine inches and the insulating post is sufficiently removed from the switch blades to afford ample protection to sets up to 1 K. W.

Connections are as follows:

Antenna, to right hand connection at top of post.

Transmitting set, to left hand connection at top of post.

Transmitting power circuit, to left hand pair of switch terminals one side of line only, being connected in series with the switch.

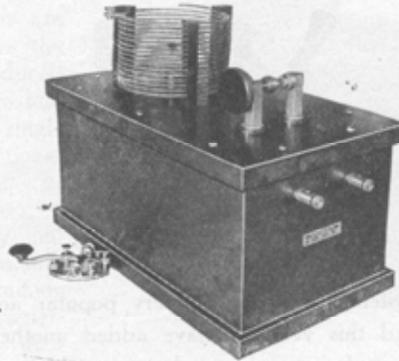
Rotary spark gap motor circuit, to right hand pair of switch terminals, one side of line only, being connected in series with the switch.

Receiving set to center pair of switch terminals, the two wires from the primary of the receiving transformer being connected directly to them and the front center switch terminal should also be grounded.

Notwithstanding the much greater expense of this switch, we have not increased its price and it represents a value to which the illustration cannot do justice.

Cat. No. W 658. Improved Antenna Switch Price \$7.50

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.

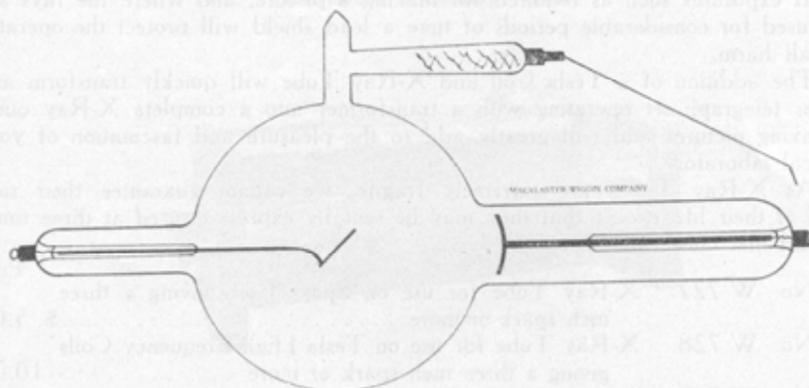
The Spark Gap. A special zinc spark gap designed for this set is used, having a fine screw adjustment for accurate work. The zinc electrodes are $\frac{3}{8}$ inch in diameter and may be renewed at a cost of fifty cents per pair. With ordinary use, however, they will last indefinitely.

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.

Cat. No. W 659. $\frac{1}{4}$ K. W. as illustrated Price \$35.00

Blitzen X-Ray Tubes



The X-Ray presents one of the most interesting and wonderful fields open to the electrical experimenter, but we believe nearly, if not all, of the equipments offered for general use, except those intended for the medical profession, are mere toys, and not of sufficient power to fully demonstrate the many marvels of this science in a satisfactory manner. The Blitzen X-Ray tubes should not be confused with very small imported tubes sometimes offered, as they are made in America by skilled workmen who for many years have made nothing but the highest grade X-Ray tubes for Physicians, Hospitals, etc. These tubes will make excellent photographs of the hand, wrist, forearm, toes, etc., as well as of small animals and will show the bones, joints, and other parts very clearly. They will also take pictures of coins or other metal objects through several inches of hard wood. No camera is required, the object to be photographed being merely laid on top of the plate holder or envelope containing an ordinary dry plate or film and the rays projected from above, for a sufficient time to make the exposure, which a few experiments will quickly determine. As the X-Rays are invisible themselves, it is necessary to use a fluorescent screen, called a fluoroscope, when it is desired to actually see through the hand or other object without making a photograph. Our fluoroscope is made with a screen coated with the best grade of Platinum Barium Cyanide crystals, and for those who wish to construct their own fluoroscopes we also supply the screen only which may be mounted in any box or holder to suit the purchaser. While the above material is the best and will give the most brilliant image, screens coated with Tungstate of Calcium will give satisfactory service for all ordinary purposes. Our No. W 727 Tube is intended for use on spark coils only and will operate on any coil giving a spark three inches or more in length. It has a bulb four inches in diameter and will give a very powerful ray for all laboratory purposes. Our No. W 728 Tube is a double focus tube and is intended only for use on Tesla High Frequency Coils. It has a bulb four inches in diameter and will give a very powerful ray on any of our high frequency coils. The No. W 728 Tube is also equipped with a vacuum regulator for lowering the vacuum when it becomes too high, as it will do in time. The vacuum of the No. W 727 Tube may also be lowered by carefully heating the tube in an oven for a short time but it is not equipped with the vacuum regulator.

We wish to caution the purchaser of these tubes against continuously exposing themselves to these rays as they produce very serious burns which often do

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not appear for several weeks after the exposure. There is no danger, however, in short exposures such as required for making a picture, and where the rays are to be used for considerable periods of time a lead shield will protect the operator from all harm.

The addition of a Tesla Coil and X-Ray Tube will quickly transform any wireless telegraph set operating with a transformer into a complete X-Ray outfit for making pictures and will greatly add to the pleasure and fascination of your electrical laboratory.

As X-Ray Tubes are extremely fragile, we cannot guarantee their safe arrival or their life except that they may be sent by express *insured* at three times the usual first class rate.

	Price
Cat. No. W 727. X-Ray Tube for use on Spark Coils giving a three inch spark or more	\$ 5.00
Cat. No. W 728. X-Ray Tube for use on Tesla High Frequency Coils giving a three inch spark or more	10.00
Cat. No. W 729. Complete X-Ray outfit for use on 110 volt lighting circuit consisting of No. W 616 Spark Coil, No. W 611 Electrolytic Interrupter, No. W 615 Knife Switch and fuses, and No. W 727 X-Ray Tube	30.00
Cat. No. W 730. Complete X-Ray and High Frequency Tesla Coil outfit consisting of our No. W 602 outfit, together with one of our No. W 728 X-Ray Tubes.....	45.00



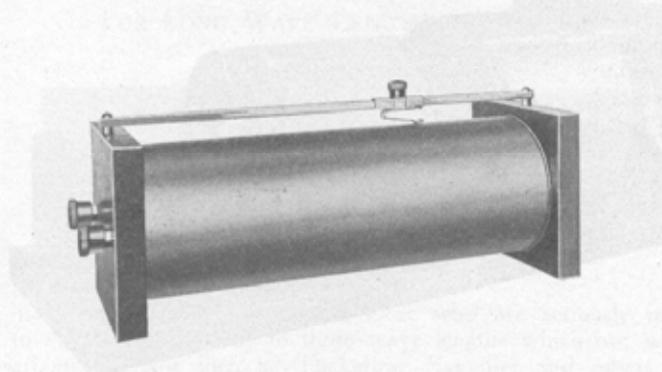
Clamp for holding X-Ray Tube to any upright rod. It will hold the tube securely and will be found a great convenience.

Cat. No. W 731. Special Tube Clamp	Price \$2.00
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Cat. No. W 732. Platinum Barium Cyanide Fluoroscope with 5 x 7 screen	\$14.25
Cat. No. W 733. Screen only. Price per sq. inch30
Cat. No. W 734. Screen only, of Tungstate of Calcium. Price per sq. inch .....	.15

Blitzen Tuning Coil

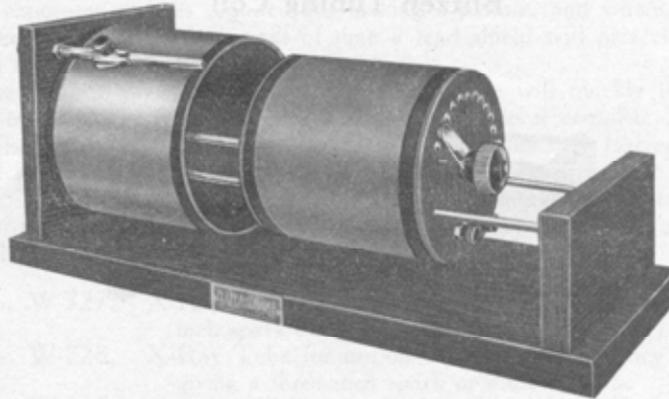


For most purposes a simple tuning coil is wholly satisfactory and will bring in distant stations with fine intensity. For those who do not wish to make a large initial investment, for the beginner or learner we recommend this tuning coil. It is equipped with the same high grade slider, the same quality of solid mahogany ends, and is built with the same care as our more expensive apparatus, and is intended for those who wish a simple outfit and at the same time one which will please the eye and lend pride to ownership.

The tube is of smooth built up paper without grooves, finished in imitation hard rubber, is 10 inches long and $3\frac{1}{2}$ inches in diameter, and is wound with bare copper wire, evenly spaced apart. Binding posts are composition rubber covered, and the entire instrument is most attractive and efficient.

Cat. No. W 500.	Tuning Coil complete	\$1.75
Cat. No. W 501.	Tube only, not wound, 10" long, $3\frac{1}{4}$ " inside diam., $3\frac{1}{2}$ " outside diam. Each .....	.20
Cat. No. W 502.	Tube wound with bare copper wire evenly spaced apart. Each .....	.70
Cat. No. W 503.	Mahogany ends, finished, 4" x 4" x $\frac{3}{8}$ ". Each ....	.35
Cat. No. W 504.	Slider to fit $\frac{3}{16}$ " square rod, nickel plated. Each	.30
Cat. No. W 504A.	Slider rod, $10\frac{3}{4}$ " long, $\frac{3}{16}$ " square, nickel plated, with screws. Each .....	.25
Cat. No. W 504B.	Rubber covered binding screws, with brass machine screw, washer and nut. Each .....	.10

"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 paper tubes 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 lengths 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 $5\frac{1}{2}$ inches in diameter respectively.

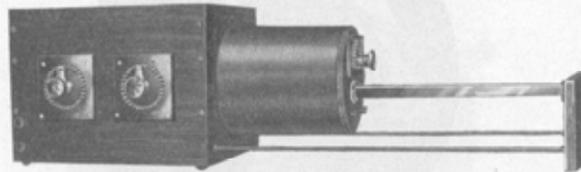
The mahogany base measures $5\frac{1}{2}$ inches x $13\frac{1}{2}$ inches x $\frac{3}{4}$ inch.

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
Cat. No. W 673. Price, complete	\$7.50
(Shipping weight, 10 lbs.)	
Cat. No. W 673A. Slider to fit $\frac{3}{16}$ in. square rod	\$0.30
Cat. No. W 673B. Primary Tube, $4\frac{1}{2}$ in. long, $5\frac{1}{2}$ in. diam., not wound .....	.20
Cat. No. W 673C. Primary Tube wound with bare wire evenly spaced apart .....	.70
Cat. No. W 673D. Secondary Tube, $4\frac{1}{2}$ in. long, $4\frac{1}{2}$ in. diam., not wound .....	.20
Cat. No. W 673E. Secondary Tube wound with double green silk wire, 10 taps	1.25
Cat. No. W 673F. Mahogany base, $5\frac{1}{2}$ in. by $13\frac{1}{2}$ in. x $\frac{3}{4}$ in. ....	.60
Cat. No. W 673G. Mahogany large end, $5\frac{1}{2}$ in. x $5\frac{1}{2}$ in. x $\frac{3}{4}$ in. ....	.40
Cat. No. W 673H. Mahogany small end, $4\frac{1}{2}$ in. x $2\frac{1}{2}$ in. x $\frac{3}{4}$ in. ....	.30
Cat. No. W 673 I. Round mahogany end, plain, $4\frac{1}{2}$ in. diam. ....	.50
Cat. No. W 673J. Round mahogany end, complete with 10 point switch and points	1.25

The Cambridge Tuner

FOR LONG WAVE LENGTH STATIONS



There is an increasing desire among those who are seriously interested in radio work to adapt their stations to those wave lengths which are used by the great Transatlantic stations such as Tuckerton, Sayville, and others in process of erection. These stations have been the sole means of communication between this country and Germany during the great European struggle now in progress and employ wave lengths running from 10,000 meters upwards to about 15,000 meters.

The general tendency in high power radio work is all in the direction of arcs, alternators, and other forms of maintained wave generators, and invariably toward very long wave lengths, which are essential to such equipments and the high powers used. It should be understood by the purchaser that many such stations are not audible without the use of a ticker, oscillating Audion, as described by Armstrong and others, or some other means of breaking up the waves into audible groups or beats, but where such means are available, work of the most interesting character may be done, and several of our customers report reception of signals from Nauen, Germany, with fair regularity.

The Cambridge Tuner is designed only for these long wave lengths, that is, 2000 meters up to about 15,000 meters. It is wound throughout with double silk covered wire, on cylindrical tubes, $6\frac{3}{8}$ inches and $7\frac{1}{2}$ inches in diameter respectively. Tuning is done entirely by switches and all sliding contacts are eliminated. The primary is entirely enclosed in a handsomely finished mahogany cabinet opened at one end to receive the sliding secondary. All metal parts are nickel plated brass, except switch contacts which are silver plated to insure the highest degree of conductivity. The total length of the instrument is 36 inches, while the cabinet enclosing the primary is 10 inches square by $13\frac{1}{2}$ inches long. Primary has 34 taps brought out to switches.

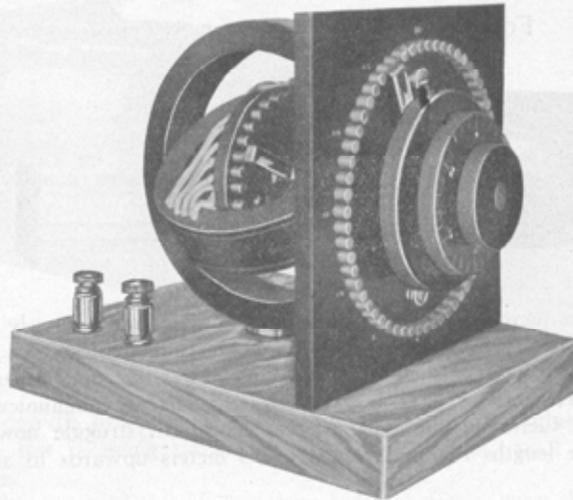
The instrument is designed to permit close tuning on the primary and very loose coupling between primary and secondary, which is quite essential for maintained wave reception.

The secondary coil is equipped with an 18 point switch for varying its inductance.

We can recommend this tuner to schools, colleges, students and electrical laboratories in general as opening a field of great interest and in line with the latest and best thought of the world's greatest radio engineers.

Cat. No. W 610.	Cambridge Tuner	\$40.00
Cat. No. W 610A.	Smooth paper tube, $7\frac{1}{2}$ in. x 13 in. ....	.50
Cat. No. W 610B.	Smooth paper tube, $7\frac{1}{2}$ in. x 13 in., wound full with No. 30 D.S.C. wire and tapped at 34 points	4.50
Cat. No. W 610C.	Smooth paper tube, $6\frac{3}{8}$ in. x $12\frac{1}{2}$ in. ....	.40
Cat. No. W 610D.	Smooth paper tube, $6\frac{3}{8}$ in. x $12\frac{1}{2}$ in., wound full with No. 32 D.S.C. wire and tapped at 18 points	2.95

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 nicked 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 and with larger antenna up to 2500 meters.

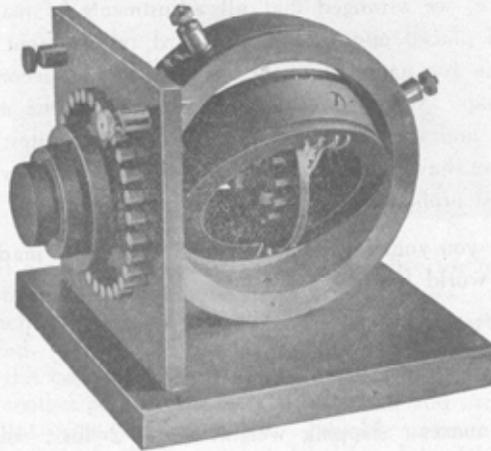
The wide variation of inductance available in the secondary renders it most efficient for use with all types of detectors including the Audion.

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.

Cat. No. W 674. Price\$25.00

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?

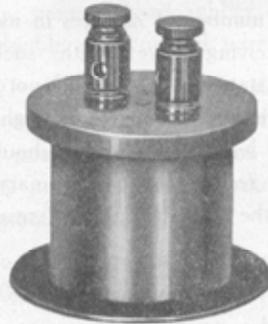
We will ship you your ideal tuner in a box specially made to carry it safely to any part of the world for

Cat. No. W 671. Price\$12.00

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.

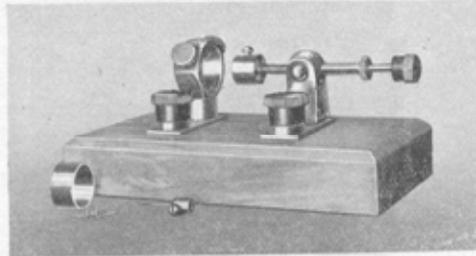
Fixed Condenser



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.

Cat. No. W 672. Price\$1.50

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.

- Cat. No. W 675. Price of Detector Stand, complete, with all parts shown in the illustration \$3.25
- Cat. No. W 676. Additional Stationary Cups to fit Holder, each :15
- Cat. No. W 677. 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.

- Cat. No. W 678. Price of Detector Stand, complete with Ferron crystal \$5.00

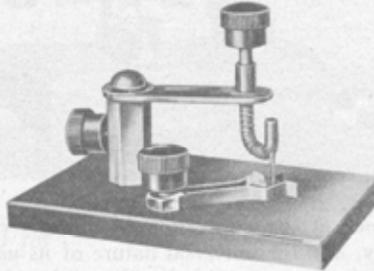
Any defective crystal returned to us within two weeks from date of purchase will be replaced without charge. Crystals worn out in use will be replaced as often as desired at a charge of one dollar upon return of old crystal only. Crystals not sold separately.

- Cat. No. W 675A. Detector Stand unmounted, complete as shown above, except without marble base, and intended for mounting direct on cabinet sets. Price \$3.00

The Blitzen Detector Stand

Holds any crystal.

Universal adjustment.



Price

\$1.00

Will do the work of stands costing several times as much.

An inexpensive stand that is "good" from the bottom up. A black slate base two inches by three inches by $\frac{3}{8}$ inch gives stability and will not wobble every time you make an adjustment.

The clip for holding the crystal is of phosphor bronze and will grip tightly any crystal of almost any size or shape. The binding screws are black rubber composition covered.

The upright post and all other metal parts except the point are of brass finely nickel plated.

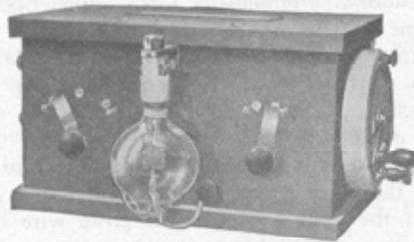
The top plate carrying the bent arm is held under a spring washer and pivots around the upright post, while the bent arm is free to rotate in its socket, so that the instrument has a universal adjustment for all positions.

The bent arm also has a vertical motion controlled by a coiled spring which always keeps a tension on the point against the crystal.

You will enjoy using this stand either as a part of your outfit, as a spare or for testing various minerals to which it is adapted.

Cat. No. W 738. Blitzen Detector Stand (no crystal) Price \$1.00

De Forest Audion Detector



IMPROVED TYPE R. J. 4

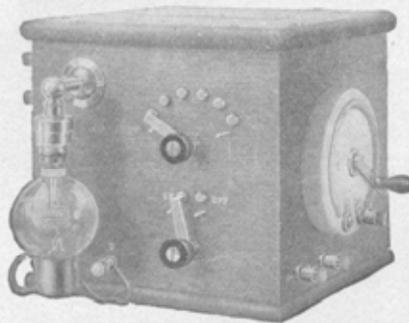
One of the highest developments of detecting apparatus known to science is the Audion Detector.

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 "Battery."

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.

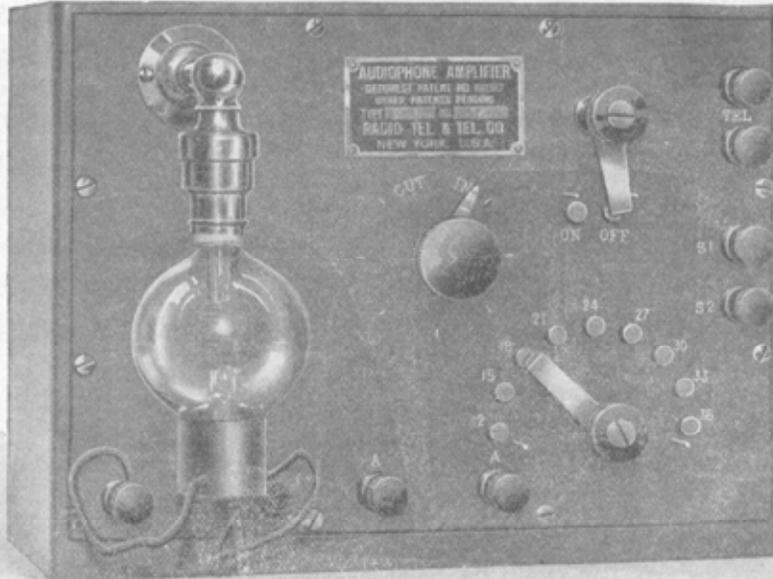
Each bulb has two filaments, so that after one burns out the other may be used, thereby doubling the life of the bulb. To connect in the second after the first has been consumed, wind the little copper wire tight around the brass base of the lamp underneath the rubber band.

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

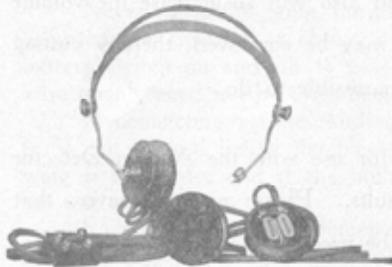
Cat. No. W 679.	R. J. 4 Audion Detector, as illustrated	.....\$18.00
Cat. No. W 680.	R. J. 5 Audion Detector, as illustrated	..... 25.00
Cat. No. W 681.	P. J. 1 One Step Amplifier	..... 65.00
Cat. No. W 682.	P. 2 Two Step Amplifier	.....300.00
Cat. No. W 683.	P. N. Audion Detector, licensed for commercial work	..... 50.00
Cat. No. W 684.	4-volt 30 ampere hour storage battery	..... 5.00
Cat. No. W 685.	6-volt 60 ampere hour storage battery (recommended by us)	..... 12.00

Audion Bulbs and Renewals

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 of Tungsten Filament at the same price.

Cat. No. W 686.	Renewal Bulbs, S grade, each	.....\$ 4.00
Cat. No. W 687.	Renewal Bulbs, X grade, each	..... 6.00
Cat. No. W 688.	Renewal Bulbs, Amplifier, each	..... 7.50
Cat. No. W 703.	3 Cell 4 Volt Flashlight Batteries for renewing high tension batteries in the audion—best grade (10 required to each set) Price each	..... .40

No. 55 Special Receivers



WITH REGULAR
HEAD BAND



WITH CORONET
HEAD BAND

A sensitive 2000 ohm head set at \$4.00 having good workmanship and material is somewhat unusual. The manufacturers of this receiver claim that this set will appeal to your eye as an especially fine looking equipment, to your ear as being as sensitive as you can buy for double the price, and to your business instinct as the best value obtainable. They back these statements with a guarantee of "Satisfaction or money back."

Buy these telephones for extras or for emergency use and you will be glad to use them all the time. Buy them for your friends to listen in and you will pass your present favorites to them thereafter. Equally good for the novice or expert, super-sensitive, strong, permanently adjusted, durable, efficient, and unrivaled value.

SPECIFICATIONS

Complete double sets made in resistances of 2000 and 3000 ohms; bipolar receivers; cases, special process hard rubber composition; patented solid construction; magnets, best quality steel in amount sufficient to provide dense and permanent magnetization; spool windings, enamel coated copper wire; diaphragm, thin flexible, non-rusting, and perfectly seated; cord, five foot, mercerized, best quality; head band, nickeled German silver, split and adjustable, weight complete double set 14 ounces, shipping weight double sets, 1 1/4 lbs., single set, 1 lb., receiver only 1/2 lb.

Cat. No. W 55.	Complete double set 2000 ohms	\$4.00
Cat. No. W 55A.	Complete double set 3000 ohms	5.00
Cat. No. W 55B.	For coronet head band on either set add	.50
Cat. No. W 55C.	Complete single set 1000 ohms	2.00
Cat. No. W 55D.	Complete single set 1500 ohms	2.50
Cat. No. W 55E.	Single receiver only 1000 ohms	1.50
Cat. No. W 55F.	Single receiver only 1500 ohms	2.00
Cat. No. W 55G.	Cord five foot mercerized, double	.50
Cat. No. W 55H.	Headband nickelled German Silver, double	1.00
Cat. No. W 55 I.	Receiver Cap	.25

The Blitzen Amplifying Telephones

These receivers will positively give from two to three times the intensity with nearly all signals, several customers writing us that when used with a crystal detector, results are almost if not quite equal to the addition of an Audion amplifier. The diaphragm is not acted upon directly by a varying magnetic force but is made of mica and receives its impulses from a thin iron armature to which it is connected by a link.

Some of the prominent advantages of this instrument may be briefly mentioned. It has a long permanent magnet being more than a complete circle since the ends overlap. The magnetic circuit has comparatively little reluctance having a double path between the pole pieces. The air spaces are thin and the flux from the permanent magnet does not have to pass lengthwise through the armature. These features of the magnetic circuit favor a strong flux and permanency of magnetization.

The loss of power by hysteresis and eddy currents is reduced to a minimum and the effect of the winding upon the armature is utilized at both ends and on both sides at each end. The diaphragm being of thin mica is very light and sensitive and the total weight of all moving parts is only a fraction of the weight of the common steel diaphragm. The head band is very simple and its construction will be easily understood from the illustration. It fits snugly and comfortably and will not pull the hair. The increase in distance and intensity of signals produced by these receivers will actually surprise you. If they don't accomplish what we say they will, return them in three days in good condition and your money will be cheerfully refunded.

Cat. No. W 632. Blitzen Amplifying Telephones \$24.00



Navy Type Telephones



Brandes Navy Type Telephones need no introduction to the wireless fraternity as they have been favorably known for a number of years as a sensitive and reliable receiver of good construction and light weight. Each receiver weighs only three ounces and is built like a watch. They are wound to 3200 ohms resistance, have polished aluminum cases, shallow hard rubber ear caps, double hard rubber covered headband with swivelled joints, six foot best silk cord and thin diaphragms (.004 inch.)

Cat. No. W737. Brandes New
 Navy Type Head Set Price \$13.00
 Cat. No. W737A. Six foot green
 silk cord, double80
 Cat. No. W737B. Receiver cap25

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, 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 an unusual degree.

The total weight is only 10½ 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, 1½ lbs.

Cat. No. W 689. Price, complete, for two receivers, hard rubber covered headband and green silk cord	\$8.00
Cat. No. W 689A. Receiver cap .....	.25
Cat. No. W 689B. 6 foot green silk cord .....	.80

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

Cat. No. W 690.	200 ohms, per set ..	\$4.50
Cat. No. W 691.	1000 ohms, per set ..	5.50
Cat. No. W 692.	1500 ohms, per set ..	6.50
Cat. No. W 693.	2000 ohms, per set ..	7.50
Cat. No. W 694.	3000 ohms, per set ..	8.50
Cat. No. W 690A.	6 foot silk cord, double	.80
Cat. No. W 690B.	Receiver cap .....	.25
Cat. No. W 690C.	Diaphragm .....	.10

"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.



Cat. No.	
W 695.	Price Trans-Atlantic Model Telephones, complete ... \$9.00
W 695A.	Receiver cap
W 695B.	6 foot green silk cord

NEW MODEL TRANS-ATLANTIC



"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.

Cat. No.	
W 696.	2000 ohm Superior Set, as illustrated
W 697.	2000 ohm Superior Set, Leather Covered Head- band
W 697A.	Receiver cap
W 697B.	6 foot silk cord

The New Blitzen Rotary Variable Condenser

Better Construction.

Genuine Aluminum.

Plates accurately machined.



Leak Proof.

Handsome appearance.

Efficient.

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.

Not only is the quality of this condenser above competition but it actually costs no more than inferior imitations. We manufactured and marketed the first rotary variable condenser offered in this country and for many years have excelled in their construction.

We recently sold fifty of these condensers from stock to the United States Navy Department. Uncle Sam does not buy poor instruments for his battleships and the purchase of our condensers by him is in itself a testimonial to their high excellence.

The condenser has 43 aluminum plates (21 rotary and 22 stationary) accurately punched with hardened dies. Beware of the condenser with plates containing iron or steel.

The capacity of each condenser is approximately .0008 M. F., sufficient for all ordinary purposes in connection with tuners of all sizes. The shaft carrying the rotary plates is of the finest tool steel made and runs in a long accurately machined brass bearing insuring long life and permanency of adjustment. All plates, both rotary and stationary, are spaced with brass separators machined to an accuracy of one half of one thousandth of an inch. The entire condenser is enclosed in a cylinder of the clearest and toughest flint glass with a pressed aluminum base and a top of special moulded insulating material which will not lose its high polish or its soft black color. The knob and binding posts are made of the same material as the top, while the aluminum pointer reads on a scale engraved directly on the top.

The glass case renders the mechanism of the condenser visible at all times and the fine workmanship thus exposed to view lends an exceedingly attractive appearance to the instrument.

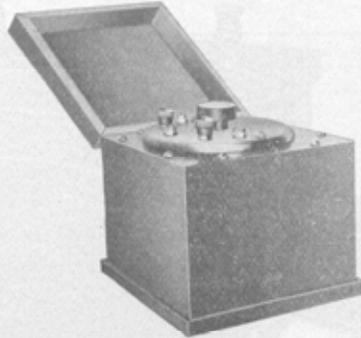
For the convenience of those wishing to purchase condensers for mounting in their own cabinets or sets we are now supplying this condenser without glass case or bottom but otherwise complete and when so supplied the condenser will fit in a round hole 3 5/16 inches in diameter and requires a space 2 1/2 inches deep.

The complete condenser measures 4 1/4 inches across the widest part of the base and the total height is 3 3/4 inches. Shipping weight, two pounds.

Cat. No. W 735. Blitzen Rotary Variable Condenser, complete. Price \$4.00

Cat. No. W 736. Blitzen Rotary Variable Condenser without glass case or base 3.60

The Blitzen Wave Meter



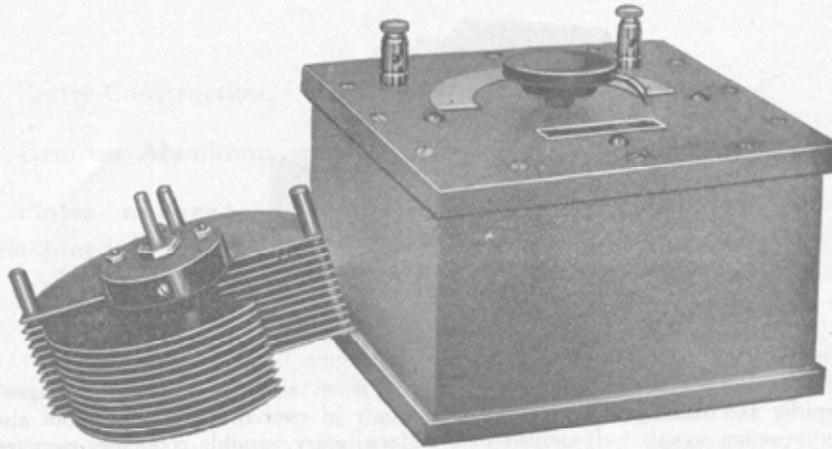
"The Blitzen" wave meter shown above is an accurate instrument designed for rapidly ascertaining the wave length, not only of your own transmitter but also of any incoming signals. It consists of a Blitzen rotary variable condenser mounted in a finely finished mahogany cabinet having a hinged cover. In this cover is mounted the inductance coil cleverly concealed from sight. The cover folds back exposing all connections to view and placing the coil and condenser in a convenient position for operation.

Full directions for use and a calibration curve sheet are furnished with each instrument. This meter is accurate to within three per cent which is sufficient for all ordinary purposes.

When furnished with buzzer and battery the wave meter emits oscillations of known wave length, this wave length depending on the setting of the meter in accordance with the calibration curve furnished. When so used it provides a source of test signals of any desired wave length from which a receiving set may be calibrated or any other tests may be made. When furnished without detector or telephones the instrument may be used in connection with any high grade 2000 ohm head set and any type of crystal detector the purchaser may have at hand.

- Cat. No. W 633. Blitzen Wave Meter with curves and directions; for 150 to 650 meters Price \$6.00
- Cat. No. W 634. Blitzen Wave Meter with curves and directions; for 150 to 2000 meters 8.00
- Cat. No. W 635. Blitzen Wave Meter with curves and directions; for 150 to 2000 meters with high frequency buzzer and battery completely wired to the instrument ... 12.50
- Cat. No. W 703. Renewal Battery for buzzer40
- Cat. No. W 704. Blitzen Wave Meter with curves and directions; for 150 to 2000 meters with high frequency buzzer and battery completely wired to instrument, including a single 1000 ohm telephone receiver and cord, and a crystal detector for use either for measuring wave lengths or for producing an oscillating test circuit of known frequency or wave length 17.00
- Cat. No. W 727. Blitzen Wave Meter with curves and directions; for 150 to 2000 meters, including a single 1000 ohm telephone receiver and cord and crystal detector for use as a complete portable wave meter but without buzzer and battery for producing oscillations 12.50

"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.

Cat. No. W 698. 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.

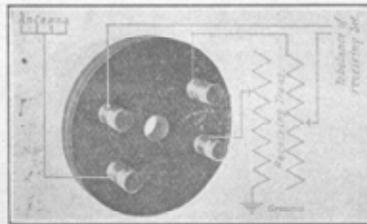
We can also furnish to order condensers similar to the above of larger capacities, mounted in oil-tight metal cases, for a wide variety of purposes, such as experimental work with oscillating arcs, etc., at the following prices:

Cat. No. W 699.	.001 M. F.	\$18.00
Cat. No. W 700.	.002 M. F.	24.00
Cat. No. W 701.	.003 M. F.	32.00

Large Size Rotary Variable Condenser Parts

Cat. No. W 420.	Celluloid protractor scales, semicircular, divided into 180 degrees, outside diameter, $4\frac{3}{8}$ inches, each	\$0.25
Cat. No. W 421.	Rotary Condenser Plates, aluminum, each	.09
Cat. No. W 422.	Stationary Condenser Plates, aluminum, thin, each	.09
Cat. No. W 423.	Stationary Condenser Plates, aluminum, thick end plates, each	.10
Cat. No. W 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
Cat. No. W 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
Cat. No. W 426.	Complete set of parts to make Condenser as above, without cabinet	5.00

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.

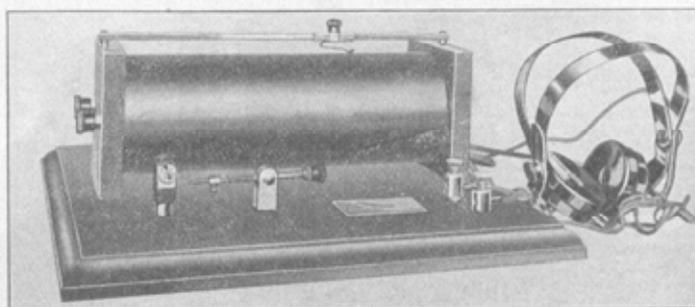
The Blitzen loader has two coils wound in a slotted hard rubber disc, each fitted with a pair of binding posts for connection in the primary and secondary circuits respectively. These two coils *have coupling between them*, so that the coupling is not unduly loosened as is the case where ordinary loading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

- Cat. No. W 705. "A" coil adds approximately 1000 meters to any receiving transformer
- Cat. No. W 706. "B" coil adds approximately 1400 meters to any receiving transformer
- Cat. No. W 707. "C" coil adds approximately 2000 meters to any receiving transformer
- Cat. No. W 708. "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

Lodge Type Receiving Set



Sir Oliver Lodge is credited with being the first to solve the problem of syntony by placing variable inductances in the antenna of a transmitting set and a distant receiving set and so bringing these stations into tune or resonance.

While the principles of tuning are now well understood and are quite simple to all of us, the disclosure of these principles by Lodge is all that makes possible our modern radio systems. Our Lodge type receiving set is intended for those who desire a simple outfit, moderate in price, with a lack of complicated adjustments, and at the same time a set having good workmanship and material, and such satisfactory service as is usually associated only with the more complicated and elaborate outfits. We believe there are many who will appreciate such a simple outfit, amply fulfilling their requirements, without giving offence to their eyes or needing apology for its operation.

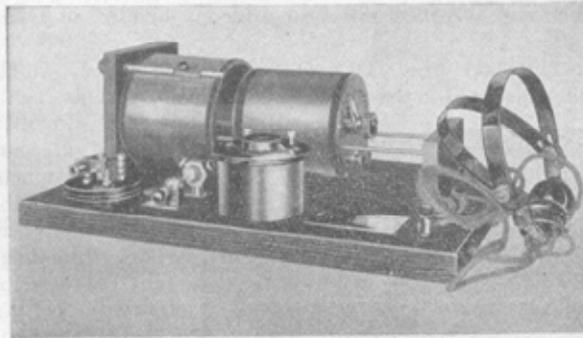
Such a set is our Lodge type; consisting of our Blitzen Tuning Coil, Fixed Condenser, Detector Stand and Telephone, all mounted on a handsome mahogany finished base as shown in the illustration and measuring 12 inches by 9 inches.

This set is really capable of very good work over long distances in spite of its simplicity and will provide all the pleasure, amusement or instruction that could be derived from a more expensive or elaborate equipment.

This set is furnished in several different combinations and we recommend the outfits equipped with the 2000 ohm double head sets as being much more efficient.

Cat. No. W 628.	Lodge type Receiving Set consisting of Blitzen Tuning Coil, No. 55 2000 ohm double head set, Universal Detector Stand and Fixed Condenser, as illustrated. Price	\$12.75
Cat. No. W 629.	Same as No. W 628 but including a Blitzen Detector Stand instead of our well known Universal Detector Stand	10.75
Cat. No. W 630.	Same as No. W 629 but with a single 1000 ohm receiver cord and headband instead of double head set	9.00
Cat. No. W 630A.	Same as Cat. No. W 630 with a single 80 ohm telephone receiver without headband	8.00

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 up to 3000 meters, 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.

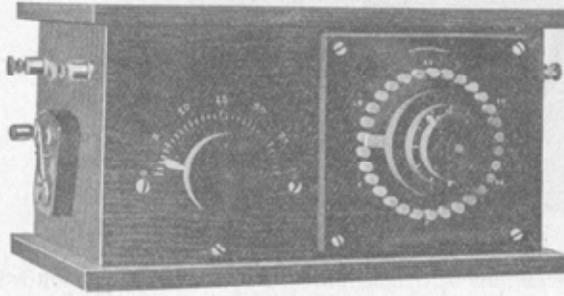
The entire set, which is mounted on a mahogany base 10½ inches wide x 14 inches long, not only makes a most attractive and imposing appearance, but its performance will give you a real surprise by its ready response to signals at great distances, and by its fineness of adjustment so necessary for cutting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

Cat. No. W 709.	Radion Set, complete, without telephones or detector crystal	\$20.00
Cat. No. W 710.	Radion Set, complete, without telephones, with Ferron Crystal	21.25
Cat. No. W 711.	Radion Set, complete, with 2000 ohm Head Set and Ferron Crystal	25.25
Cat. No. W 712.	Radion Set, complete, with 2000 ohm Head Set, without crystal	24.00
Cat. No. W 713.	Radion Set, complete, with 3000 ohm Holtzer-Cabot Head Set and Ferron Crystal	29.00
Cat. No. W 714.	Radion Set, complete, with 3000 ohm Holtzer-Cabot Head Set, without Ferron Crystal	28.00
Cat. No. W 715.	Radion Set, complete, with 3000 ohm Holtzer-Cabot Head Set and R. J. 4 Audion Detector in place of Ferron Detector	45.00
	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 5 1/4 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.

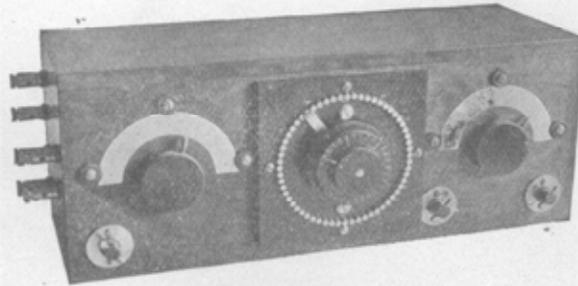
When so ordered, this set may be furnished with a Blitzen duplex loading coil and switch mounted on the right-hand end of the cabinet, which will increase the wave length of the set to include all wave lengths up to 3000 meters. The switch on the loading coil when in the down or closed position short 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

Cat. No.		
W 716.	Blitzen Receiving Set, without telephones or detector	\$24.00
W 717.	Blitzen Receiving Set, with Holtzer-Cabot 3000 ohm Head Set and Universal Detector Stand (no crystal)	35.00
W 718.	Blitzen Receiving Set, with Holtzer-Cabot 3000 ohm Head Set and Ferron Detector, complete, with crystal	36.00
W 719.	Blitzen Receiving Set, with high grade 2000 ohm Head Set, no detector	29.00
W 720.	Blitzen Receiving Set, with high grade 2000 ohm Head Set and Universal Detector Stand (no crystal)	32.00
W 721.	Blitzen Receiving Set, with high grade 2000 ohm Head Set and Ferron Detector complete, with crystal	33.00
W 722.	Blitzen Receiving Set, with Holtzer-Cabot 3000 ohm Head Set and Audion Detector	50.00
W 723.	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:

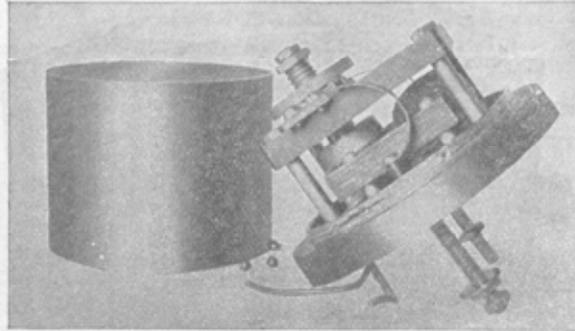
- 2 pairs for connecting any two detectors to the set.
- 1 pair for connecting telephone.
- 1 pair for connecting antenna and ground.

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.

Cat. No. W 724.	Type D Receiving Set	\$ 90.00
Cat. No. W 725.	Type D. Receiving Set, with Ferron Detector...	95.00
Cat. No. W 726.	Type D Receiving Set, with R. J. 5 Audion Detector	115.00

Any other detector may be furnished at regular prices.

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.

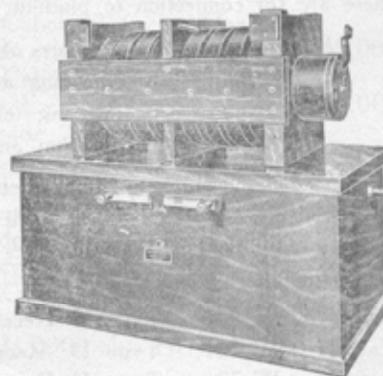
Relays. We have designed and constructed relays for large currents, and illustrate one type which operates on both A. C. and D. C., and satisfactorily breaks upwards of 10 K. W.

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

QUALITY **CE** SERVICE