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**“ROENTGEN”**  

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**INDUCTION**  

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**COILS . . . .**  

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and other  
X-RAY APPARATUS.



**JAMES G. BIDDLE,**

General Sales Agent,

1112-1114 Chestnut Street,

PHILADELPHIA, U. S. A.



**“Roentgen”**  

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**Induction Coils**  

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**X-Ray Apparatus.**

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## ANNOUNCEMENT.

The X-Ray Coils and Interrupters described in this catalogue are made by the **Roentgen Manufacturing Co.** of Philadelphia, for which the undersigned acts as general sales agent.

All "Roentgen" Apparatus is made of the best obtainable materials, by skilled mechanics and is guaranteed to be strictly first-class in every detail.

The demand for large and powerful X-Ray machines is very fully met by Roentgen Coils of 15-inch and 18-inch ratings, especially when equipped with Roentgen Electrolytic Interrupters. Outfits of this character will be found entirely equal to the *rapid* radiographic work which is now required by many hospitals.

For therapeutic treatment and for radiographic work that does not require *high speed* the Roentgen Portable Coil will prove very effective. It can be carried about without injury, and is undoubtedly the apparatus to use at the home of a patient.

Particular attention is requested to *Interrupters* made by the Roentgen Manufacturing Co. The Roentgen Electrolytic Interrupter produces maximum energy at the coil terminals, with minimum manipulative attention, and rarely "chokes" unless operated much longer at a time than is usually necessary.

The Roentgen Self-starting Mechanical Interrupter is a decided advance over previous forms of the same general class. It is positively *self-starting* and will "break" a relatively larger amount of current without appreciable sparking at contact points. Also it can be operated at a high rate of interruption, which is essential to satisfactory fluoroscopic examinations.

The other apparatus described in this catalogue is the very best which we can secure at the present time. We are constantly alert for improvements and aim to supply up-to-date equipments of highest quality.



We believe there is a steady demand for *first-class* X-Ray apparatus and desire this fact to be properly considered when our prices are compared with quotations obtained elsewhere.

It is impossible to make a really intelligent selection of X-Ray apparatus by depending entirely on catalogues or even on the advice of experts already in the field. The intending buyer should have an opportunity to personally examine the apparatus and see for himself just what it will do.

For that purpose we have equipped (at large expense) an exhibition room with photographic dark room attached, and cordially invite our medical friends to inspect this *working exhibit* which is in charge of a competent expert operator. *Whenever possible it is well to make an appointment in advance.*

We carry a *varied stock of X-Ray Tubes* suitable for induction coils or static machines. When buying tubes customers should give full particulars of the exciting apparatus with which they are to be used. Being fragile all tubes are shipped at the risk of the purchaser, and we assume no responsibility for breakage.

In the hands of a *competent expert* we claim unhesitatingly that our X-Ray Apparatus will produce *unsurpassed results*. A *novice* can hope for no real success, no matter how good his equipment may be.

Upon request, we shall be glad to recommend the most suitable outfit or apparatus to meet any stated requirements.

**JAMES G. BIDDLE,**  
**General Sales Agent.**

Philadelphia, November, 1903.

**The Roentgen Manufacturing Co. was established June, 1903. As this fact indicates it is a comparatively new enterprise, but the men connected with the company have had long experience in manufacturing and selling X-Ray Apparatus.**

## *Roentgen Induction Coil.*

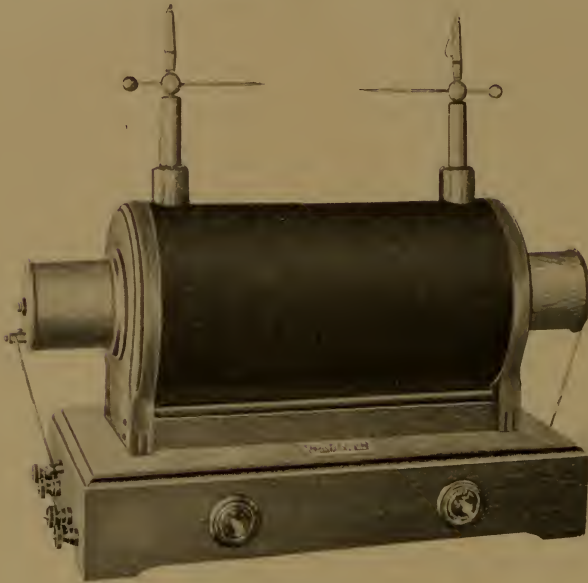


FIGURE 1.

### *Roentgen Induction Coil.*

**T**HE Induction Coil is now firmly established as the standard apparatus for X-Ray work. There was question when the rays were discovered and for a long time afterward regarding the most efficient and flexible apparatus for the generation of the discharge. The Static Machine, the Tesla or Thompson Coil, and the Induction Coil were the different types of machines available.

**The Induction Coil the Thing.** The Tesla coil was soon dropped, and the Static Machine, because of its advantage in direct electrotherapeutics divided honors with the Induction coil, which was found better for radiography, but not superior in fluoroscopic work.

Induction coils have been much improved and adapted to direct electro-therapeutics, so that the static machine yielding indifferent results in Skiagraphy is now seldom installed in a first-class X-Ray equipment.

NOTE.—Figure 1 illustrates a 12-Inch Type "E" Coil for use with Electrolytic Interrupter.

**The Kind of Spark.** As is well known the "thin blue spark" from an induction coil is one with small energy and the "fat, red spark" the one with greater power. Our coils have been made to deliver exceptionally heavy sparks, and we believe them the most powerful coils made.

**Latest Type of Coil.** They represent the latest achievements in the art of coil building. The secondaries are built up in sections and insulated with our own special compound, which does not deteriorate with age or usage of the coil.

We guarantee the induction coil to be of the best of construction and not to break down or become injured by ordinary usage.

Mica is used exclusively as the insulation in our condensers, though some makers still cling to the less expensive paraffined paper, which absorbs much of the energy of the current and prevents a heavy output from the coil.

**Interrupters.** Our self-starting mechanical interrupter is the mechanical interrupter *par excellence*, as it is absolutely reliable, has few adjustments and uses but little current. It is especially suited to the long and continuous running necessary in therapeutic work.

The Roentgen Electrolytic Interrupter is used on Roentgen coils for making radiographs by short exposures, and we think we have succeeded in making it the most reliable and efficient electrolytic interrupter manufactured.

**Rheostats.** Our rheostats are especially made for us and are of ample capacity to carry the currents used without undue heating. We prefer to mount the rheostat away from the coil to prevent the varying expansion and contraction of the coil parts which results from the alternate heating and cooling.

**Switches.** All switches furnished with our regular coils are of the indicating snap type. Experience has taught that these are advisable to minimize the arcing which occurs at the switch contacts and that they are much more desirable than knife switches.

**Finish.** The finish is superior throughout. Either polished mahogany or selected quartered oak is furnished for the wood-work as desired. Polished hard rubber of best quality is used for the jackets of the secondary cylinders, for the high tension terminals and wherever high insulation is needed.

## *Roentgen Induction Coil.*

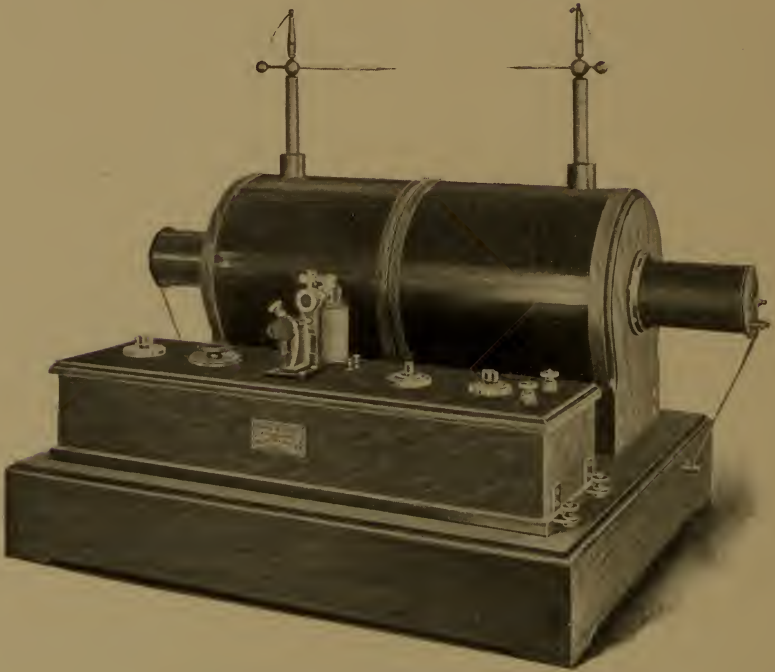


FIGURE 2.

### *Type "A" Coil for 20 or 110 volts Direct Current.*

This is the type of coil in most extensive use for X-Ray work and is operated on direct current,—either 20 volts from battery or motor-generator, or the commercial 110 volts.

It has the **Roentgen Self-Starting Mechanical Interrupter**, adjustable mica condenser and switches as described under "Mechanical Interrupter and Condenser." The finish of the wood-work is either mahogany or selected quartered oak, as desired.

#### *Prices.*

B3000.	18-inch Type "A" Coil for 20 volts D. C. . . . .	\$400.00
B3001.	18-inch Type "A" Coil for 110 volts D. C. . . . .	400.00
B3002.	15-inch Type "A" Coil for 20 volts D. C. . . . .	325.00
B3003.	15-inch Type "A" Coil for 110 volts D. C. . . . .	325.00
B3004.	12-inch Type "A" Coil for 20 volts D. C. . . . .	250.00
B3005.	12-inch Type "A" Coil for 110 volts D. C. . . . .	250.00

## *Roentgen Induction Coil.*



FIGURE 3.

### *Type "A" Coil With Table and Rheostat.*

#### *Prices.*

B3006.	18-inch Type "A" Coil with table and rheostat for 20 volts D. C. . . . .	\$450.00
B3007.	18-inch Type "A" Coil with table and rheostat for 110 volts D. C. . . . .	450.00
B3008.	15-inch Type "A" Coil with table and rheostat for 20 volts D. C. . . . .	375.00
B3009.	15-inch Type "A" Coil with table and rheostat for 110 volts D. C. . . . .	375.00

# Roentgen Induction Coil.

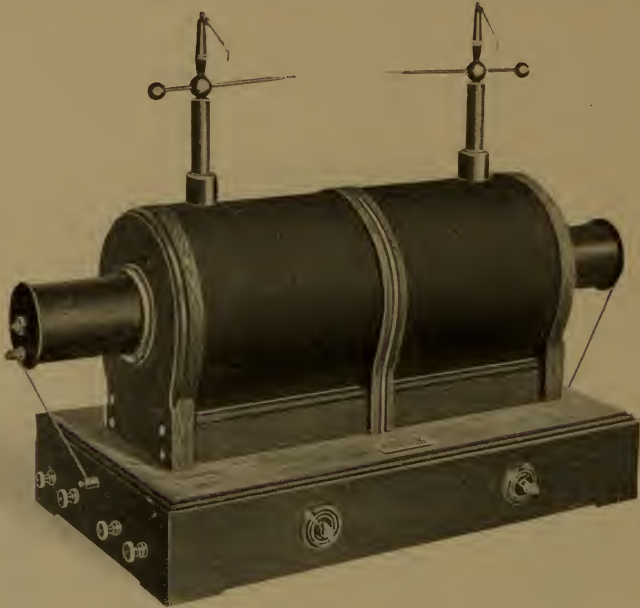


FIGURE 4.

## Type "E" Coil for Electrolytic Interrupter.

Type "E" coil is similar to Type "A" in its construction except that it is without condenser or interrupter as it is specially designed for use with the electrolytic interrupter which is listed separately.

**Rheostats.** A Rheostat is necessary when the electrolytic interrupter is used. We furnish two sizes of rheostats; one for coils of 15-inch spark or more and one for coils of less than 15-inch spark.

The rheostats are made to order for our own special use and are of ample capacity.

### Prices.

B3025.	18-inch Type "E" Coil . . . . .	\$340.00
B3026.	15-inch Type "E" Coil . . . . .	270.00
B3027.	12-inch Type "E" Coil . . . . .	210.00
B3028.	Large Rheostat for Coils of 15-inch spark or more, mounted on finely polished table as shown on page 7 . . .	50.00
B3029.	Large Rheostat, unmounted . . . . .	30.00
B3030.	Medium size Rheostat unmounted, for Coils less than 15-inch spark . . . . .	20.00

## Portable Coil.



FIGURE 5.

### *Roentgen Portable Induction Coil, Type "P."*

Of the portable coils yet produced this is by far the most powerful. It gives a 9-inch spark which is thicker and fatter than that obtained from any portable coil of equal or less spark length.

An adjustable mica condenser with a **Roentgen Self-Starting Mechanical Interrupter** is mounted in one case, while the coil proper is in the other.

The adjustable **Condenser Switch** is in the upper right hand corner of the condenser case, while the **Pole-Changing Switch** is in the upper left hand corner. The **Interrupter Switch** is below the **Condenser Switch** and the **Operating Switch** is below the **Pole-Changing Switch**.

These switches are operated in the same manner as described on page 13.

Leather straps are provided on both cases for convenience in carrying.

The coil is *best* operated on 20 volts direct current from battery or motor generator, although it can be used on somewhat lower potential.

#### *Price.*

B3040. 9-inch Type "P" Coil . . . . . \$200.00

## *Mechanical Interrupter.*



FIGURE 6.

### *Roentgen Self-Starting Mechanical Interrupter.*

**A**N Interrupter for an induction coil should be capable of doing its work efficiently, with the least amount of attention on the part of the operator. In view of this fact, the Roentgen Mechanical Interrupter has been designed to require but infrequent adjustment and to *start itself*.

***It Starts Itself.*** This has been accomplished by making the magnetic circuit with a minimum amount of reluctance, and providing a properly shaped armature and pole piece. The magnetic circuit is completed from the armature to the base of the magnet coil in a novel way through the interrupter spring itself. By this arrangement the only air gap in the path of the magnetic lines of force is that between the pole piece and the armature itself, making the tractive force exerted on the armature a maximum for the magnetizing current employed.



**Requires Little Current to Run It.** The result of this economical use of the magnetic field is two-fold: First—It exerts enough force on the armature to start it vibrating; and, Second—enough energy is imparted to the armature during a small part of the time of each complete vibration to operate it with *small current*.

The interrupter itself requires only about  $\frac{2.5}{100}$  of an Ampere on a 20 volt current, and about  $\frac{4}{100}$  of an Ampere on 110 volts to keep it running.

**Takes Little Attention.** After the small contact for the magnet coil is adjusted, and the large contact for the induction coil primary is once set, the interrupter does not require re-adjustment if a rheostat be used to control the current. Merely an occasional inspection of the adjustments need be made, the switches and the rheostat being the means used to control the discharge.

**Adjustable Frequency** The frequency of the interrupter is variable within wide limits by means of the adjustable weights which are supplied to be clamped to the vertical rod at the upper extremity of the vibrating system.

As the vibrating weight is increased and as it is moved upwards, the frequency is lowered. It is seen that the highest frequency is obtained when no weight is used above the armature, and the lowest frequency results from clamping the largest weight at the top of the rod.

A medium frequency which is just high enough that the persistence of vision and the lag of the fluorescence of the screen bridge across the interval between each flash of light from the tube, is the proper one to be employed in fluoroscopic work, as it renders the fluoroscopic image steady with the minimum amount of energy delivered to the tube.

For radiographic purposes a high frequency is desirable because more energy can be delivered to the tube in a given length of time by a high frequency than a low one, and radiographic results depend upon energy.

**Suited for Long Running.** It is entirely practical to run the Roentgen Mechanical Interrupter *continuously* for therapeutic work as the magnet coil takes such a small amount of current that it becomes scarcely warm at all, even when run all day long.

**Renewal of Parts** The magnet spool is readily removed with the casting carrying the springs in toto by simply taking out two large screws. The springs or any of the contacts can then be readily removed and replaced by new ones of standard size, *without*

being returned to the factory. All the parts of the interrupter are standardized and can be renewed at any time as we keep a stock of parts on hand.

**Long Life of Parts.** A long life of all the parts has been made an especial feature. The ones subjected to the greatest wear are of course the contacts. But they have been made unusually large and of the very best Iridio-Platinum obtainable. Aside from the contacts, the only parts which may need renewing are the springs, which once in a great while crystallize and break under the strain of constant bending.

The contacts should last for a year with constant use, while the springs are likely never to need renewing.

In short we recommend the **Roentgen Self-Starting Mechanical Interrupter** as the most efficient, most reliable, and most satisfactory of the various mechanical interrupters which are offered to-day.

**Price.**

B3050. Roentgen Self-starting Mechanical Interrupter . . . . \$20.00

## *Interrupter and Condenser.*

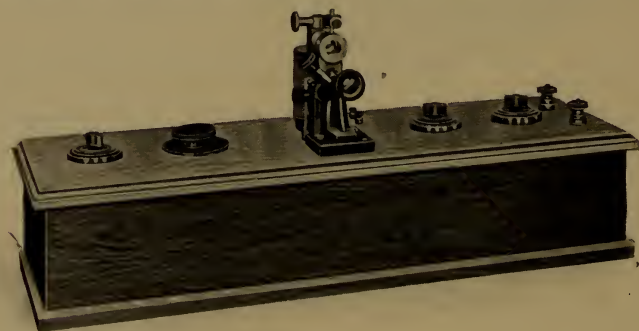


FIGURE 7.

### *Roentgen Self-Starting Mechanical Interrupter and Adjustable Condenser, with Switches.*

A COMPLETE interrupter with adjustable condenser and switches as shown can readily be adapted to coils whose operation is rendered unsatisfactory because of the inefficiency of the interrupter. The output of an induction coil, operated by the ordinary mechanical interrupter, can be materially increased if the Roentgen Mechanical Interrupter be used in its place.

**Interrupter and Condenser.** The interrupter is of the well-known self-starting type and has a current carrying capacity of up to 10 amperes on the 16 volts 20 volts or 110 volts direct current. The condenser is adjustable and of the best mica insulation, assembled by a process that excludes all air from the condenser and insures maximum efficiency.

**The Switches.** The indicating snap switch at the extreme right is the **Interrupter Switch**, which, on being closed, starts the interrupter vibrating without closing the circuit through the induction coil primary. Next to it is a snap switch, also of the indicating type, and is the **Operating Switch** which opens and closes the circuit through the induction coil. The circuits are so arranged that if by mistake, when the coil is in use, the interrupter switch be opened first, the main circuit through the induction coil is also opened, preventing the short circuit which would occur with the stopping of the interrupter. The snap switch at the extreme left is the **Pole Changing Switch** for reversing the current in the induction coil and should never be operated without first opening the **Operating Switch**. Next to the **Pole Changing Switch**, is the **Condenser Switch**, by means of which the amount of condenser shunted across the heavy contacts of the interrupter may be varied and the best conditions secured for the particular value of current which is being used.

**The Regular Type.** The illustration shows the interrupter and condenser with auxiliary parts as supplied for use with our regular type "A" coils. When it is furnished to be adapted to other coils, it is provided with two pair of binding posts, instead of one as shown, and these are plainly stamped "Line" for connection to the source of current and "Coil" for connection to the induction coil primary.

### **Interrupter and Adjustable Condenser.**

(as above described.)

B3051.	With interrupter wound for 16 volts	.....	\$60.00
B3052.	“ “ “ “ 20 “	.....	60.00
B3053.	“ “ “ “ 110 “	.....	60.00

## *Electrolytic Interrupter.*



FIGURE 8.

### *Roentgen Electrolytic Interrupter.*

**T**HE special work of the Electrolytic Interrupter is that of short exposures in radiography.

The ordinary mechanical interrupter has not a sufficient current carrying capacity to permit of its use when the very heavy discharges are demanded of an induction coil for short exposures in radiographic work.

**Large Capacity.** The Electrolytic Interrupter has, however, a large current carrying capacity, and is especially suitable for producing the heavy discharges necessary for quick exposures. It can be made to deliver momentarily from two to thirty amperes of current to a properly designed induction coil for the purpose of making a snap shot exposure, or it can be readily adjusted to furnish less current as desired. It is thus readily understood that the use of the Electrolytic Interrupter on large induction coils is the thing which has made possible the short exposure skiagraphic work.

**Description.**

It consists essentially of a small anode of iridio-platinum sealed into a porcelain tube, and a large cathode of lead immersed in a diluted solution of sulphuric acid. The interruption of the current occurs through the electrolysis of the water which liberates bubbles of gas at the anode, thus periodically insulating the anode from the solution and interrupting the current. The rate of interruption is very high, being from 1,000 to 40,000 or more a minute.

The surface of platinum to be exposed to the electrolytic action is adjustable so that the coil can be made to deliver a thick, heavy discharge, or a light thin one, as desired. Fresh platinum surface can thus readily be exposed as the old is worn away.

**Cooling**

Since the interruptions cease to be regular as the sulphuric acid solution warms up with use, the cathode is made of a lead tube through which water from a faucet should be passed when the interrupter is used for long and continuous running.

**Attachment.**

When the interrupter is used on the alternating current, we furnish a special form of interrupter with an inexpensive wire anode which is readily renewed as it is eaten away. The wear of the parts is reduced to a minimum when the direct current is used.

**How It Is**

In installing the interrupter, it is only necessary

**Set Up.**

to make a solution of sulphuric acid, which when cold, has a specific gravity of 1.2 that of water. Fresh storage battery acid is excellent. This is to be poured in the glass jar and a layer of paraffin oil poured on top to smother the acid spray which rises when the interrupter is in action. A bottle of paraffin oil for this purpose is furnished with each interrupter. The cover, upon which are mounted the two electrodes, is placed in position, the connections to the coil made with the binding posts, when the interrupter is ready for use.

If the water cooling attachment is to be used, it is necessary to provide merely flexible rubber tube connections.

**Requires no****Condenser.**

An interesting and gratifying fact about the Electrolytic Interrupter is that it does not require any condenser, as must be used with the various forms of mechanical or mercury interrupters. This greatly reduces the expense of the interrupter, and is a most important consideration in the selection of an outfit.

**Price.**

B3060. Roentgen Electrolytic Interrupter . . . . . \$40.00

## *Electrolytic Interrupter.*



FIGURE 9.

### *Roentgen Three-Anode Electrolytic Interrupter.*

THIS form of the electrolytic interrupter is designed to be placed some distance away from the coil itself. Each of the three anodes has its corresponding point on a three-point switch, mounted upon the coil so that the operator may use any one at his pleasure. When the anodes are adjusted to carry different amounts of current the character of the discharge from the coil can be changed readily from light to heavy and vice versa by simply changing the position of the switch. This modification is, in every other respect, like the usual form which is made with but one anode.

#### *Price.*

B<sub>3061</sub>. Three Anode Electrolytic Interrupter . . . . . \$90 00

## *Series Spark Gap.*

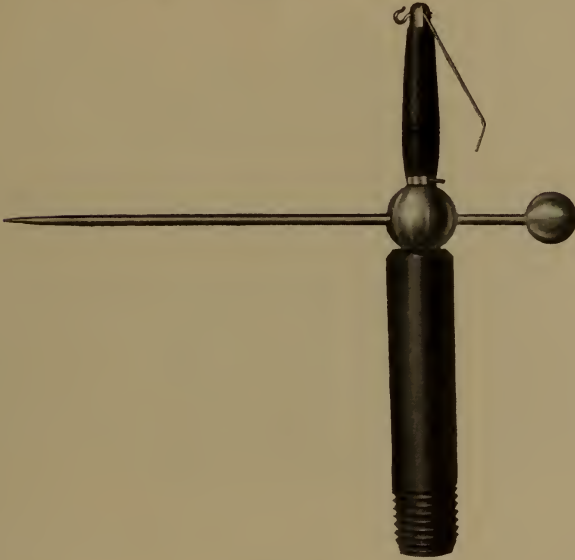


FIGURE 10.

### *Roentgen Series Spark Gap.*

THE well known phenomenon of the "inverse discharge" of the induction coil, makes it advisable to use some form of resistance in series with the terminal of the induction coil and the X-Ray tube, to prevent the inverse discharge from going through the tube. When this inverse discharge is permitted to pass through the tube, a blackening of the inner walls of the tube occurs and is attributed to the deposition of the metal of the electrodes upon the glass.

*How It Is Used.* The most practical form of resistance has been found to be a spark gap placed in series with the terminal of the induction coil and the tube, as the inverse discharge often is of sufficient voltage to jump across the resistance of an inch of air or more. If the series spark gap is greater than the distance through which the inverse discharge will jump, it cannot pass into the tube and blacken it.

This form of Series Spark Gap is the evolution of the work of several years in the attempt to obtain something "simple and efficient."

We furnish a set of these Series Spark Gaps with each one of our X-Ray coils.

## *Motor=Generators.*



FIGURE II.

### *Direct Current Motor=Generators.*

**T**HE Motor-Generator above shown is designed to transform the 110, 220 or 500 volts direct current down to 20 volts direct current, which latter current is the one supplied directly to the induction coil.

**Little Inverse Discharge.** When the comparatively low voltage supplied by one of these machines is fed to the induction coil the "inverse discharge" with its annoying blackening of tubes is at a minimum as well as the current consumed from the service mains.

The economy of maintenance accompanying the use of a motor-generator over that obtained with storage batteries should be seriously considered when the mechanical interrupter is installed.

### *Direct Current Motor=Generators,*

With secondary output of 200 watts at 20 volts.

#### *Price.*

B3070.	To operate from	110	volts	direct	current	.....	\$125.00
B3071.	"	"	"	220	"	"	132.50
B3072.	"	"	"	500	"	"	140.00



## *Motor-Generators.*

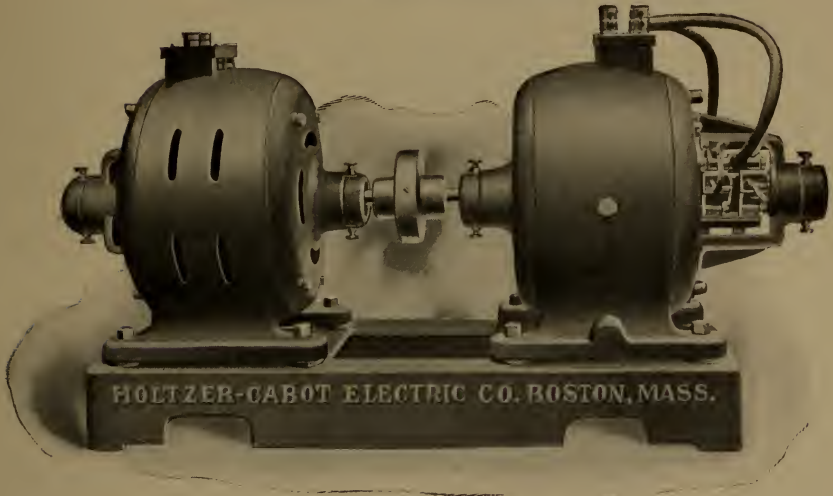


FIGURE 12.

### *Alternating Current Motor-Generators.*

**A** SATISFACTORY and reliable Alternating Current Motor-Generator is necessary when the alternating current is to be used in conjunction with a mechanical or other direct current interrupter.

We recommend the form here shown as thoroughly reliable and satisfactory.

It transforms the commercial alternating current to 20 volts direct current, furnishing the same kind of current to be used in the induction coil as is delivered by the Direct Current Motor-Generator shown on the preceding page.

In ordering an Alternating Current Motor-Generator it is necessary to specify the voltage and frequency of the alternating current to be used.

### *Alternating Current Motor-Generators.*

Commercial Voltage.	Secondary Voltage.	Watts Output.	Price.
B3073. 110	20	175	\$225.00
B3074. 220	20	175	240.00
B3075. 110	20	275	260.00
B3076. 220	20	275	275.00

## *Storage Batteries.*



FIGURE 13.

### *Portable Storage Batteries.*

PHYSICIANS and experts who have occasion to treat patients in their own homes or must have a portable outfit, will find this type of cell convenient for transportation. The size of these cells is well suited to induction coil work.

No. Cells in Case.	Normal Charge and Discharge.	Weight Complete.	Price Complete Charged.
B3080. 1	10 Amperes.	33½ lbs.	\$14.50
B3081. 2	10 "	60 "	28.00
B3082. 3	10 "	86¾ "	40.00
B3083. 4	10 "	113¼ "	50.00
B3084. 5	10 "	140 "	60.00

## Fluoroscopes.



FIGURE 14.

### *Barium Platino-Cyanide Fluoroscopes.*

OUR Fluoroscopes are of the best quality and are provided with their screens removable so that more than one person at a time can use them in a properly darkened room.

**Retain their Brilliancy.** The Barium Platino-Cyanide of these screens does not lose its water of crystallization with resulting decrease in brilliancy of fluorescence, for it is protected by a transparent coating applied directly to the crystals of the salt. We recommend these fluoroscopes as being thoroughly satisfactory in this respect, for they retain their original fluorescence indefinitely with proper care.

#### *Prices.*

Fluoroscopes with removable Barium Platino-Cyanide Screens.

B3090.	Size of Screen,	5 x 7	.....	\$12.50	
B3091.	“	“	6 x 8	.....	16.00
B3092.	“	“	7 x 9	.....	20.00
B3093.	“	“	8 x 10	.....	24.00

## *Tube Stand.*

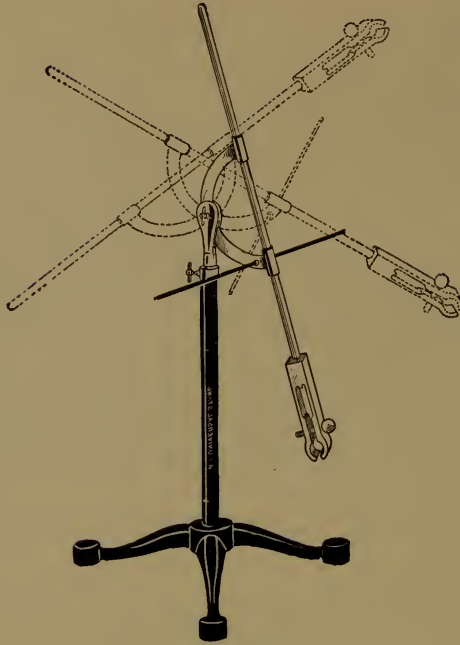


FIGURE 15.

### *Universal Tube Stand.*

**T**HIS tube stand is so constructed that it is very rigid and stable. The tripod base is quite heavy, and the adjusting, clamps are strong. As is shown by the dotted lines in the cut the tube is readily placed in any desirable position.

#### *Price.*

B3095. **Universal Tube Stand complete, with rubber-covered wires for connecting tube . . . . . \$15.00**

# X-Ray Tubes.

## R. F. Patent Regulating Tube.

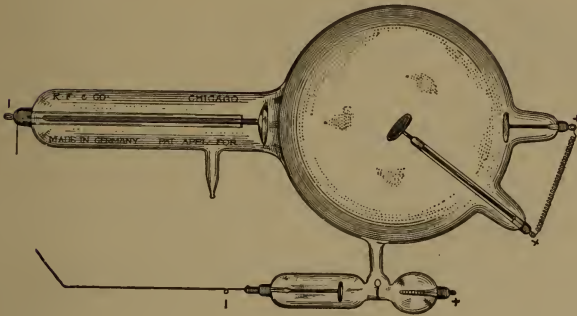


FIGURE 16.

This tube is of the self-regulating type and is an exceptionally fine one for static machine or light coil work.

- |        |           |   |         |
|--------|-----------|---|---------|
| B3200. | (No. 6).  | Diameter of Glass Bulb 5 inches . . . . . | \$18.00 |
| B3201. | (No. 7a). | “ “ “ “ 6 “ . . . . .                     | 20.00   |

## R. F. Patent Regulating Tube.

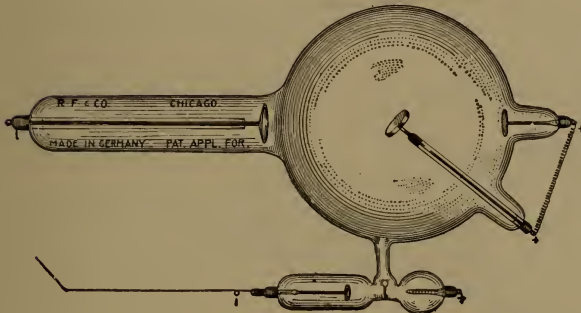


FIGURE 17.

An extra heavy anode is used in this tube, and it is well adapted to the field of ordinary coil work.

- |        |          |   |         |
|--------|----------|---|---------|
| B3202. | (No. 7). | Diameter of Glass Bulb 6 inches . . . . . | \$22.00 |
| B3203. | (No. 8). | “ “ “ “ 7 “ . . . . .                     | 26.00   |
| B3204. | (No. 9). | “ “ “ “ 8 “ . . . . .                     | 30.00   |

**R. F. Patent Regulating Tube.**

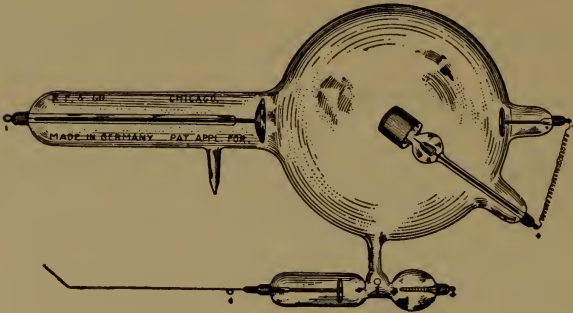


FIGURE 18.

The tube here shown is capable of caring for still more energy than either of the two preceding ones, and is very widely used for difficult radiographic work.

- B3205. (No. 10). Diameter of Glass Bulb 6 inches . . . . . \$25.00
- B3206. (No. 11). " " " " 8 " . . . . . 35.00

**R. F. Patent Regulating Tube.**

This tube is operated in approximately the position in which it is shown for the purpose of keeping the water from running out of the cooling attachment. Designed to withstand the heaviest dis-

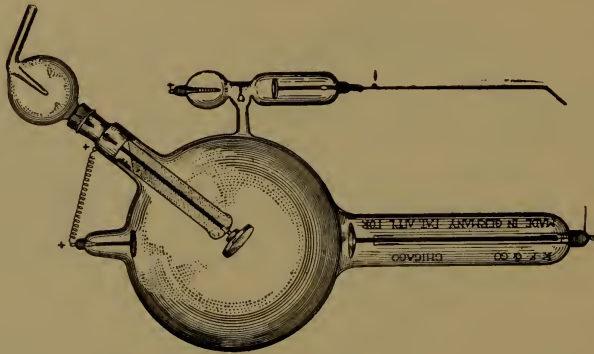


FIGURE 19.

charges obtainable, even such as are secured with an electrolytic interrupter from a large coil, it has proved a most satisfactory tube for the difficult skiagraphic work.

- B3207. (No. 15). Diameter of Glass Bulb 6 inches, . . . . . \$40.00
- B3208. (No. 16). " " " " 7 " . . . . . 47.50
- B3209. (No. 17). " " " " 8 " . . . . . 55.00

### Queen Patent Regulating Tube.

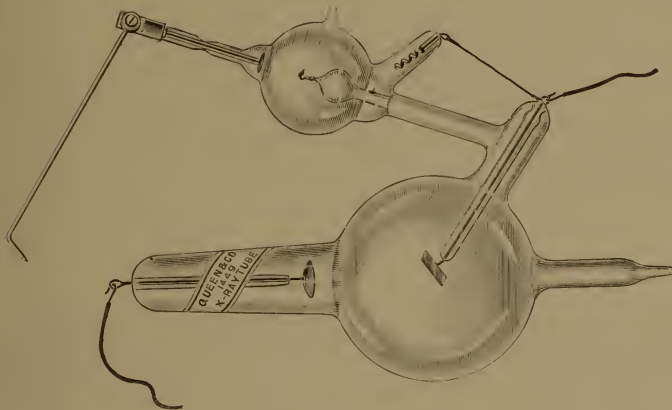


FIGURE 20.

Here is a good form of the regulating type of tube which is recommended for use in ordinary work,

both therapeutic and radiographic.

B3210.	Queen Tube (No. 6001), Light Anode	\$15.00
B3211.	“ “ (No. 6002), Heavy “	18.00
B3212.	“ “ (No. 6003), Extra Heavy Anode	22.00

### Non-Regulating Tube With Light Anode.

This is a very good form of non-regulating tube. The workmanship on the glass is the best, while the proper mounting of the electrodes is well done. The glass is very transparent to the radiation, and the tube is an efficient one.

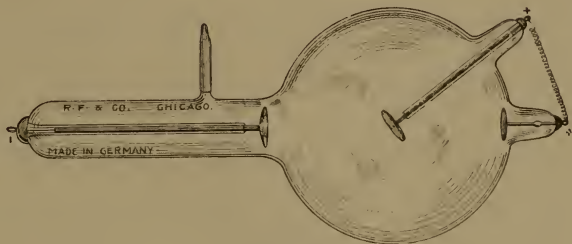


FIGURE 21.

B3213.	(No. 3 E.) Diameter of Glass Bulb 5 inches	\$8.00
B3214.	(No. 4 E.) “ “ “ “ 6 “	10.00

### Gundelach Light Anode Tube.

The Gundelach light anode tube is well known for its reliability, good construction and facility with which the vacuum is reduced when it has become too high by continued use.

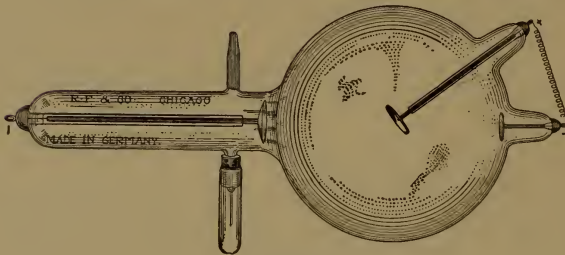


FIGURE 22.

B3215.	(No. 3).	Diameter of Glass Bulb	5 inches	.....	\$12.50
B3216.	(No. 4).	“ “ “ “	5½ “	.....	15.00
B3217.	(No. 5).	“ “ “ “	6 “	.....	16.00

### Gundelach Heavy Anode Tube.

For skiagraphic purposes the Gundelach heavy anode tube is recognized as being very effective.

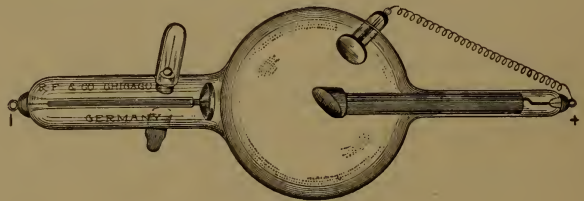


FIGURE 23.

B3218.	(Type B).	Diameter of Glass Bulb	4¾ inches	.....	20.00
B3219.	(Type C).	“ “ “ “	5½ “	.....	22.50
B3220.	(Type D).	“ “ “ “	6 “	.....	25.00
B3221.	(Type F).	“ “ “ “	6½ “	.....	30.00
B3222.	(Type G).	“ “ “ “	7¾ “	.....	45.00

### Ventril or Valve Tube.

These tubes are used in series with the X-Ray tube and the induction coil to prevent the “inverse discharge” from passing through the X-Ray tube. They take the place of the “series spark gap” and have over it the advantage of absence of noise and constant resistance

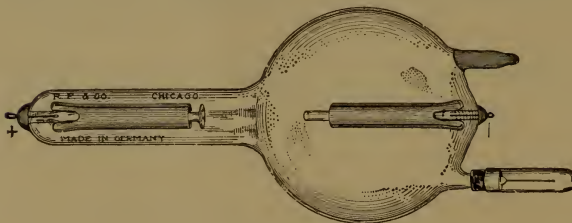


FIGURE 24.

with both light and heavy currents. When the electrolytic interrupter is used they are of especial advantage and we recom-



mend them as the most satisfactory and reliable resistance for the tube circuit under such circumstances.

The inverse discharge tends to blacken the tube and proves very annoying during fluoroscopic examination, so that the use of these ventril tubes is quite imperative in eliminating it.

B3225. **Ventril Tube with reducing attachment** . . . . . \$10.00

## *Tube Rack.*

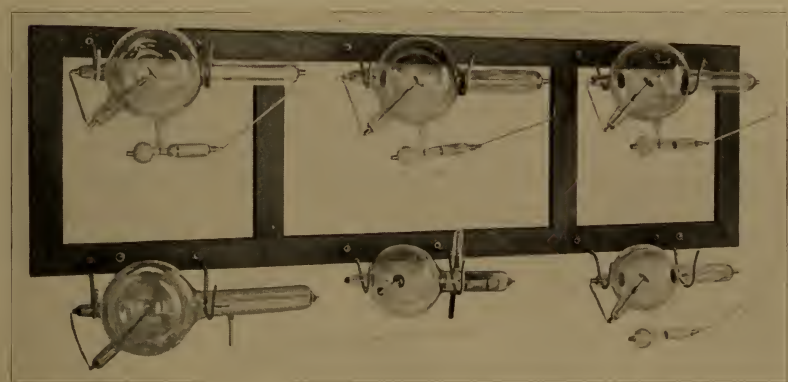


FIGURE 25.

### *Roentgen Tube Rack for X-Ray Tubes.*

WHEN the X-Ray tube is not in use a convenient rack for holding it in a safe place beyond the reach of danger is quite desirable.

Our tube rack readily accommodates the different makes of tubes and we furnish it in various sizes to carry different numbers of tubes.

### *Roentgen Tube Racks.*

#### *Price.*

B3230.	Capacity, 2 tubes	. . . . .	\$ 2.00
B3231.	“ 4 “	. . . . .	4.00
B3232.	“ 6 “	. . . . .	6.00
B3233.	“ 8 “	. . . . .	8.00
B3234.	“ 10 “	. . . . .	10.00

## *Static Transformer.*



FIGURE 26.

### *Roentgen Static Transformer.*

**T**HE Roentgen Static Transformer is used to obtain *Static Discharges* from the ordinary induction coil. The discharge from an induction coil is too heavy, even when the coil is operated as lightly as possible, to be used directly in electro-therapeutic applications. Because of this fact the static machine, the discharge from which is very light and especially suited to this work, till now has been the only machine available for the purpose.

**Resonance Apparatus.** Many attempts have been made to utilize the induction coil in electro-therapeutics by using a small Tesla coil, or some form of resonance apparatus, with it. All these devices give a discharge of high potential and sufficiently light in volume, but *alternating* and not *unidirectional* as is needed for the best results.

The discharge from the Roentgen Static Transformer is practically unidirectional.

**Its Discharge Unidirectional.** It is as much so as the discharge of the induction coil by which it is operated and is of slightly less voltage than that of the coil. But the discharge from the transformer is very light, and resembles that obtained from the static machine. It is especially suited to direct application for electro-therapeutic treatment and does exactly the same work heretofore accomplished by the static machine alone.

**It is used as a Static Machine.** It is used as a static machine with similar electrodes for applying the current to the patient. The same tube stand used for holding the X-Ray tube serves to mount it for use, and the same wires used for connecting up the tube are used to connect it to the coil.

The expert who has a Static Transformer to use in conjunction with his coil has the *Static Machine and Induction coil combined in one machine* at moderate expense.

**Is Simple and Reliable** The Static Transformer has no moving parts, and is, therefore, not subject to the difficulties experienced with apparatus which has them.

It is reliable, simple, and presents a handsome appearance, though not bulky and expensive like a static machine.

It is believed that the Static Transformer is an attachment which every owner of an induction coil outfit should have for electro-therapeutic purposes, since it makes a static machine out of his induction coil and at the same time leaves him his coil as well.

### Price.

B3240. **Static Transformer complete, with ball and point electrode** . . . . . **\$30.00**

NOTE.—It can be used with Tube Stand B3095, or with any substantial holder having 2-inch jaws.

## X-Ray Plates.

### Cramer X-Ray Plates.

THESE Plates are packed in pasteboard boxes after the manner of ordinary photographic plates, and should be transferred in a dark room to the separate light proof envelopes, only a short time before they are used, as it has been found that paper envelopes are somewhat radio-active and tend to fog the plates if left on them for some time. The developer and fixing bath recommended by the manufacturer will be found satisfactory and reliable.

Size.	Price Per Dozen.	Size.	Price Per Dozen.
B3250. 4 x 5	\$ .80	B3256. 10 x 12	\$ 5.15
B3251. 5 x 7	1.40	B3257. 11 x 14	7.25
B3252. 5 x 8	1.55	B3258. 14 x 17	11.25
B3253. 6½ x 8½	2.10	B3259. 16 x 20	16.40
B3254. 7 x 10	2.65	B3260. 17 x 20	17.25
B3255. 8 x 10	3.00	B3261. 18 x 22	20.40

## *Comparative Exposures.*

There is an increasing demand for *short exposures* in radiography. To meet such conditions most perfectly, we recommend an 18-inch Roentgen Coil. The ideal equipment includes both types of interrupters—mechanical and electrolytic.

Given a patient weighing not over 200 pounds and a heavy tube capable of withstanding the discharge from the coil the following is a list of comparative exposures which should be attained by the *experienced* worker when the apparatus is operated on direct current:

### **Fifteen inch coil with Mechanical Interrupter.**

Part	Distance from Plate	Exposure
Hand	12 inches	5 to 10 seconds
Foot	12 "	10 to 15 "
Shoulder	15 "	45 to 60 "
Hip-joint	20 "	4 to 7 minutes
Chest	18 "	40 to 50 seconds

### **Fifteen inch coil with Electrolytic Interrupter.**

Part	Distance from Plate	Exposure
Hand	12 inches	1 to 2 seconds
Foot	12 "	1½ to 5 "
Shoulder	15 "	2 to 7 "
Hip-joint	20 "	1¼ to 2¼ min.
Chest	18 "	1 to 3 seconds

### **Eighteen inch coil with Mechanical Interrupter.**

Part	Distance from Plate	Exposure
Hand	12 inches	3½ to 7 seconds
Foot	12 "	7 to 10 "
Shoulder	15 "	30 to 45 "
Hip-joint	20 "	3 to 5 minutes
Chest	18 "	35 to 45 seconds

### **Eighteen inch Coil with Electrolytic Interrupter.**

Part	Distance from Plate	Exposure
Hand	12 inches	½ to 1 second
Foot	12 "	1 to 3 "
Shoulder	15 "	1½ to 5 "
Hip-joint	20 "	¾ to 1½ min.
Chest	18 "	½ to 2 seconds

### *Switchboards.*

It is of great assistance in X-Ray work to know how much energy is being delivered to the apparatus. For this purpose we supply special switchboards equipped with Weston Ammeter, Weston Voltmeter and necessary switches. The switchboard can be mounted against the wall of an X-Ray room. Prices vary according to requirements.

### *Working Exhibit.*

We place great importance upon the thorough personal inspection of our apparatus, by intending buyers.

With that in view we have equipped a special X-Ray laboratory, with photographic dark room attached, and cordially invite our medical friends to examine same, even if no immediate business will possibly result.

We show Roentgen Coils of different sizes, with self starting mechanical and electrolytic interrupters ; also various types of X-Ray tubes and accessory apparatus.

The exhibit is in charge of an *expert operator* who can demonstrate every detail of radiography, from "starting up" the coil to developing the negative.

Our expert is in attendance each week day (except Saturday) *between 2 and 5 P. M.* At other times appointments should be made in advance, for any hour that will be more convenient to the visitor.

When so desired, we give *our customers* who come here for the purpose, a thorough course of instruction in the varied details of radiography.

### *References for "Roentgen" Apparatus.*

From our list of customers we have selected the following to indicate the character of X-Ray Coils and Interrupters for which we are finding the greatest demand at present:

**St. Lukes Hospital, South Bethlehem, Pa.**

15-inch Roentgen Coil with Three-Anode Electrolytic Interrupter; operated from 110 volts alternating current.

**University of Pennsylvania Hospital, Philadelphia.**

18-inch Roentgen Coil with Self-starting Mechanical Interrupter; operated from 110 volts direct current.

**Orthopædic Hospital, Philadelphia.**

18-inch Roentgen Coil with One-Anode Electrolytic Interrupter and Self-starting Mechanical Interrupter; operated from 110 volts direct current.

**Episcopal Hospital, Philadelphia.**

18-inch Roentgen Coil with One-Anode Electrolytic Interrupter and Self-starting Mechanical Interrupter; operated from 110 volts direct current.

**Barnard Sanitorium, Baltimore, Md.**

18-inch Roentgen Coil with One-Anode Electrolytic Interrupter; operated from 104 volts alternating current.

**Dr. Wisner R. Townsend, New York City.**

18-inch Roentgen Coil with Three-Anode Electrolytic Interrupter and Self-starting Mechanical Interrupter; operated from 110 volts direct current.

**Dr. Robert P. Cummins, Germantown, Phila.**

15-inch Roentgen Coil with Self-starting Mechanical Interrupter; operated from 110 volts direct current.

**Dr. Robert C. Parrish, Youngstown, Ohio.**

12-inch Roentgen Coil with One-Anode Electrolytic Interrupter; operated from 110 volts alternating current.

**Mr. W. C. Fuchs, Chicago, Ill.**

15-inch Roentgen Coil with Self-starting Mechanical Interrupter; operated from storage battery.

## ANTICIPATE YOUR WANTS AND SAVE MONEY.

On or about December 1st we expect to place a large import order for German X-Ray tubes and in connection with it, have decided to make the experiment of a *special offer* to hospitals and physicians.

Whether or not there is any *direct* profit to us in this offer, concerns no one but ourselves. It is certainly a fact however, that we would be very unwise business managers to fill orders from stock at any such prices as here quoted, while at the same time we count the advertising features of the proposition to possess sufficient value to justify it.

The tubes which we shall offer are of the celebrated **Gundelach** make and are suitable for *static machines* or *coils* as the specifications indicate.

### SPECIFICATIONS.

## GUNDELACH LIGHT ANODE TUBE,

No. 4.



Very excellent for Static Machines; also for coils of comparatively light discharge. A fine tube for therapeutic treatment. Diameter of bulb,  $5\frac{1}{2}$  inches.

Catalogue Price, \$15.00

OUR SPECIAL PRICE, \$9.00.

[OVER.]

# GUNDELACH HEAVY ANODE TUBE, TYPE C.

The right tube for large coils, especially if electrolytic or mercury interrupters are used. For *quick* radiographic work. Diameter of bulb,  $5\frac{1}{2}$  inches.



Catalogue Price, \$22.50.

OUR SPECIAL PRICE, \$13.00.

Both tubes are provided with the Gündelach "regenerating" device, by which the vacuum can be lowered when necessary.

The tubes will reach Philadelphia not much if any before *March 1st, 1904*, and may be delayed slightly beyond that date. Consequently in considering our offer it should be remembered that *tubes now in use* will have to be replaced later, probably by the time our goods are ready to deliver. *Orders must reach us not later than November 26th.*

At the special prices quoted herewith, we cannot accept an order from any one physician (or hospital) *for more than two tubes.*

Without questioning the financial responsibility of our customers, we must impose *cash terms* for this sale; 25 per cent. with order, and the balance when we give notice that the tubes are ready to deliver.

We carry a comprehensive stock of X-Ray tubes for all purposes, and are prepared to fill orders promptly, *at regular prices.* For particulars see Catalogue 480 entitled "*Roentgen Induction Coils and other X-Ray Apparatus.*"

## JAMES G. BIDDLE,

1114 Chestnut St., Phila.

November 1st, 1903.

OVER.





# **JAMES G. BIDDLE,**

**Dealer, Manufacturers's Agent  
and Importer**

**1114 Chestnut Street, Philadelphia**

**Representing as Special Agent**

**Roentgen Manufacturing Co., Philadelphia,**

Manufacturers of Roentgen Induction Coils and other X-Ray Apparatus, Transformers, Tesla Coils and High Tension Condensers.

**Leeds & Northrup Co., Philadelphia,**

Manufacturers of High Grade Electrical Measuring Instruments and other Scientific Apparatus.

**Weston Electrical Instrument Co., Newark, N. J.,**

Manufacturers of Standard Portable Ammeters, Voltmeters and Wattmeters. Also Illuminated Dial and Round Pattern Switchboard Instruments.

**The Bristol Co., Waterbury, Conn.,**

Manufacturers of Recording Ammeters, Voltmeters and Wattmeters. Also Vacuum and Pressure Gauges.

**The Electric Storage Battery Co., Philadelphia,**

Manufacturers of the "Chloride Accumulator" Storage Battery.

**Société Genevoise, Geneva,**

Manufacturers of High Grade Physical Laboratory Apparatus—Dividing Engines, Standards of Length, Cathetometers, Comparators, Spectrometers, Goniometers, Chronographs, etc.

**Kelvin & James White, Limited, Glasgow,**

Manufacturers of Lord Kelvin's Standard Ampere, Volt and Watt Balances, Electrostatic Voltmeters, Electrometers, etc.

**Siemens & Halske, Berlin,**

Manufacturers of Electrical Instruments, including DuBois-Rubens Armored Galvanometers, Dubois Magnetic Precision Balance, Chatelier Pyrometer, etc.

**Cambridge Scientific Instrument Co., England,**

Manufacturers of Apparatus for Physical Laboratories, including Callender & Griffith's Platinum Thermometers, Duddell Oscillographs, Ayton-Mather D'Arsonval Galvanometers, etc.





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