

1,025,464.

P. C. HEWITT.  
VAPOR-ELECTRIC APPARATUS.  
APPLICATION FILED MAR. 23, 1908.

Patented May 7, 1912.

2 SHEETS-SHEET 1.

Fig. 1

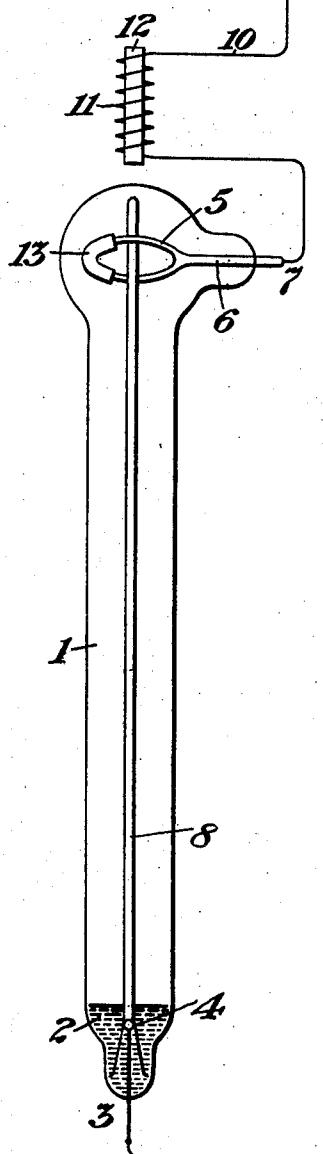
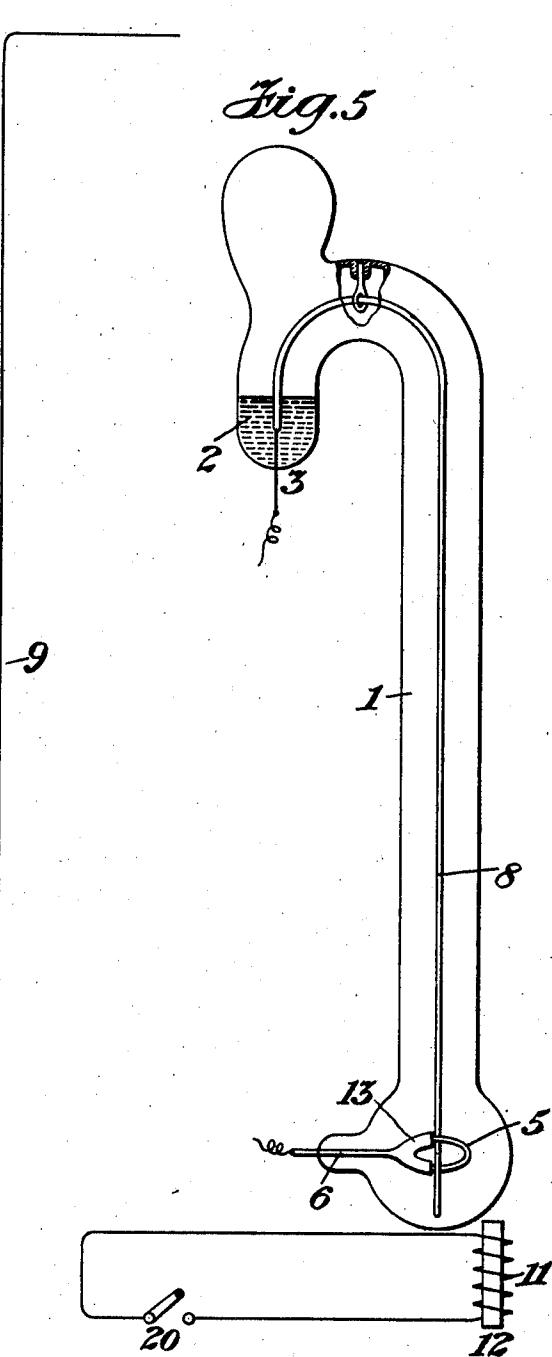


Fig. 5



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Peter Cooper Hewitt  
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By his Attorney  
Charles A. Perry.

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2 SHEETS—SHEET 2.

Fig. 2

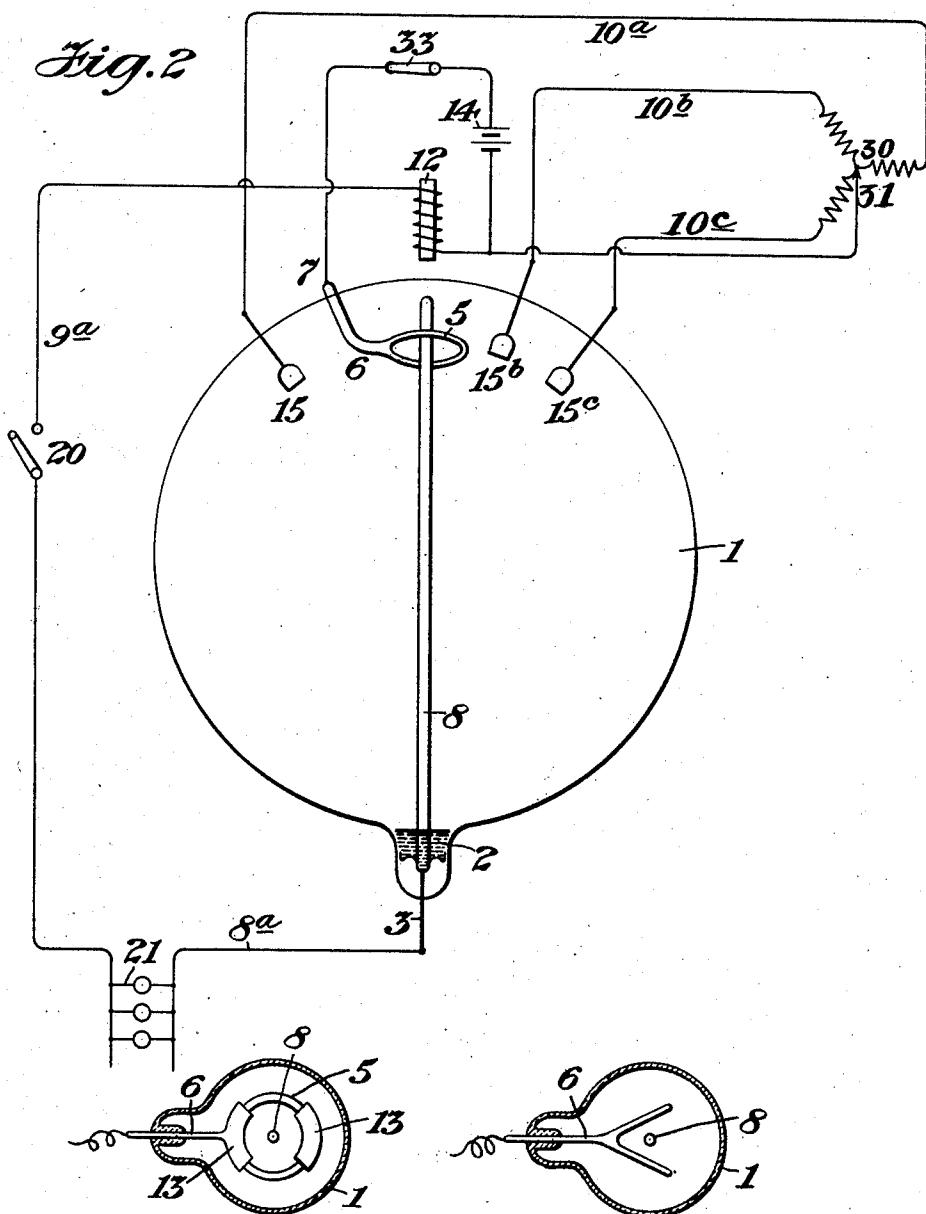


Fig. 3

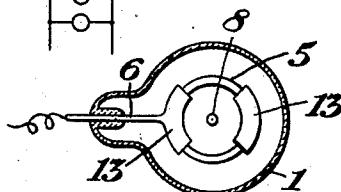


Fig. 4



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# UNITED STATES PATENT OFFICE.

PETER COOPER HEWITT, OF RINGWOOD MANOR, NEW JERSEY, ASSIGNOR TO COOPER HEWITT ELECTRIC COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## VAPOR ELECTRIC APPARATUS.

1,025,464.

Specification of Letters Patent.

Patented May 7, 1912.

Continuation of application Serial No. 204,179, filed April 21, 1904. This application filed March 23, 1908. Serial No. 422,616.

*To all whom it may concern.*

Be it known that I, PETER COOPER HEWITT, a citizen of the United States, and resident of Ringwood Manor, county of Passaic, 5 State of New Jersey, have invented certain new and useful Improvements in Vapor Electric Apparatus, of which the following is a specification.

My invention relates to that class of electrical apparatus in which electric currents are caused to traverse an inclosed gas or vapor. The device embodying these features may be used for yielding light or, under certain conditions, producing a flow of current in a continuous direction from an alternating source of supply, and various other purposes. Devices of the same general character are described in certain patents issued to me on September 17, 1901, and 10 reference may be had thereto for details as to the general plan of exhausting the inclosing chamber and securing the proper conditions of the inclosed gas or vapor. It is now well-known that devices of this character oppose a resistance to the initial passage of current therethrough, but that when this resistance has once been overcome, as by the application of a current of high potential for instance, current will continue to 15 flow under the influence of moderate difference of potential.

The present invention relates more particularly to means for initiating the flow of current through apparatus of this class. I 20 have found that if an actual conducting path through the gas or vapor is provided in the first instance from a negative electrode to a positive electrode of the device, and if current is caused to flow through this conducting path and the path is then interrupted at or near the negative electrode, the current will flow through the gas or vapor between the electrodes in preference to jumping or bridging the comparatively small gap 25 between the separated terminals of the interrupted conducting path. In practice, I have adopted a form of apparatus in which the negative electrode is provided with a conducting prolongation or extension 30 which makes contact either with the other electrode or with an extension therefrom, and I have provided automatic means for the opening of the conducting path thus formed inside the containing vessel, with

the result already described. In the original 55 experiments with this class of devices, difficulty was encountered in obtaining a solid conductor which could be freed from gases and foreign materials within a practical time while on the pump. Such lamps after 60 having apparently been suitably exhausted would become inoperative within a comparatively short time which was attributed to the giving off of deleterious gases from the extension of the negative electrode, thus 65 rendering the lamps difficult to make practically and impairing their durability when made. I have devised various ways of overcoming this difficulty among which may be mentioned, constructing the extension from 70 the negative electrode of very thin material and heating it by reason of the ohmic resistance offered to the passage of current through it while on the pump. It was also overcome by allowing the negative flame to 75 lick it from the top to the bottom, thus heating it locally all over in spots while still on the pump. The material forming this extension may also be treated externally from 80 the lamp, before putting on the pump, thus obviating the major part of the difficulty of removing the gases while the final pumping is in progress. The material may be of soft iron, carbon, graphite, or other suitable material.

The details of a convenient embodiment 85 of my invention are described herein and illustrated in the accompanying drawings in which Figure 1 illustrates one form of apparatus adapted to carry out the invention; and Figs. 2, 3, 4 and 5 illustrate details and modifications.

In the first figure of the drawings, 1 represents a suitable inclosing chamber which, when the device is to be used as a lamp, will 90 generally be made of glass or other suitable transparent material. The chamber contains a suitable gas or vapor, such for example, as mercury vapor. In the present instance, I have shown a negative electrode, 2, as consisting of a small quantity of mercury, and have shown this electrode as being connected with an external conductor 9, by a leading-in wire, 3. The latter is flexibly connected with the base of the extension 8, which is 95 surrounded by the mercury and in electrical connection therewith. The rod, 8, which is 100 thus in contact with the mercury extends 105

longitudinally through the container 1, forming, so to speak, a prolongation or extension of the negative electrode. The extension 8 may conveniently consist of a relatively stiff piece of conducting material such, for instance, as iron, carbon, chromium, or other suitable conductor. Should some non-magnetic material be selected for the extension 8, its remote end may be provided with a magnetizable material to constitute an armature, as will be explained later on. Near its remote end the extension 8 is here surrounded by a loop or ring, 5, constituting the main portion of the positive electrode of the apparatus. The said loop or ring is connected by an extension, 6, with a leading-in-wire, 7, constituting the means of connection with the external circuit.

When the apparatus is mounted, say in a vertical position, the extension 8 rests against the inner edge of the ring electrode 5, thereby completing a conducting path through the container 1 by way of the leading-in-wire 7, the extension 6, the ring electrode 5, the extension 8, the negative electrode 2, and the leading-in-wire 3. The connection of the positive electrode 5 to the external circuit conductor, 10, is made through a coil, 11, having a magnetizable core, 12. To start the device into operation, the circuit 9—10 is closed and current passes through the device by way of the conducting path already described. In this way the electro-magnet 11—12 is vitalized and acts magnetically upon the adjacent end of the extension 8 whereby the said extension will be lifted out of contact with the ring 5. Thereupon the current will pass from the ring through the intervening vapor path to the extension 8, after which the current very quickly chooses the path of gas or vapor in the container, and instead of continuing to traverse a portion of the extension 8, passes directly through the gas or vapor path to the surface of the electrode 2. The position of the magnet 11—12 may be such as to draw the extension 8, over against an insulating block or coating, 13, carried by the ring 5; or it may cause the extension to stand free within the ring and out of contact with any portion thereof.

The extension 6, may terminate in circular form, as shown in cross-section in Fig. 3, or in an electrode of Y-shape, as shown in Fig. 4, or in an electrode having other suitable configuration.

In Fig. 2 I have shown a modification illustrating the invention as applied to a multiphase electric circuit. The source, 30, is here shown as a three-phase generator, which may be either a transformer or any other suitable source of three-phase currents. It is not necessary that the multiphase circuit should be a three-phase circuit, it being readily possible to adapt the invention to

circuits carrying any desired number of phases. The neutral point, 31, of the generator is joined by a wire, 9<sup>a</sup>, with the leading-in-wire 3. The terminals of the generator are connected by wires, 10<sup>a</sup>, 10<sup>b</sup>, and 10<sup>c</sup>, respectively, with positive electrodes 15<sup>a</sup>, 15<sup>b</sup>, and 15<sup>c</sup>, within the container 1. The magnet 11—12 is here included in the conductor 9<sup>a</sup>, and a switch, 20, is provided for controlling the circuit. A work circuit is shown at 21. The electrode 5 is ring shaped as before and surrounds the open end of the extension 8. The latter simply rests within the mercury electrode, 2, without being mechanically linked to the leading-in-wire. For energizing the magnet 11—12 and initiating the flow of current, I may use a suitable source, 14, of continuous electric currents and I may provide its circuit with a switch, 33, by means of which the said source may be cut into and out of circuit. This circuit may be independent of the work circuit. Assuming that the said switch is closed, the closure of the switch 20 will then complete a circuit from the source 14 through the leading-in-wire 7, the extension 6, the electrode 5, the extension 8, the electrode 2, the leading-in-wire 3, and the conductor 9<sup>a</sup>. This will cause the extension 8 to be lifted out of contact with the ring electrode 5, and it will be held out of contact so long as the circuit to the source 14 remains closed. As to the operation of the device under the influence of multiphase currents, it may be said that successive phases pass through the device to the electrode 2 from the electrodes 15<sup>a</sup>, 15<sup>b</sup> and 15<sup>c</sup>, and inasmuch as current from one of these electrodes begins before that through another ceases, the apparatus will be kept in operative condition.

In Fig. 5, I have shown a modification in the arrangement of the apparatus in which the negative electrode is put at the upper end of the device in the bottom of a bent-over extension and hangs downward through the tube and passing through the ring 5 at the lower end. The magnet 11 may be so placed as to swing the extension into contact with the electrode when it is desired to make contact therewith and it will be released when the circuit of the magnet 11 is broken, or it may be made to operate in the same manner as described with reference to Fig. 1. The magnet 11, in this instance, is shown as being connected in a separate circuit provided with a switch of any suitable character for temporarily closing its connection.

The present application is a continuation of applicant's case Serial Number 204,179, filed April 21st, 1904.

I claim as my invention:—

1. In a system of electrical distribution, the combination with an alternating cur-

rent source, a rectifier therefor comprising a completely exhausted container and electrodes therein, including a plurality of anodes and a vaporizable reconstructing cathode and connections between said anodes and terminals of the source and a connection between the cathode and an intermediate point of said source, of a separate direct current source connected between the intermediate point of the alternating source and a separate anode within the container, means for connecting and disconnecting said additional anode to and from said cathode within the container and automatic means responsive to the rectified current from said alternating source for operating said means, together with non-automatic means for controlling the direct current source.

2. In a system of electrical distribution, the combination with an alternating current source, a rectifier therefor comprising a completely exhausted container and electrodes therein, including a plurality of anodes and

a vaporizable reconstructing cathode and connections between said anodes and the terminals of the source and a connection between the cathode and an intermediate point of said source, of a separate direct current source connected between the intermediate point of the alternating source and a separate anode within the container, means for connecting and disconnecting said additional anode to and from said cathode within the container, a magnet coil located in the said first named connection to the intermediate point of the alternating source for operating said means, together with non-automatic means for controlling the direct current source.

Signed at New York, in the county of 40  
New York, and State of New York, this  
19th day of March A. D. 1908.

PETER COOPER HEWITT.

Witnesses:

Wm. H. CAPEL,  
GEORGE H. STOCKBRIDGE.