

P. H. THOMAS.
METHOD OF OPERATING VAPOR ELECTRIC DEVICES.
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981,328.

Patented Jan. 10, 1911.

Fig. 1

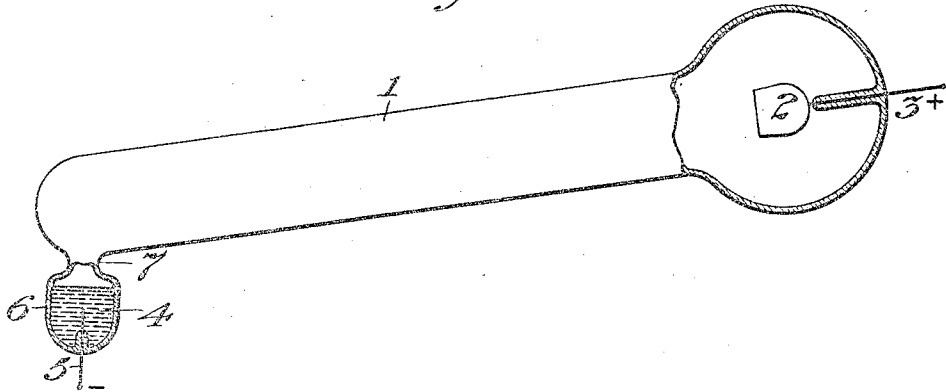
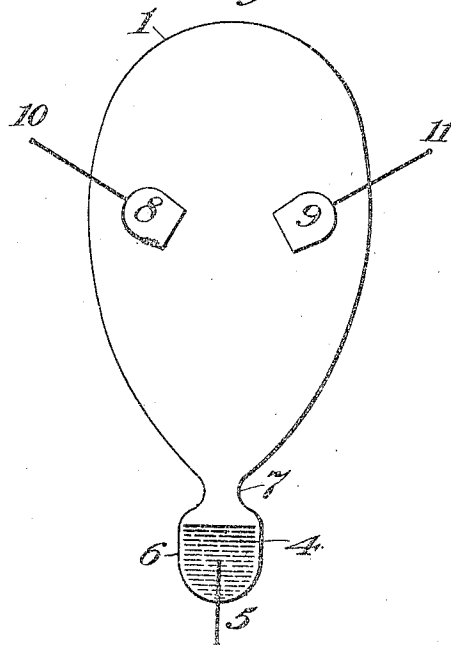


Fig. 2



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UNITED STATES PATENT OFFICE.

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METHOD OF OPERATING VAPOR ELECTRIC DEVICES.

981,328.

Specification of Letters Patent. Patented Jan. 10, 1911.

Original application filed February 10, 1904. Serial No. 192,926. Divided and this application filed March 31, 1905. Serial No. 253,170.

To all whom it may concern:

Be it known that I, PERCY H. THOMAS, a citizen of the United States, and resident of Montclair, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Methods of Operating Vapor Electric Devices, of which the following is a specification.

The phenomena of negative electrode resistance in mercury vapor apparatus designed either for lighting, current rectifying or other purposes, is now a matter of knowledge. It is known, moreover, that for the successful and economical production of light or for the operation of the apparatus for other purposes, the negative electrode resistance should generally be broken down for starting purposes and afterward maintained in that state. This matter presents considerable difficulty under certain circumstances, since, when the negative electrode is cold, or when the device is operated by small currents, the mercury has a strong tendency to increase its resistance as a negative electrode, in a marked degree. When, however, the mercury is heated and kept heated, it loses this tendency toward an increase of its resistance. Accordingly, it is, at first thought, more desirable to design mercury vapor lamps and other mercury vapor apparatus in such a manner that in normal operation the negative electrode should be maintained at a very high temperature. This, however, is not the case, for the reason that it results in a loss of efficiency in the apparatus, due to the fact that the vapor pressure within the apparatus becomes so great under such circumstances as to introduce a considerable electrical resistance to the passage of the current.

It is the object of the present invention to combine the advantages due to a heated negative electrode with those due to the presence of a proper and economical vapor pressure. This result is accomplished by introducing between the negative electrode and the operating portion of the chamber of the apparatus a comparatively narrow inlet passage, so that although the vapor pressure at the surface of the negative electrode may be very great, on account of its high temperature, yet, in the chamber itself, on account of its greater cooling capacity, the vapor pressure may be of any desired value. The

function of the narrow throat or passage above described is that of preventing a too rapid flow of vapor from the negative electrode to the operating chamber. There is, of course, a slight loss of efficiency due to the passage of the current from the surface of the negative electrode to the throat through a high vapor pressure, but this may be made negligible by a proper proportioning of the apparatus, the distance between the surface of the negative electrode and the mouth of the throat being short. Moreover, by properly proportioning the heat dissipating capacity of the negative electrode and the narrow throat, and that of the main position of the chamber, any desired electrode temperature may be attained and any desired vapor pressure secured in the operating chamber of the apparatus.

I have illustrated my invention as applied on the one hand to a mercury vapor lamp and on the other hand to a converter or current rectifier, Figure 1 being a sectional view of a lamp embodying my invention; and Fig. 2 being a similar view of a current rectifying apparatus.

Referring to the first figure of the drawings, 1 is the main or operating chamber of a mercury vapor lamp, 2 is a solid electrode contained therein and mounted upon a lead-wire, 3, passing through the wall of the chamber. The negative electrode, 4, is of mercury and is also provided with a lead-wire shown at 5.

The mercury electrode 4 is contained in a receptacle, 6, which is connected to the chamber 1 by a narrow throat, 7.

The lamp described may be started by any suitable means and if the proportions of the receptacle 6, the throat 7 and the chamber 1 and the electrode 4 be properly made, so that the heat radiating capacity of the several parts is suited to the purposes in view, the electrode 4 may be caused to run hot while at the same time no excess of vapor will pass over into the chamber 1 owing to the presence of the throat 7 which chokes the passage of too much vapor. In this way the appropriate vapor pressure can be maintained in the main or operating chamber and at the same time the advantages of a hot negative electrode which reduces the normal negative electrode resistance are obtained.

Fig. 2 represents a small converter having

two positive electrodes, 8 and 9, lead-wires, 10 and 11, a negative electrode 4, a main operating chamber 1, a receptacle 6, a lead-wire 5 and a throat, 7. The operation of this apparatus will be clearly understood in view of the description given to the operation of the lamp illustrated in Fig. 1.

I do not wish to limit myself to the employment of mercury as the material for the negative electrode, it being understood that any suitable conducting volatilizable material might be employed.

In the description above, it has been assumed that this invention is used for the purpose of improving the operation of a vapor lamp and that it is desired to operate with the negative electrode at a high pressure and the vapor path at a lower pressure. In some cases, however, the conditions may be reversed and the high pressure be required or desirable in the vapor path rather than in the electrode. In this case, the difference in pressure is made possible by means of the narrow throat, as already explained. In other words, my invention is not limited to the specific type of apparatus described, but is intended to include a method for producing a difference in pressure between two chambers by means of a throat so narrow as to prevent a free passage of the vapor from one to another.

This application is a division of my application Serial Number 192,926, filed February 10, 1904, in which parent application claims are made upon the apparatus disclosed herein.

I claim as my invention:

1. In a vacuum electric apparatus possessing a vaporizable negative electrode having the quality of negative electrode starting re-

luctance, the method of operation which consists in developing vapor from the vaporizable electrode, increasing its pressure and temperature in the immediate neighborhood of the electrode and permitting a relatively free flow of current in regions more remote from the electrode by there condensing excess.

2. The method of preventing excessive vapor pressure in a gas or vapor electric apparatus, containing a volatilizable negative electrode, which consists in generating vapor at a negative electrode, cooling such vapor at a distance from the electrode and maintaining near the electrode a relatively large portion of the vapors generated.

3. The method of producing in a gas or vapor electric apparatus a comparatively low resistance and a proper vapor pressure, which consists in generating the vapor from a special electrode, cooling said vapors in a region remote from the electrode, and maintaining the temperature of the special electrode higher than that corresponding to the vapor pressure in the remote region.

4. In a vacuum electric apparatus in which positive and negative electrodes are relatively widely separated, the method of operation which consists in maintaining the negative electrode at a relatively high temperature and pressure and reducing the vapor pressure in the vapor path.

Signed at New York, in the county of New York, and State of New York, this 28th day of March A. D. 1905.

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Witnesses:

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