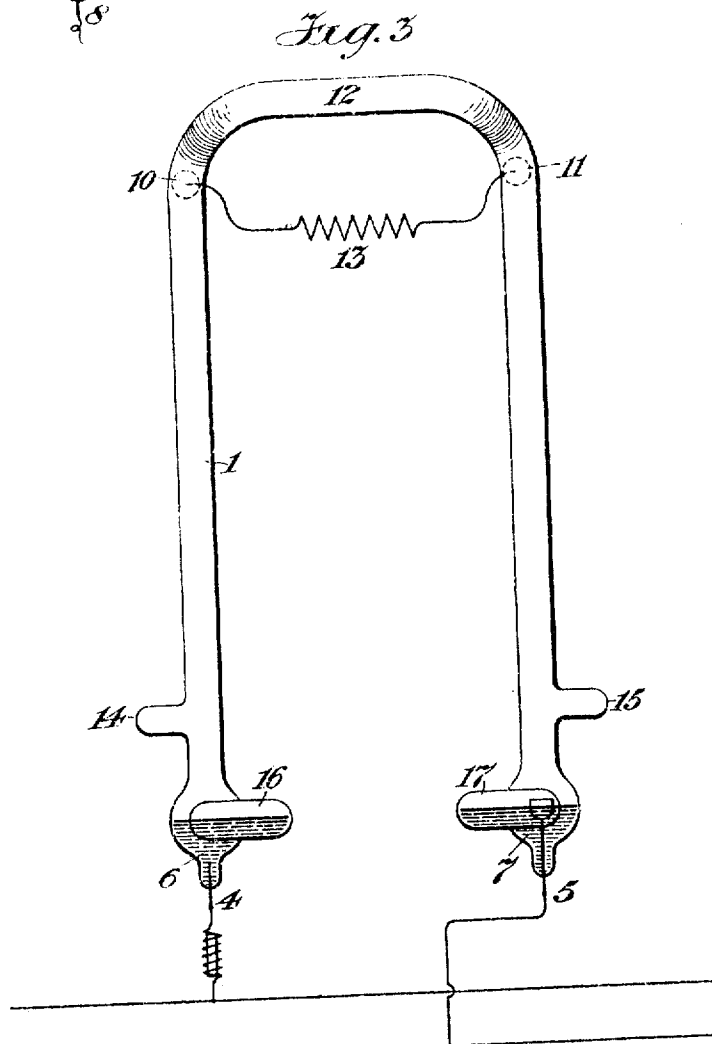
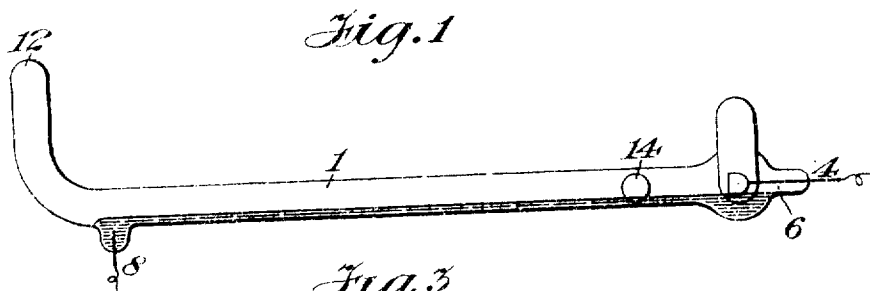


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3 SHEETS—SHEET 1.

939,912.



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Fig. 2

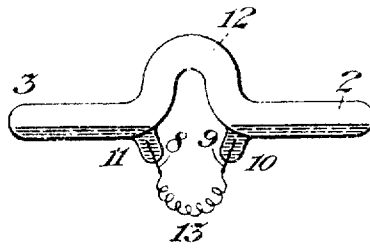
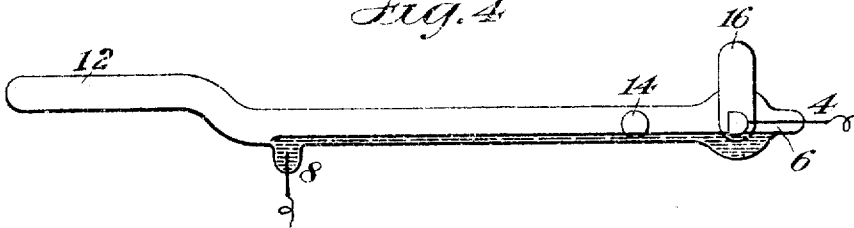


Fig. 4



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Fig. 5

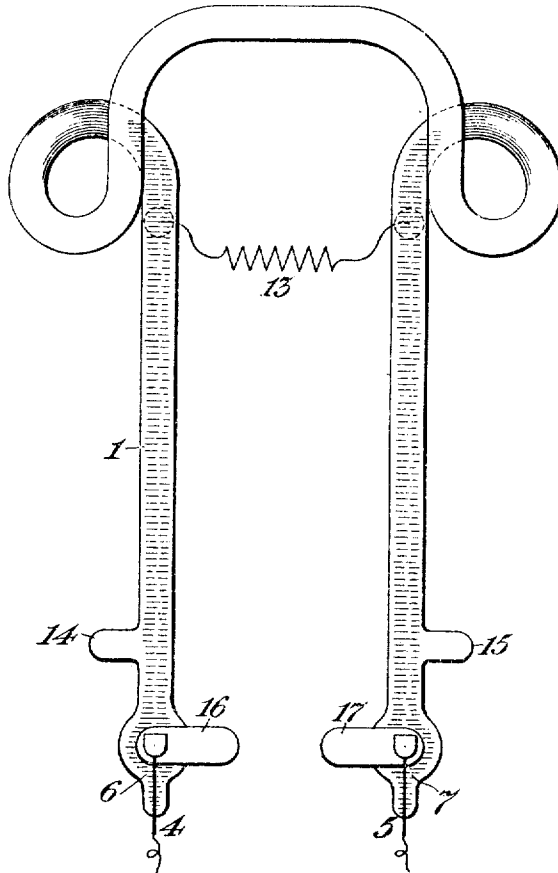
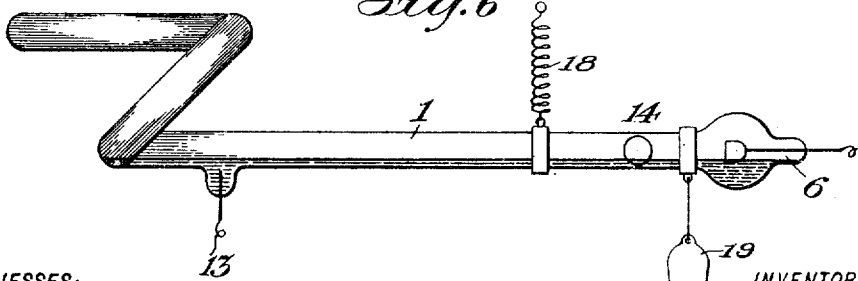


Fig. 6



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UNITED STATES PATENT OFFICE.

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

GAS OR VAPOR ELECTRIC LAMP.

939,912.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Original application filed April 9, 1904, Serial No. 202,286. Divided and this application filed June 29, 1905. Serial No. 267,526.

To all whom it may concern.

Be it known that I, PETER COOPER HEWITT, a citizen of the United States, and resident of New York, county of New York, State of New York, have invented certain new and useful Improvements in Gas or Vapor Electric Lamps, of which the following is a specification.

The present invention relates to starting devices for gas or vapor electric apparatus, and for convenience the description and drawings will be made to apply to gas or vapor lamps, although it will be understood that the same principles may be applied to gas or vapor electric apparatus employed for any purpose whatsoever.

Still further for convenience, the invention will be described as applied to a U-shaped lamp, although the shape of the apparatus need not be confined to those illustrated and described.

In general the invention belongs to that class of vapor electric devices wherein a current may be initially passed through the apparatus by way of a continuous conductor, without regard to the vapor column through which the current is ultimately to pass. This has already been accomplished by providing a path of mercury from one electrode to the other inside the apparatus and, after the current is established through such path, the apparatus has been tilted so as to interrupt the mercury path and cause a flow of current through the vapor, such flow of current being rendered easily possible by reason of the fact that the negative electrode resistance is locally broken down inside the apparatus, after which the flow of current easily takes place to the negative electrode without the application of any abnormal potential to the terminals. In the present instance, the conducting path consists partly of mercury or other conducting fluid, and partly of a resistance conductor. The resistance conductor is introduced between the terminals of two liquid columns, the said columns and the resistance forming a continuous conducting path from one electrode to the other. Indeed, the so-called liquid columns may extend a very short distance from the electrodes, only just far enough so that a rupture can be made inside the apparatus between the terminals of the resistance conductor and the liquid at the elec-

trodes. The rupture of this conducting path takes place when the apparatus is tilted so as to permit the mercury or other conducting liquid to flow away from the terminals of the resistance conductors where they enter the apparatus. It is found that the current, on the rupture of the original circuit as described, will find its way through the mercury vapor and establish a flow of current through the apparatus. This can all be accomplished upon a voltage similar to that which is employed in the actual operation of the apparatus, without the application of any abnormal initial voltage for starting it.

The tilting of the apparatus may be accomplished by automatic means or manually as preferred, or as circumstances may dictate.

Looked at from another point of view, the resistance conductor described above may be regarded as a shunt-circuit for the original vapor resistance between the ends of the mercury columns or between the electrodes themselves. This vapor resistance, as is well-known, is initially very high at the negative side of the circuit, and requires to be broken down before current will pass through the vapor. Such breaking down occurs when the rupture takes place between the resistance on the negative side and the mercury column on the same side. The resistance being once broken down the tendency for the current to flow through the vapor path is at once made operative and as the mercury column recedes from the terminals of the resistance conductor, the flow continues through the entire vapor path between the electrodes.

My invention will be understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a mercury vapor lamp in the position which it occupies before starting; Fig. 2 is an end view of the same looking toward the right of Fig. 1; Fig. 3 is an elevation of the lamp in its position of operation; and Figs. 4, 5, and 6 illustrate modifications.

Referring to the drawings, 1 is a U-shaped tube containing columns of mercury, 2 and 3. These columns of mercury in the inactive position of the lamp extend from lead-wires, 4 and 5, respectively, which extend

into the respective electrode pockets, 6 and 7, to lead-wires, 8 and 9, extending into pockets, 10 and 11, near the yoke end of the tube 1. At this end, the tube is bent upward as shown at 12, so that the mercury does not pass over the bend, but terminates in the pockets 10 and 11. Between the lead-wires 8 and 9 is mounted a resistance, 13, which in the position illustrated in Figs. 1 and 2, constitutes a conducting continuation of the mercury columns 2 and 3.

The lead-wires 4 and 5 are suitably connected with the poles of an electric source, and when the circuit of the said source is closed, a complete circuit is made through the apparatus, say from the lead-wire 4 to the mercury column 2, the lead-wire 8, the resistance 13, the lead-wire 9, the mercury column 3, and the lead-wire 5.

The apparatus may be provided with trunnions, 14 and 15, on which it can be turned from a substantially horizontal position to an inclined or vertical position, and a spring or weight may be provided tending to hold it in the position selected for operation.

The circuit having been established through the apparatus by way of the path already described, the apparatus can now be tilted on its trunnions, say, into the position illustrated in Fig. 3, whereby it will happen that a rupture will be made between the mercury columns 2 and 3 and the lead-wires 8 and 9, respectively. The flow of current will now pass through the entire vapor column including the bend 12, from the electrode in the pocket 6 to the electrode in the pocket 7, or vice versa, as the case may be, depending upon which is the positive and which is the negative electrode, so that the entire vapor column will be traversed by current and will become luminous in the case of a lamp or will pass current for other purposes in the case of a vapor converter. I generally provide supplemental pockets, 16 and 17, near the lower end of the apparatus to receive the excess of mercury which might otherwise be present at the positive and negative electrodes in the operative position of the lamp. The lead-wires 8 and 9 also terminate in pockets, as already described.

With the arrangement described, one of the electrodes may be of solid material and the other of volatilizable material, in which case the solid electrode would be so arranged as to project beyond the mercury in one or the other of the pockets 6 and 7.

Fig. 4 shows a partial view of a modified form of apparatus, the especial feature being that of providing a longer vapor path between the ends of the mercury columns 2 and 3. The bend 12 is here prolonged in the general direction of the legs of the U-shaped tube, whereby the vapor column is length-

ened as stated. Instead of forming two liquid columns extending from the electrodes, one terminal of the resistance conductor may be connected directly with one of the electrodes and the rupture of the circuit may take place between the other terminal of the resistance conductor and a column extending from the opposite electrode.

In Figs. 5 and 6 the yoke end of the U-shaped tube is twisted in the manner indicated in the drawing so that the legs of the U return upon themselves, thereby causing the bend to occupy a higher position when the apparatus is horizontal than the rest of the tube, and limiting the distance to which the columns 2 and 3 extend in a direction away from the electrodes.

The resistance 13 is connected as before between the remote ends of the mercury columns, and the action is generally the same as that already described. In this figure are shown a spring 18 and a weight 19, tending to hold the lamp 1 in the position selected for operation, namely, with the left hand end above horizontal to return the mercury to the proper electrodes or receptacles.

In all the illustrated forms of the apparatus, it will be seen that an initial path from electrode to electrode is provided through a resistance conductor. The resistance is here shown as mainly exterior to the container, but it may obviously be carried across the bend inside the container, if preferred. Owing to the presence of this initial path for the current, the negative electrode resistance which is usually present in apparatus of this class is broken down as soon as the current is turned on in the circuit including the apparatus.

In another application Serial Number 202,286, filed April 9, 1904, of which this application is a division, claims are made upon the apparatus described herein.

I claim as my invention:

The method of securing a closed metallic circuit between electrodes of a vapor electric apparatus, for the purpose of starting, which consists in connecting the electrodes by passing the starting current between the electrodes within the container for a portion of the way adjacent to the electrodes, and for the remainder of the way more remote from the electrodes passing the current outside of the container.

Signed at New York, in the county of New York, and State of New York, this 26th day of June A. D. 1905.

PETER COOPER HEWITT.

Witnesses:

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GEORGE H. STOCKBRIDGE.