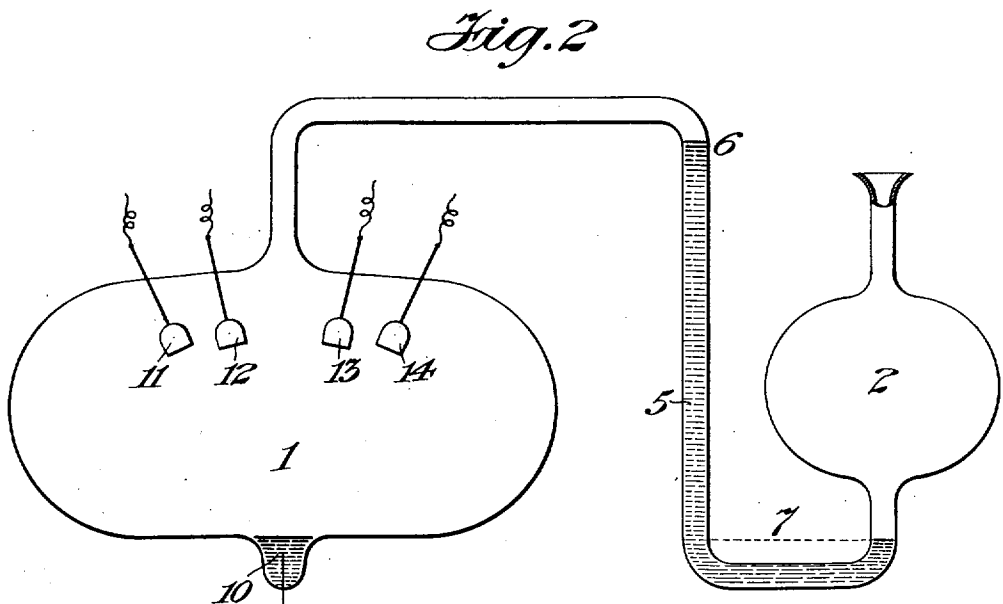
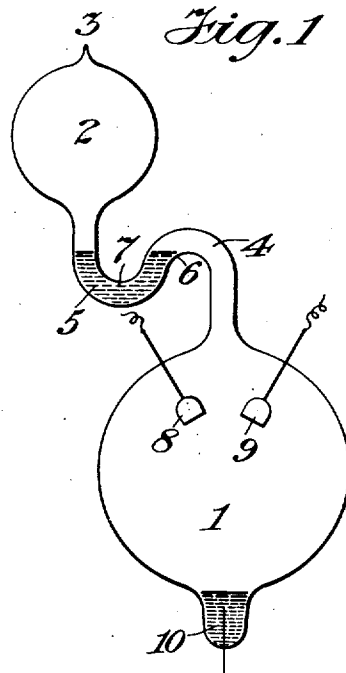


P. H. THOMAS.
MANUFACTURE OF VAPOR ELECTRIC APPARATUS.
APPLICATION FILED MAY 25, 1904.

1,009,939.

Patented Nov. 28, 1911.



Witnesses
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UNITED STATES PATENT OFFICE.

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MANUFACTURE OF VAPOR ELECTRIC APPARATUS.

1,009,939.

Specification of Letters Patent. Patented Nov. 28, 1911.

Application filed May 25, 1904. Serial No. 209,655.

To all whom it may concern:

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

The vapor apparatus which is represented by the well-known mercury vapor lamp and mercury vapor converter commonly comprises a glass container with one or more mercury electrodes therein from which mercury vapor is developed in the operation of the apparatus. Under these conditions, it is possible to develop within the apparatus a pressure which may be equal to several inches of mercury. The manufacture of apparatus of this class involves the production of a high degree of vacuum and several ways for creating a good vacuum have been suggested.

The present invention relates to means for improving the vacuum in the process of manufacture or in a subsequent process, reliance being had upon the possibility above mentioned of producing within the container any desired amount of pressure within reasonable limits.

It is further known that we can free an inclosed space from injurious gases by the production within the space (by heat or otherwise) of a large quantity of vapor, such as mercury vapor, and passing this vapor out of the chamber or container while the vapor is commingled with the gases which are to be removed.

The means for creating the desired pressure and the desired production of vapor may be a high degree of heat, and in the present specification such means are described. In carrying out my invention, I provide a separate chamber connected with the main chamber by a one way valve or its equivalent and I develop in the chamber which is to be exhausted a high pressure by heat or other means and thus force out the injurious gases, usually commingled with mercury vapor, into the separate chamber, after which the gases cannot again return to the main chamber. The one way valve herein described consists of a small U-tube trap suitable for holding mercury or other liquid and for preventing the return of any gases that may be passed through the tube.

I have mentioned mercury as a suitable liquid, for the purpose, but it will be understood that I do not limit myself to the use of mercury alone.

In Figures 1 and 2 of the accompanying drawings I show different embodiments of the invention herein described and claimed.

In Fig. 1 the main chamber is shown at 1 and the separate or supplemental chamber at 2. The initial preparation of the main chamber consists in exhausting the same by any of the usual methods and sealing off the apparatus at 3. The chamber 1 is connected to the chamber 2 by a bent tube, 4, constituting a U-valve, which permits gases under pressure to pass upward from the main chamber to the supplemental chamber 2 through a trap, 5, of mercury or other liquid. Let it be assumed that the main chamber is exhausted by one of the usual processes so as to provide a high vacuum within the chamber. If we wish to improve the vacuum by removing still more of the superfluous gases therefrom, we may heat the chamber 1 by any suitable means and develop therein a pressure which will be sufficient to cause gases to pass through the trap 5 into the chamber 2. This process may be continued until the pressure in the chamber 2 becomes equal to or in excess of the pressure in the chamber 1. During the process mercury vapor will be developed and will carry with it through the trap a portion of the superfluous gases and in this way a very high degree of vacuum in the chamber 1 can be obtained. The capacity of the chamber 2 should be such as to readily condense the mercury vapors which pass to it. When the chamber 1 is allowed to cool down the mercury in the trap will not permit the return of gases from the chamber 2 unless the latter has a pressure greater than that which is due to the height of the column between the points 6 and 7 in the tube 4. All that is necessary is to provide at 2 a chamber large enough to contain the gases to be exhausted from the chamber 1 without exceeding the pressure between the points 6 and 7. The same idea may be applied to pumping and re-pumping vapor apparatus in actual installation. This is illustrated in Fig. 2. Here the chamber 2 is open to the atmosphere and the height between the points 6 and 7 is at least the barometric height.

In the construction shown, if the proportions are right, mercury passed over from the chamber 1 to the chamber 2 will for the most part return to the chamber 1 when heat is removed from the said chamber, while at the same time a perfect seal will be maintained at all times from the atmosphere. By this arrangement the apparatus can obviously be repumped at any time, provided the apparatus as a whole will stand the necessary temperature for producing a pressure slightly above that of the atmosphere.

This method is of especial advantage in those types of apparatus in which a gas escapes slowly from the electrodes or other parts of the container, as it allows the apparatus to be pumped in the usual manner, sealed off and after sufficient time has elapsed or treatment been provided to discharge the remaining portions of the occluded gases they may be forced into the supplemental chamber which may then be sealed off, leaving a comparatively perfect vacuum within the main operating chamber. This may be done after a lapse of any desired period, during which the apparatus can be normally operated or may be stored away, as the case may be. In those cases of the general character of Fig. 2 in which it is undesirable to increase the pressure within the chamber to a sufficient degree above atmospheric pressure to expel the gases, it is possible to accomplish the result with a much less pressure by producing a partial vacuum in one end of the tube which is otherwise at atmospheric pressure. This can be done by apparatus which would otherwise be inadequate for pumping the main chamber under ordinary conditions. An ordinary water jet pump would be sufficient.

It is to be noted that the valve which has herein been described as a one way valve operates as a one way valve for the vapors while at the same time permitting the mercury or other condensable liquid to pass in either direction. This arrangement permits any gases or vapors driven into the chamber 2 and therein condensed to return to the chamber 1 without disturbing the capacity of the valve as preventing the flow of vapors in the return direction.

The parts indicated at 8 and 9 in Fig. 1 are positive electrodes, say of iron, and the part 10 is a negative electrode, say of mercury. In Fig. 2, the negative electrode 10 is also shown and four positive electrodes, identified as 11, 12, 13 and 14.

I claim as my invention:—

1. The combination with a chamber to be exhausted, of a volatilizable liquid contained therein, a separate closed chamber, a valve therefor adapted to permit the passage of gases outward under pressure from the

chamber to be exhausted and to prohibit the return of gases under atmospheric pressure, and means for conducting a volatilized portion of said liquid from the first named to the second named chamber through said one-way valve.

2. The combination with a chamber to be exhausted, of a volatilizable liquid contained therein, and a supplemental sealed chamber and means for permitting the passage of a volatilized portion of said liquid to said supplemental chamber, said means including a valve inoperative under all pressures below a certain operative amount thus permitting the passage of vapors in the direction of the supplemental chamber under temporary excessive pressure in the main chamber.

3. The combination with a chamber to be exhausted, the said chamber containing a volatilizable liquid, of a separate closed chamber, and a valve interposed between the two chambers, the said valve being adapted to permit the exit of vapors from the chamber to be exhausted and to permit the return of the condensed vapors in liquid form to the original chamber.

4. The combination with a chamber to be exhausted, the said chamber containing a volatilizable liquid, of a separate closed chamber, and a liquid valve interposed between the two chambers, the liquid of the said valve being of the same material as the liquid in the chamber to be exhausted.

5. The combination with a chamber to be exhausted, and a body of mercury contained within the same, of a separate sealed chamber and a mercury valve interposed between the chambers.

6. The combination with a mercury vapor apparatus comprising a hermetically sealed and completely exhausted container, and suitable electrodes contained therein, one of which is a vaporizable reconstructing cathode, of means permitting the expelling of residual gases from said container, together with means for supplying a permanent discharge path to a supplementary exhausted chamber for said residual gases, said means prohibiting the return of all gases to said container, with all pressures below a certain operative minimum in said supplementary chamber.

7. A vapor electric device having a hermetically sealed chamber, and an empty auxiliary chamber communicating therewith through a constructed opening, said auxiliary chamber being removable to improve the vacuum of the device.

8. The combination with the evacuated envelop of a vapor device, of an auxiliary chamber communicating therewith and removable therefrom to effect permanent removal of gas from said main envelop at any time during normal operation of said device.

9. The method of improving the vacuum

of a vapor electric device, which consists in driving gas or foreign material from main envelop of the vapor device into an auxiliary chamber during normal operation, and then closing the opening between said main chamber and said auxiliary chamber.

10. The method of improving the vacuum of a sealed vapor electric device during normal operation, which consists in driving gas or foreign material from the main chamber of the device through a constricted opening, and then sealing said opening.

11. The combination with the sealed envelop of a vapor electric device, of means attached thereto for at any time improving the vacuum of said device by actual removal of material from the envelop while in circuit under normal working conditions.

12. A sealed vapor electric device having a main chamber, and an auxiliary chamber communicating therewith through a constricted opening, said auxiliary chamber being initially empty, but being removable from the main chamber to improve the vacuum of the device.

13. The combination with an evacuated envelop having a condensing chamber, means for maintaining an arc blast in said envelop, and an auxiliary chamber communicating with said condensing chamber and removable therefrom at any time during normal operation of the device to permanently remove gases from said envelop.

14. The method which consists in highly exhausting a vapor electric device, hermetically sealing said device and thereafter putting it into normal operation, segregating in an auxiliary chamber the gases liberated within the device during normal operation, and ultimately sealing off said auxiliary chamber to permanently prevent return of said gases to the arc path of said device.

Signed at New York, in the county of New York, and State of New York, this 21st day of May A. D. 1904.

PERCY H. THOMAS.

Witnesses:

WM. H. CAPEL,
GEORGE H. STOCKBRIDGE.

Correction in Letters Patent No. 1,009,939.

It is hereby certified that in Letters Patent No. 1,009,939, granted November, 28, 1911, upon the application of Percy H. Thomas, of East Orange, New Jersey, for an improvement in "The Manufacture of Vapor Electric Apparatus" an error appears in the printed specification requiring correction as follows: Page 2, line 121, for the word "constructed" read *constricted*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of January, A. D. 1912.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.

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