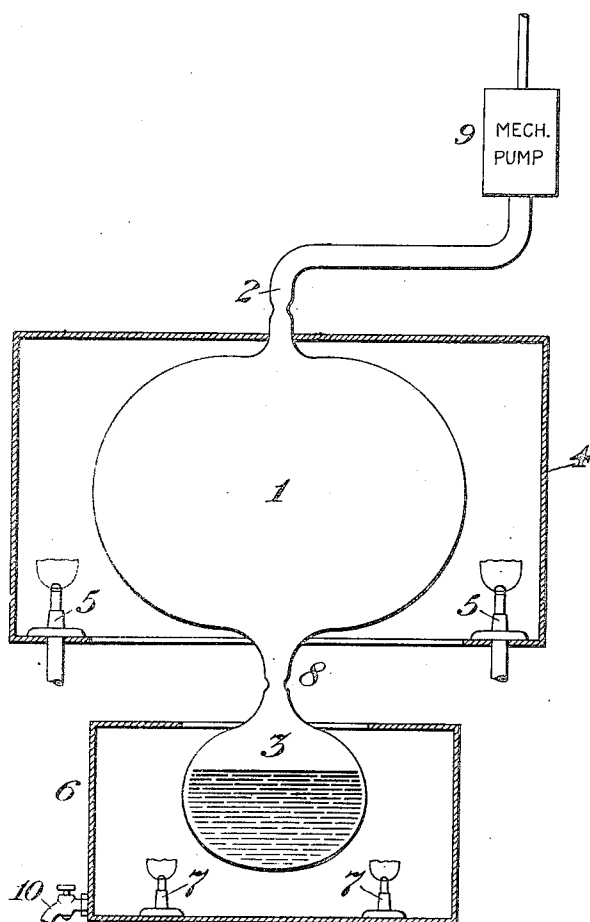


P. H. THOMAS.
VACUUM APPARATUS.
APPLICATION FILED JUNE 16, 1905.

981,498.

Patented Jan. 10, 1911.



WITNESSES:

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VACUUM APPARATUS.

981,498.

Specification of Letters Patent.

Patented Jan. 10, 1911.

Original application filed January 23, 1904, Serial No. 190,285. Divided and this application filed June 16, 1905. Serial No. 265,503.

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 Vacuum Apparatus, of which the following is a specification.

When it is desired to remove injurious gases from a containing vessel or chamber, it is sometimes desirable to assist the operation by creating a vapor inside the chamber and causing the expulsion or removal of the said vapor either wholly by the same means as those employed for creating it or partially by the use of supplemental means such as a mechanical pump which would not in itself provide sufficient means for accomplishing the removal. Such a vapor may be exemplified by mercury vapor and the vapor may be produced by heating mercury inside the chamber and expelling the gases either entirely by the influence of the heat, or with the aid of a mechanical pump. This process has been found useful in connection with the pumping of mercury vapor apparatus wherein the mercury may serve the purpose of forming an electrode or more than one electrode inside the container after the chamber has been sealed off and the apparatus is ready for use. It should be understood that the sealing off, in all cases, takes place while the operation of expelling or withdrawing the vapors is in progress.

The present invention is designed to utilize, to some extent, the same general principles as those above set forth, but it is more particularly applicable to apparatus in which the material used for creating the vapor is not essential to the operation of the completed apparatus. For convenience, I shall show mercury as the source of vapor, and a jet, flame or torch as a source of heat for generating vapor from the mercury. Instead, however, of placing the mercury in the vessel which is to be exhausted of air and other gases, I locate the mercury in a separate receptacle below the chamber and connect this receptacle to the chamber by a neck which can readily be sealed off when the operation is complete. During the process of removing injurious gases from the chamber, the chamber itself and the receptacle containing mercury will both be subjected to heat, thereby causing the passage of a

portion of the mercury vapor generated to pass through the chamber and out at a suitable exit tube. With the said exit tube may or may not be connected a mechanical pump for assisting in the withdrawal of the vapors and gases. When the operation has been continued long enough so that the products issuing through the exit tube are substantially pure mercury vapor, the said exit tube is sealed off, heat is withdrawn from the mercury containing receptacle, the latter is subjected to the influence of special cooling means, thereby promoting the condensation of the mercury and its return to the receptacle, after which the neck connecting the receptacle to the chamber is sealed off and the operation is complete.

When this process is carried out in the manner described, it is found that a very high degree of vacuum is produced in the chamber, such production being assisted by the means which are provided for condensing the mercury through a cooling process.

The invention is illustrated in the accompanying drawing which is an elevation of an apparatus adapted to secure the carrying out of my invention.

In the drawing, 1 is the chamber to be exhausted, 2 is the exit pipe therefrom, and 3 is the receptacle for containing mercury. Around the chamber 1 I may arrange a heat retaining shield, 4, adapted to receive jets, 5, 5, which may be ignited for producing heat. I may also surround the receptacle 3 with a heat retaining shield, 6, and may place in the bottom thereof one or more jets, 7, 7, for heating the mercury receptacle 3 and the mercury contained therein. The receptacle 3 is joined to the chamber 1 by means of a neck, 8. The exit tube 2 may have connected to its remote end a mechanical pump, as shown at 9, and in general I prefer this arrangement, although the pump may be dispensed with if preferred.

To operate the apparatus, the jets 5, 5 and 7, 7 may be ignited and the pump 9 set in action. Through the operation of the jets 7, 7 mercury vapor is formed and this passes into the chamber 1 where it is still further heated by means of the jets 5, 5. This causes a tendency for the vapor to pass out through the exit tube 2 and in some instances no other source of power for withdrawing the vapor is required. Should the pump 9 be

used it will assist the withdrawal of the vapors. The gases originally contained in the chamber 1 will naturally diffuse themselves in the vapor of mercury created by the process above described, and as the said vapor passes out from the chamber, the original gases will be carried along with it and the process may be continued until practically nothing but pure vapor passes out through the exit tube. At this time the tube 2 should be sealed off and the jets 7, 7 should be removed, or the flames put out. The jets 5, 5, however, will remain in operation. The part 6 which has been, up to this point, used as a heat retaining chamber may now be filled with a cooling liquid, such as water, which may be caused to pass continuously through the part mentioned, thereby causing a rapid cooling of the receptacle 3. Owing to the comparatively low temperature of this receptacle, the mercury vapor in the chamber 1 will be condensed and fall by gravity into the receptacle. Accordingly, an excellent vacuum will be produced in the chamber 1 and when the operation has been continued long enough, the neck 8 may be sealed off leaving the chamber as a distinct structure provided with a high vacuum. The cooling fluid may be poured into the part 6 from any suitable source and may pass out through a cock, 10, as shown near the bottom of the figure.

Under some circumstances it will be found convenient instead of retaining the source of heat 5 during the operation of condensation or removal of the vapor, to allow the chamber 1 to cool, thus condensing the vapor if only means be provided for removing the condensed vapor in the chamber 1 before sealing off the neck 8.

It is convenient to locate the receptacle 3 below the chamber 1. It is, however, quite possible to locate said receptacle at any convenient point, the cooling of the said receptacle as described being adequate to withdraw the vapors from the chamber 1 by condensing them in the receptacle.

In another application filed January 23rd, 1904, Serial Number 190,285, Patent Number 845,670, Feb. 26, 1907 of which this application is a division, claims are made upon the method described herein.

In applicant's companion cases Serial Number 190,283, filed January 23rd, 1904 and Serial Number 190,284, filed January 23rd, 1904 as well as in applicant's Patents No. 845,670 issued February 26th, 1907 and No. 806,853 issued December 12th, 1905 claims are made on subject matter related to that claimed herein.

I claim as my invention:—

1. In a vapor apparatus, a chamber, a receptacle containing a volatilizable fluid, said receptacle being connected to the said chamber by suitable inlet, an outlet leading from the said chamber, means for vaporizing a

portion of said volatilizable fluid, and means for causing generated vapors to pass through the said chamber and through said outlet at a rate sufficient to produce a motion outward of the injurious gases, together with means whereby the outlet may be sealed off before the cessation of said outward motion of deleterious gases.

2. In a vapor apparatus, a chamber, a receptacle containing a volatilizable fluid, said receptacle being connected to the said chamber by suitable inlet, an outlet leading from the said chamber, means for vaporizing a portion of said volatilizable fluid, and means for causing generated vapors to pass through the said chamber and through said outlet at a rate sufficient to produce a motion outward of the injurious gases, together with means whereby the outlet may be sealed off before the cessation of said outward motion of deleterious gases, and means whereby said receptacle may be sealed off from said chamber.

3. In a vapor apparatus, a chamber, a receptacle containing a volatilizable fluid, said receptacle being connected to the said chamber by suitable inlet, an outlet leading from the said chamber, means for vaporizing a portion of said volatilizable fluid, and means for causing generated vapors to pass through the said chamber and through said outlet at a rate sufficient to produce a motion outward of the injurious gases, together with means whereby the outlet may be sealed off before the cessation of said outward motion of deleterious gases and means for removing the vaporized fluid from the said chamber after the sealing off of said outlet.

4. In a vacuum apparatus, a chamber, a receptacle containing a volatilizable fluid located below the chamber and connected thereto by a suitable inlet tube, an outlet tube for the chamber, means for applying heat to both the receptacle and the chamber, means for causing the vapors generated in the receptacle to pass into and out of the chamber, together with means whereby said receptacle may be sealed off from said chamber.

5. In a vacuum apparatus, a chamber, a receptacle containing a volatilizable fluid, located below the chamber and connected thereto by a suitable inlet tube, an outlet tube for the chamber, means for heating both the receptacle and the chamber, thereby vaporizing a portion of the fluid and causing some of the generated vapors to pass through the chamber, means whereby the outlet from the chamber may be sealed off during the passage of said generated vapors through the chamber, means whereby the generated vapors within the chamber may be condensed, and means whereby the inlet tube may be sealed off.

6. In a vacuum apparatus, a chamber, a receptacle containing a volatilizable fluid,

located below the chamber and connected thereto by a suitable inlet tube, an outlet tube for the chamber, means for applying heat to both the receptacle and the chamber, means for causing the vapors generated in the receptacle to pass into and out of the chamber, such means consisting in part of the sources of heat applied to the receptacle and in part of a mechanical suction pump applied to the outlet tube from the chamber together with means whereby said outlet may be sealed off during the operation of the said source of heat and of said suction pump.

7. In a vacuum apparatus, a chamber, a receptacle containing a volatilizable fluid located below the chamber and connected thereto by a suitable inlet tube, an outlet

tube for the chamber, means for applying heat to both the receptacle and the chamber, means for causing the vapors generated in the receptacle to pass into and out of the chamber, means whereby the outlet tube from the chamber may be sealed off during the passage of said generated vapors through the chamber, and means whereby the said receptacle may be cooled to cause a condensation of the vapors created in the chamber upon the removal of the source of heat.

Signed at New York, in the county of New York, and State of New York, this 14th day of June, A. D. 1905.

PERCY H. THOMAS.

Witnesses:

WM. H. CAPEL,
GEORGE H. STOCKBRIDGE.