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VAPOR DISCHARGE DEVICE

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Fig. 1.

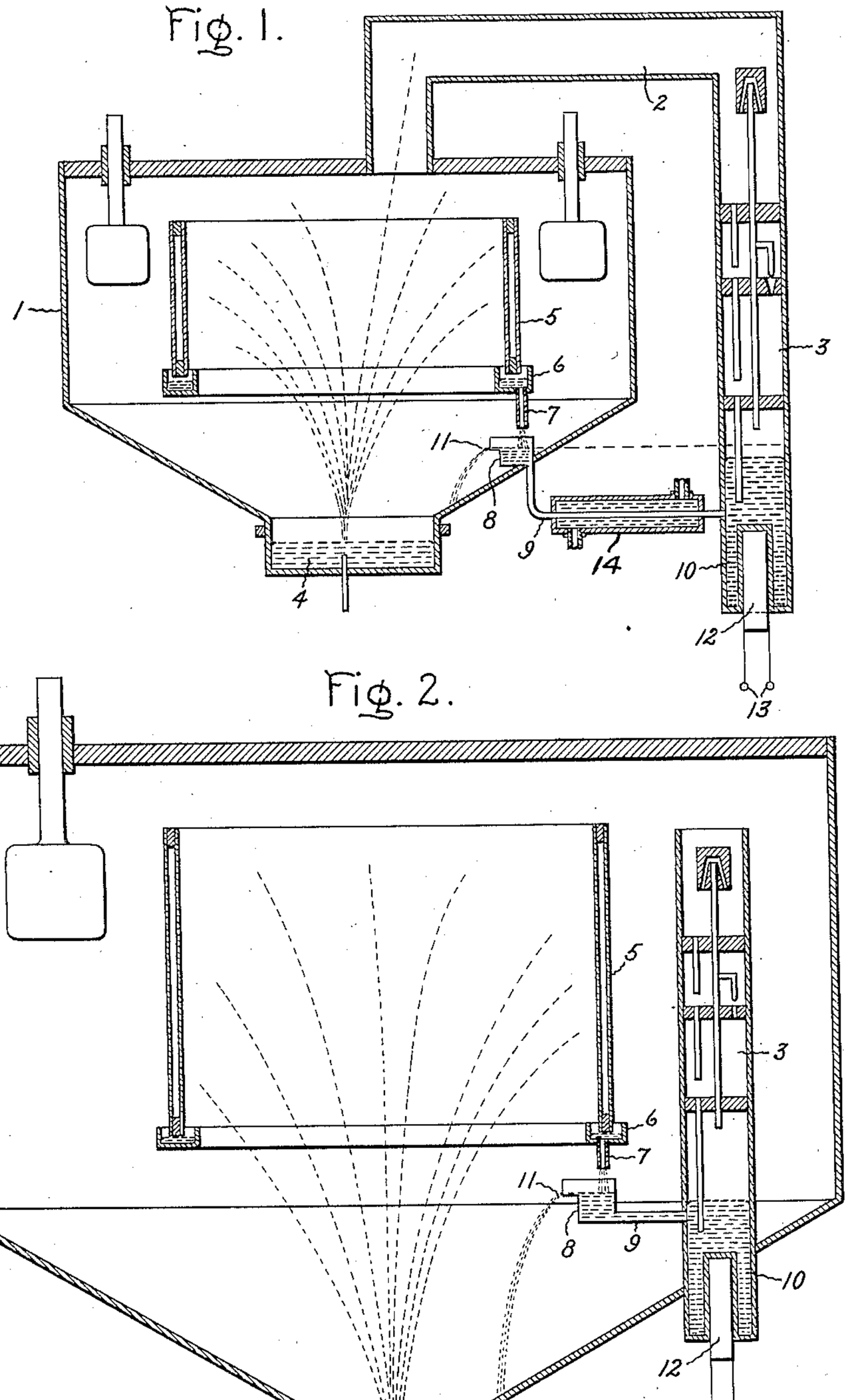

Fig. 2.

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VAPOR DISCHARGE DEVICE

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6 Claims. (Cl. 250—27.5)

This invention relates to vapor discharge devices comprising a container in which a vacuum is maintained by exhaust means and has for its principal object the provision of an improved vacuum pump system for such devices.

In mercury arc rectifiers and like apparatus having an evacuated container permanently connected with a mercury vapor pump provided with a heating vessel, the danger exists that mercury vapor may diffuse out of the container into the pump or vice versa. This flow of vapor will occur, for example, whenever either the evacuated container or the pump is insufficiently cooled, with the result that the operation of the pump is impaired.

It is the particular object of the present invention to ensure that the pump shall be at all times supplied with a predetermined suitable quantity of operating medium, preferably mercury. To this end, in accordance with the invention, a connection of the vapor pump to the vapor discharge device is provided such that suitable distribution of the medium, as mercury, which circulates during operation of the apparatus is automatically effected.

The heating vessel of the pump and the condensing surfaces of the vapor discharge device are preferably so arranged and so connected with one another by conduits that at least a part of the condensate formed during normal circulation of the vapor in the container may return to the cathode through an overflow which is in communication with the heating vessel of the pump. It is preferable to arrange the overflow in such a manner that only the quantity of mercury which is required for proper operation of the pump is permitted to flow from the overflow into the heating vessel of the pump, the remaining quantity running off into the container of the vapor discharge device and thence to the cathode, without previously flowing through the heating vessel of the pump.

My invention will be better understood from the following description when considered in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

Referring to the drawing, Fig. 1 is a sectional view of a vapor discharge device and vacuum pump embodying my invention, and Fig. 2 is a sectional view of a modification thereof.

In the form of the invention illustrated in Fig. 1, a mercury arc rectifier is shown having a container wall 1 connected by an exhaust tube 2 to a diffusion vacuum pump indicated diagrammatically at 3. The rectifier is provided with a mercury cathode 4, the mercury which evaporates from the cathode condensing on a surface 5 which may be cooled by any suitable means and below the edge of which is mounted a channel 6 provided with a discharge tube 7. The condensed mercury flows through this tube into a container 8 connected by means of a conduit 9 with the heating vessel 10 of the pump 3.

In order that approximately the same level may be maintained at all times in the pump 3, an overflow 11 is provided on the container 8 whereby the excess of the condensed mercury vapor returns to the container of the rectifier and thence to the cathode 4. In this manner only that quantity of mercury necessary for filling the pump to the required level is supplied to the heating vessel 10, and thus the flowing of the entire quantity of cool condensate into the vessel 10 is prevented, thereby preventing this vessel from being unduly cooled. It will be understood that the mercury in vessel 10 may be heated by any suitable means as by the heater element 12 connected to terminals 13 which may be supplied with current from any suitable source.

In order that in case of a small load on the rectifier the mercury heated in the heating vessel 10 may not distill out of the overflow 11 into the container of the rectifier, the connecting pipe 9 between the heating vessel 10 and the overflow 11 may be constructed of considerable length or may be cooled by special means, as by water circulated through a cooling chamber 14 surrounding the pipe.

It will be seen that the possibility of a large flow of mercury effected, in accordance with the invention, by the connection between pump and rectifier, permits the use of this very large, continuously circulating quantity of mercury for operating a pump constructed on the drip principle, the efficiency of which becomes greater as the flow of operating medium increases. It will be seen, further, that in order to continue the pumping operation when the vapor discharge device is not itself in operation and in order to elevate the mercury, in vapor form, sufficiently to provide the necessary head of mercury, it is suitable for the purpose of operating the drip pump to utilize for the heating of the mercury either the heat supplied by a diffusion pump operating in addition to the drip pump or to utilize a special heating device for the purpose.

As shown in Fig. 2, the connection of the vapor discharge device to the pump by conduit means as 9 in accordance with the invention per-

mits, further, the mounting of the pump 3 within the walls of the device. The arrangement and operation of the apparatus are essentially as described in connection with the embodiment of the invention shown in Fig. 1. Due to the operation of the overflow means 11 connected to the conduit 9, the pump may be thus enclosed within the evacuated container without danger of the heating vessel 10 becoming gradually filled with condensate in case of a high vapor pressure within the container. The arrangement shown in Fig. 2 has the further advantage that the exhaust tube 2 which is required when the pump is outside the vapor discharge device as in Fig. 1 may be dispensed with.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. The combination of a vapor discharge device including a container, a pump to maintain said container in evacuated condition, a vaporizable operating medium for said device and said pump, medium conductng means connecting said container and said pump, and overflow means connected to said medium conducting means to maintain predetermined distribution of said medium to said container and pump, the medium in said medium conducting means being subjected to substantially the pressure of the vapor within said container throughout the whole extent of said medium conducting means.

2. The combination of a vapor discharge device including a container, a pump to maintain said container in evacuated condition, a vaporizable medum for said device and said pump, means associated with the container to condense the vapor of the medium therein, an overflow vessel separate from the pump mounted below the condensing means to collect the condensate therefrom, and means comprising a condensate conducting member connecting the overflow vessel and the pump to maintain the medium in the overflow vessel and the pump at the same predetermined level.

3. The combination of a vapor discharge device including a container, a pump to maintain said container in evacuated condition including a heating vessel, a vaporizable medium for said device and said pump, means mounted within said container to condense the vapor of the medium therein, an overflow vessel separate from the pump mounted below the condensing means to collect the condensate therefrom and to return a part of said condensate to said container, and means comprising a condensate conducting member connecting the overflow vessel and the pump to maintain the medium in the overflow vessel and the pump at the same predetermined level.

4. The combination of a vapor discharge device including a container, a pump to maintain the container in evacuated condition including a heating vessel, a vaporizable medium for said device and said pump, means mounted within the container to condense the vapor of the medium therein, an overflow vessel separate from said heating vessel mounted below the condensing means to collect the condensate therefrom, and means comprising a condensate conducting member connecting the overflow vessel and the heating vessel to maintain the medium in said vessels at the same predetermined level.

5. The combination of a vapor discharge device including a container, a pump to maintain the container in evacuated condition including a heating vessel, a vaporizable medium for said device and said pump, means mounted within the container to condense the vapor of the medium therein, an overflow vessel separate from said heating vessel mounted below the condensing means to collect the condensate therefrom, means comprising a condensate conducting member connecting the overflow vessel and the heating vessel to maintain the medium in said vessels at the same predetermined level, and cooling means in operative relation with the condensate conducting means to prevent distilling of the medium out of the overflow vessel into the container.

6. The combination of a vapor discharge device comprising a casing having an electrode of vaporizable material contained therein, a pump having a connection with the interior of said casing operable to withdraw gases and said electrode material therefrom, and means including a second connection for returning electrode material drawn into said pump to the casing, said second connection entering the casing at a point higher than the level of said electrode to prevent flow of said electrode material therethrough from said electrode into the pump, the medium in said second connection being subjected to substantially the pressure of the vapor within said container throughout the whole extent of said second connection.

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