

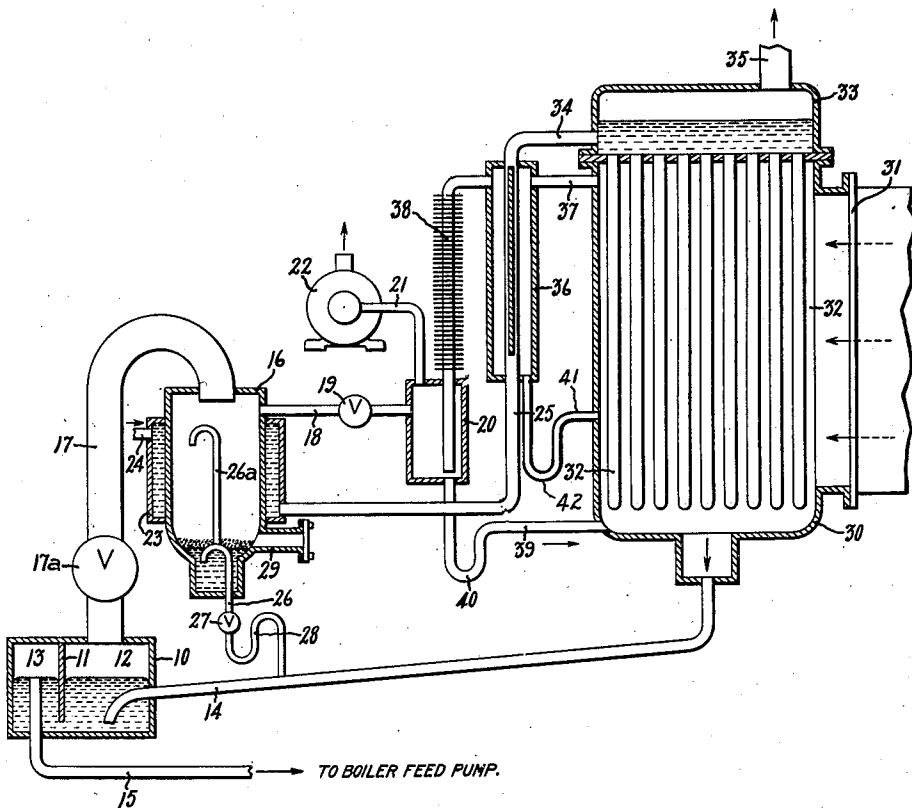
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MERCURY SUMP ARRANGEMENT

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MERCURY SUMP ARRANGEMENT

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5 Claims. (Cl. 266—34)

The present invention relates to mercury sump arrangements as may be used in mercury power plants for removing impurities contained in mercury liquid discharged from a condenser.

5 The removal of these impurities, that is, the separation of foreign matter from mercury liquid is important because otherwise such impurities would be conducted to the mercury vapor boiler or generator in which they might interfere with the effective operation of the heating elements.

10 The object of my invention is to provide an improved mercury sump arrangement whereby mercury liquid may be effectively purified.

15 For a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto in connection with the accompanying drawing.

20 The single figure of the drawing illustrates somewhat diagrammatically the arrangement embodying my invention.

The sump arrangement in the present example is shown in connection with a mercury vapor condenser as is used in mercury power plants for condensing the vapor discharged from a mercury turbine or other consumer. The arrangement comprises a container 10 which has a dividing wall or partition 11 separating the container into two chambers 12 and 13 and permitting communication between the lower portions of the chambers. The chamber 12 is connected to a conduit 14 for conducting mercury to be purified to the chamber. Mercury flows from the chamber 12 through a lower opening in the wall 11 into the chamber 13, whence it is discharged through a conduit 15, which latter forms an overflow in the chamber 13. Thus, during operation a pool of mercury, if not already present, is formed in each of the chambers 12 and 13. The conduit 15 and the partition 11 broadly constitute a sealed inlet for the chamber 12. The upper level of the pool is substantially above the lower opening in the partition 11 whereby impurities contained in the mercury and conducted to the chamber 12 rise to the upper level of the pool in the chamber 12 and only substantially pure mercury flows through the lower opening in the partition 11 into the chamber 13. The impurities thus collecting on the surface of the chamber 12 are removed from the chamber by means for creating a vacuum in the chamber sufficient to effect evaporation of some of the mercury liquid contained therein. These means comprise a container or auxiliary condenser 16 having an upper portion connected to the chamber 12 by a con-

duit 17 including a valve 17a. The container 16 is connected by a conduit 18 having a valve 19 to a chamber 20 which in turn is connected by a conduit 21 to a vacuum pump 22. During operation the pump 22 creates a vacuum in the container 16 and accordingly also in the chamber 12. This causes evaporation of some of the mercury in the latter, more particularly of the mercury near the level of the pool in the chamber 12. The mercury vapor thus formed carries away impurities collecting on the surface of the pool into the container 16. The latter is surrounded by a jacket 23 through which cooling water is circulated by means including a supply conduit 24 and a discharge conduit 25. Circulation of the cooling water effects condensation of the mercury vapor in the container 16, the mercury liquid forming a pool in the latter and the impurities collecting on the surface of the mercury pool. The liquid is discharged from the container by means of a pipe 26 which has an upper portion curved downward so that the inlet opening to the pipe 26 is submerged substantially below the level of the mercury, thus forming a sealed inlet and thereby preventing the entrance of impurities to the inlet of the discharge pipe 26. The pipe 26 is connected to the conduit 14 whereby mercury liquid is returned to the chamber 12. The sealed inlet portion of the pipe 26 is connected to a vent pipe 26a to prevent the discharge of non-condensibles through the pipe 26. The latter also includes a valve 27 and a mercury liquid seal 28. Dirt or impurities collecting in the container 16 may be removed therefrom through a clean-out 29.

As stated above, my present arrangement is shown in connection with a mercury vapor condenser. The mercury supply pipe 14 for the sump accordingly forms a discharge pipe for mercury liquid from a condenser or condenser boiler 30. The latter has a casing with a flanged inlet opening 31 for receiving mercury vapor discharged from a consumer, such as a turbine or like source (not shown). A plurality of spaced cooling tubes 32 are arranged within the condenser casing and connected to a header or drum 33. Cooling fluid, in the present instance water, is conducted to the header 33 by a conduit 34, which latter forms a continuation of the conduit 25 connected to the jacket 23 of the auxiliary condenser 16. Thus, during operation cooling water supplied to the jacket 23 is conducted through the conduits 25, 34 into the drum 33 of the main condenser, whence it flows into the depending cooling tubes 32 and is evaporated

therein, the stream being discharged from the drum to a conduit 35. The vapor conducted to a mercury condenser usually contains in addition to mercury vapor, air and other non-condensable gases. These non-condensable gases have to be removed from the condenser in order to maintain the desired vacuum therein. During the removal some of the mercury vapor is carried away together with the non-condensibles. Therefore cooling of the non-condensibles after removal from the condenser is necessary in order to prevent the loss of mercury. This is accomplished in the present instance by means including the aforementioned vacuum pump 22 connected by the conduit 21 to the chamber 20. The chamber 20 is connected to the condenser by means of two series-connected coolers, a water-cooled chamber 36 connected by a conduit 37 to the condenser, and a finned tube or air-cooler 38 connected in series between the chamber 36 and the chamber 20. The water-cooler 36 includes the aforementioned conduit 25 which is surrounded by a jacket connected between the conduits 37 and 38. Thus, the non-condensibles are first cooled in the chamber 36 and thereafter cooled in the finned tube or air-cooler 38. The condensate, that is, the mercury liquid, is returned from the chamber 26 to the condenser 30 by means of a conduit 39 including a mercury seal 40. Similarly the condensate, mercury liquid is returned from the bottom of the chamber 36 to the condenser 30 by means of a conduit 41 including a mercury seal 42. Thus, the vacuum pump 22 serves both to remove non-condensibles from the condenser, that is, to maintain a vacuum therein, and also to create a vacuum in the auxiliary condenser 16 of the sump arrangement.

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

1. Mercury sump arrangement for use in mercury vapor power plants including the combination of a closed chamber for receiving mercury and for normally forming a mercury pool, and means including a container and a pump connected in series to the chamber to effect evaporation of the surface layer of mercury contained in the chamber and removal into said container of impurities by the vapor discharged from the chamber, evaporation being effected solely by action of the pump.

2. Mercury sump arrangement for use in mercury vapor power plants including the combination of a closed container with a partition having an opening in the lower end thereof and defining a first and a second chamber, a conduit for con-

ducting mercury to the first chamber, an overflow conduit connected to the second chamber to drain mercury liquid therefrom and to maintain a pool in the first chamber, pumping means and a condenser for effecting evaporation of the surface layer of mercury liquid contained in the first chamber to remove impurities therefrom, and means effecting condensation in said condenser of mercury vapor discharged from the first chamber.

3. Mercury sump arrangement for use in mercury vapor power plants including the combination of a container forming a first and a second chamber communicating with each other at their lower ends, a conduit for conducting mercury liquid to the first chamber, said conduit having an outlet below the normal liquid level in the first chamber, an overflow conduit connected to the second chamber, an auxiliary condenser and a vacuum pump connected to the first chamber to effect removal of impurities collected on the surface of the mercury pool formed in the first chamber by evaporation of mercury and to condense the evaporated mercury in the condenser.

4. Mercury sump arrangement including the combination of a container forming a first and a second chamber communicating with each other at their lower ends, a conduit for conducting mercury liquid to the first chamber, an overflow conduit connected to the second chamber to maintain a pool in the first chamber, an auxiliary condenser and a vacuum pump connected to the first chamber to effect removal of impurities collecting on the surface of the pool by evaporation of mercury, and a conduit having a seal in the auxiliary condenser to conduct mercury liquid from the auxiliary condenser to the first chamber.

5. Mercury sump arrangement including the combination of a container forming a chamber having a sealed outlet to maintain a pool therein, a mercury condenser for condensing mercury vapor discharged by a consumer, a conduit conducting mercury liquid from the condenser to the chamber, means including a vacuum pump for removing non-condensibles from the condenser, means including an auxiliary condenser and said pump connected to the chamber to effect evaporation of the surface layer of mercury and removal of impurities collecting on the surface of the mercury pool formed therein, and a conduit including a seal for conducting mercury liquid from the auxiliary condenser to the chamber.

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