Aug. 28, 1934. A. C. DURDIN, JR 1,971,775

VACUUM CONDENSATION PUMP

Original Filed June 22, 1931 2 Sheets-Sheet 1

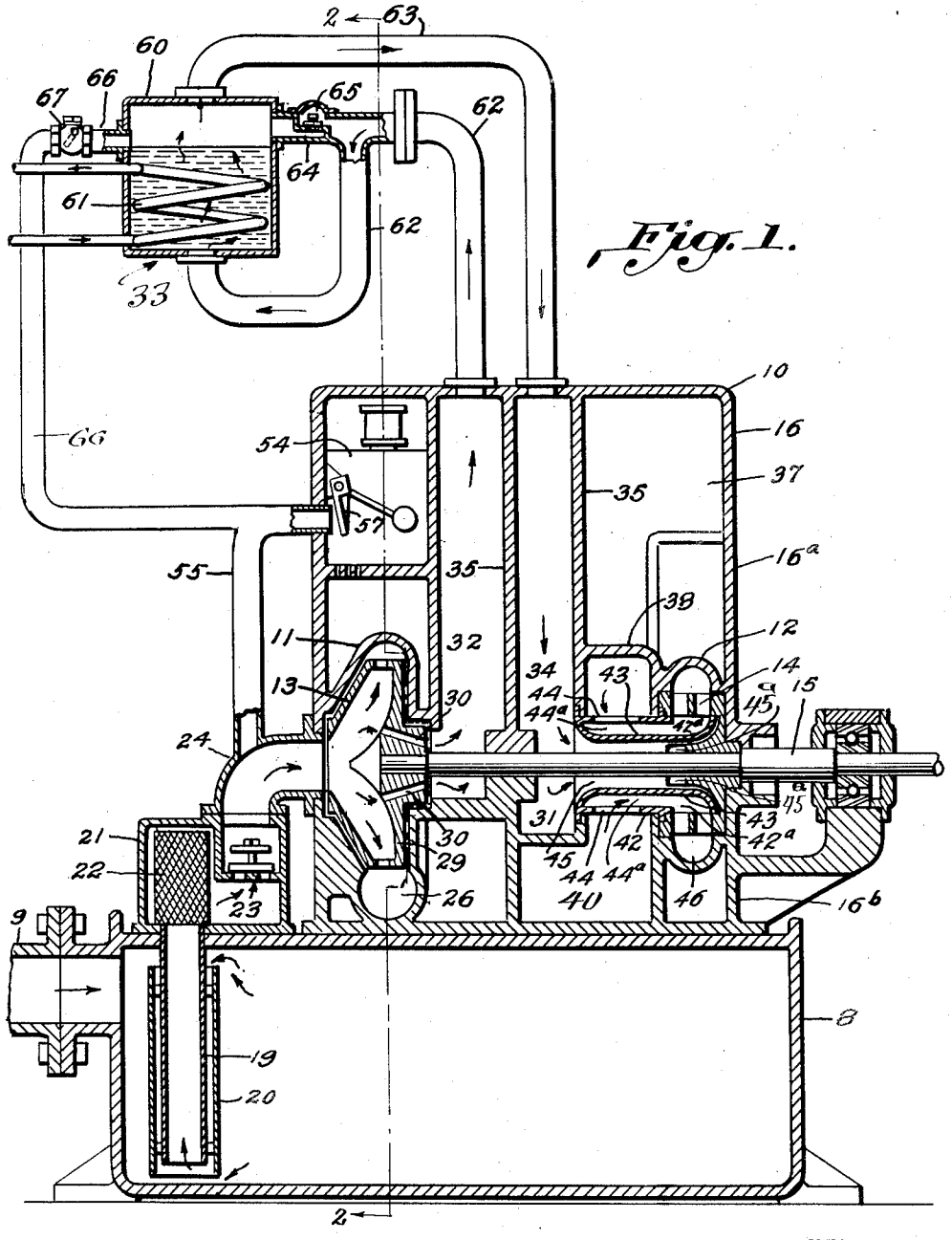

Fig. 1.

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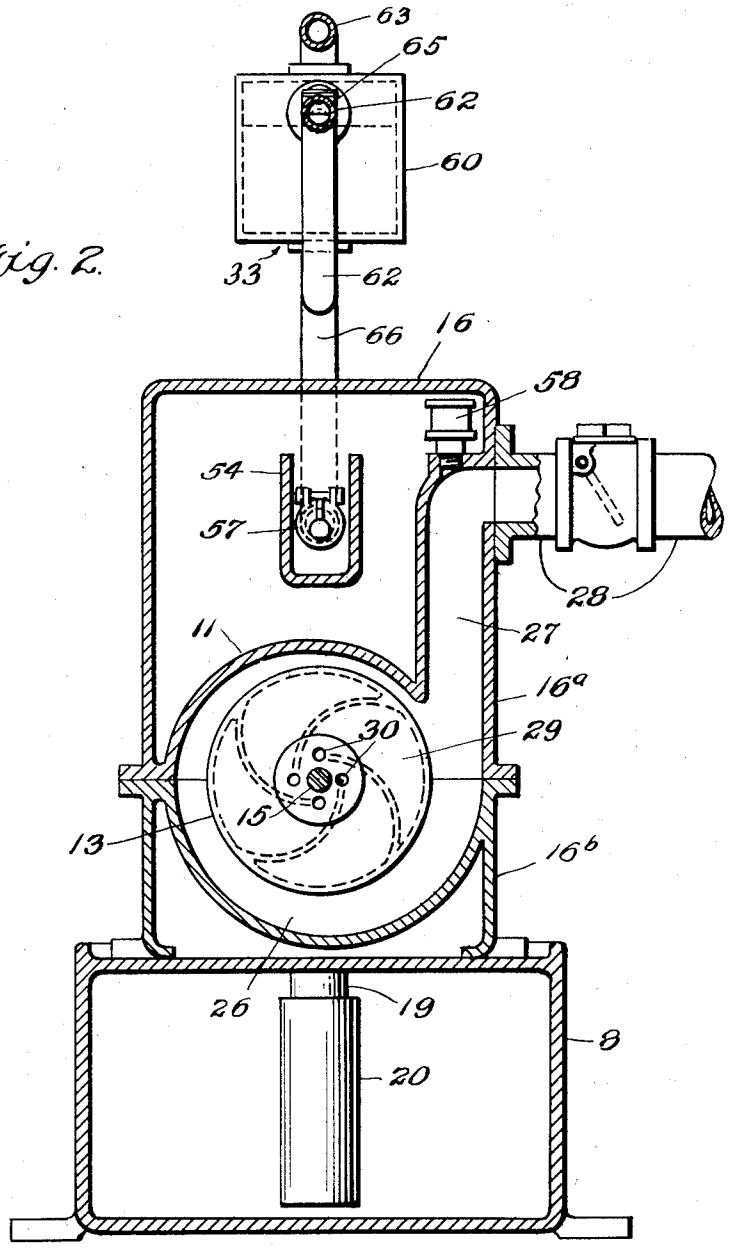
Fig. 2.



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UNITED STATES PATENT OFFICE

1,971,775

VACUUM CONDENSATION PUMP

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Original application June 22, 1931, Serial No. 545,916. Divided and this application December 19, 1932, Serial No. 647,914

12 Claims. (Cl. 103—6)

This invention relates to vacuum condensation pumps and its principal object is the provision of novel condensing means interposed in the conduit which runs to the vacuum pump, whereby steam and condensable vapors may be condensed before they reach the vacuum pump, and returned to the boiler or other desired place. The subject matter of this application has been divided out of a co-pending application for patent on improvements in Vacuum condensation pumps, filed June 22, 1931 under Serial No. 545,916, upon which Letters Patent No. 1,901,154 issued March 14, 1933.

It is well known that considerable quantities of steam and condensable vapors, as well as non-condensable gases return from steam heating plants along with the water of condensation and ordinarily must be handled by the vacuum pump. As a result, the vacuum pump must handle large quantities of steam and vapor which requires power and prevents the vacuum pump from producing a normally high vacuum without the expenditure of an unnecessary amount of power.

It is an object of this invention to condense the steam and condensable vapors before reaching the vacuum pump, thereby assisting the vacuum pump besides permitting it to utilize its full capacity in handling air and non-condensable gases, whereby a higher vacuum may be maintained with a minimum amount of power.

Another object is the provision of means whereby the water of condensation resulting from the condensed steam is utilized to condense the steam and vapor.

The invention consists in a vacuum condensation pump having a condensing tank containing a cooling liquid through which steam and vapor that returns with the condensate, passes on its way to the vacuum pump and is thereby condensed. The invention further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly illustrated in the drawings accompanying this specification in which: Fig. 1 is a vertical section through a vacuum condensation pump embodying a simple form of the present invention, and Fig. 2 is a vertical cross-section taken on the line 2—2 of Fig. 1.

Referring to said drawings which illustrate the invention applied to the form of water pump illustrated in the co-opending application and patent above referred to, and in which the same reference characters are used as in the present application, the receiver 8 connects with the return pipe 9 of the steam heating plant, with which the condensation pump is used. Connected with the receiver, through a suction conduit 19, 20, strainer 22, housing 21, check valve 23, and elbow 24, is a centrifugal water pump 11, having an impeller 13 and rotating in a volute 26. A water discharge passage 27 leads from the volute to a discharge pipe 28. The impeller has the customary blades and in its wall 29 are formed air discharge openings 30. The water is thrown outward by centrifugal force and any steam, vapor and gas that may accompany the water passing to the water pump is exhausted through the openings 30, into a conduit 32, through the condenser 33 and through a conduit 34 to the vacuum pump 12.

The vacuum pump is preferably of the type which employs make-up or throwing water for its pumping operation, for a full description of the vacuum pump reference may be had to my prior Patent No. 1,699,328, dated January 15, 1929. Briefly the impeller 14 is provided with spiral blades which rotate around a cylindrical wall 42, which together with a cylindrical wall 43 forms a water inlet passage 44^a that leads from the inlet openings 44 through openings 42^a to the impeller blades. An air inlet passage 45 leads from the air and gas inlet opening 31 at the bottom of the conduit 34 through outlet openings 45^a to the impeller blades. The operation of vacuum pumps of the type shown is well understood and requires no detailed explanation, so far as this specification is concerned. Water is contained in the chamber 37 and enters the chamber 40 through a suitable opening and furnishes the throwing water for the vacuum pump. The water flows to the impeller 14 through the passages 44^a and the air and gas to be pumped flows from the conduit 34 through the passage 45. The impeller discharges through a volute 46 into the chamber, from which the air and gas escape through a suitable discharge port.

As in the pump of the parent application, an overflow tank 54 is provided, which discharges through a pipe 55 to the elbow 24 of the inlet conduit and a float valve 57 controls the discharge through the pipe 55. Structurally, the pump casing 16 is composed of upper and lower casing sections 16^a, 16^b bolted together, and the conduits 32, 34 are formed by the walls 35 of the casing structure.

In the operation of the pump described the vacuum pump 12 creates a vacuum through the centrifugal pump and exhausts steam, vapors, air and gases that pass through the centrifugal pump. The condenser for the steam and vapors will now be described.

A condenser tank 60, containing a body of cooled water, is provided in the suction line to the vacuum pump and is here shown as interposed between the sections 32, 34 of the conduit. In the condenser tank is a cooling coil 61 through which is circulated a cooling medium such as cold water. The condenser tank is interposed between the receiver and the vacuum pump. In the form shown, the bottom of the condenser tank is connected by a pipe 62 with the section 32 of the conduit that leads through the centrifugal pump to the receiver. In various types of condensation pumps the pipe 62 may lead directly to the receiver. The top of the condenser tank is connected by a pipe 63 with the section 34 of the conduit that leads to the vacuum pump. Steam, vapor, air and other non-condensable gases are, therefore, moved through the cooled water contained in the condenser tank from the bottom to the top thereof in their passage from the receiver to the vacuum pump, and as a result, the steam and vapor passing therethrough are condensed, the air and non-condensable gases only passing on to the vacuum pump, thus enabling it to handle air and non-condensable gases only, instead of handling large volumes of steam and vapors.

The pipe 62 also communicates with the upper end of the condenser tank through a branch 64 in which is contained a check valve 65 opening away from the interior of the tank.

Water of condensation collects in the condenser tank and an overflow pipe 66 containing an outwardly opening check valve 67 leads down from the upper portion of the tank and runs to the inlet side of the centrifugal water pump or to the receiver as desired. The body of water contained in the tank is replenished by the condensation of the steam and vapor entering the tank and passing into the water. The water is kept in a cool condition by the cooling coil 61. Excess water overflows through the pipe 66 and re-enters the system.

I claim as new and desire to secure by Letters Patent:

1. In a vacuum condensation pump, the combination of a receiver, a vacuum pump, a condenser tank containing a body of water and a cooling coil therein, a conduit for vapors and gases leading from said receiver to the bottom of said condenser tank, and a conduit leading from the top of said condenser tank to the vacuum pump.

2. In a vacuum condensation pump, the combination of a vacuum pump, a condenser tank for condensing the steam and vapors of the condensate, and adapted to contain a body of cooled water, a conduit for steam, vapors and gases communicating with the return pipe of a steam heating plant and discharging said steam, vapors and gases into the water in said tank, and a conduit leading from the upper end of said tank to the vacuum pump.

3. In a vacuum condensation pump, having a vacuum pump connected with the returns of a steam heating plant, a condenser tank, containing a body of cooled liquid, interposed in the connections leading to the vacuum pump, with the incoming connection to the tank discharging into the bottom of the tank and the outgoing connection therefrom leading from the top thereof, whereby any steam and vapor are discharged into the bottom of the body of liquid.

4. In a vacuum condensation pump, having a vacuum pump connected with the returns of a steam heating plant, a condenser tank, containing a body of liquid, interposed in the connections leading to the vacuum pump, and a cooling element associated with said condenser tank for cooling the liquid therein, said connections acting to convey steam, vapor and gases to the bottom of the liquid in the tank, whereby steam and vapor are condensed therein, and to convey non-condensable gases from the condenser tank to the vacuum pump.

5. In a vacuum condensation pump, the combination of a receiver having a connection with the returns of a steam heating plant, a vacuum pump having connections extending to the receiver, whereby said vacuum pump exhausts steam, vapor and gases from said receiver, a condenser tank interposed in said connections, with the incoming connection discharging into the bottom of the tank and the outgoing connection leading from the top thereof, a body of liquid in said tank, through which the steam, vapor and gases pass upwardly, and means for cooling the liquid.

6. In a vacuum condensation pump, a vacuum pump having a suction conduit, a condenser tank having a body of liquid therein, and cooling means for cooling said liquid, said condenser tank being interposed in said suction conduit with the entering part of the conduit discharging upwardly through the liquid.

7. In a vacuum condensation pump, a vacuum pump having a suction conduit, a condenser tank having a body of liquid therein, and a cooling coil therein for cooling said liquid, said condenser tank being interposed in said suction conduit with the entering part of the conduit discharging upwardly through the liquid.

8. In a vacuum condensation pump, a vacuum pump having a suction conduit, a condenser tank having a body of liquid therein, and cooling means for cooling said liquid, said condenser tank being interposed in said suction conduit with the entering part of the conduit discharging upwardly through the liquid and an overflow pipe leading from said condenser tank to the structure.

9. In a vacuum condensation pump, the combination of a vacuum pump, a condenser tank adapted to contain a body of water, cooling means for said body of water, a conduit for vapors and gases leading to the lower end of the tank, whereby vapors and gases discharged into the tank travel upwards through the cooling water therein, and the vapors are condensed thereby, and a conduit leading from the upper end of the tank to the vacuum pump.

10. In a vacuum condensation pump, the combination of a vacuum pump, a condenser tank, adapted to contain a body of water, cooling means for said body of water, a conduit for vapors and gases leading to the lower end of said tank, whereby vapor and gases discharged into said tank travel upwards through the body of water therein and the vapors are condensed thereby, a conduit leading from the upper end of said tank to the vacuum pump, an overflow pipe leading from the upper end of the tank and a liquid pump connected to the overflow pipe.

11. In a vacuum condenser pump, the combination of a condenser tank adapted to contain a body of water, cooling means for said body of water, a conduit discharging into the lower end of said tank and adapted to receive vapors and gases from the return of a heating system, a vacuum pump having its intake connected to the upper end of said tank, and adapted to exhaust gases from said tank, an overflow connection with

the upper end of said condenser tank, and a liquid pump connected to said overflow connection and having a discharge connection adapted to discharge to a boiler.

12. In a vacuum condensation pump, the combination of a vacuum pump, a condenser tank having a body of cooled liquid therein, and connections for returning condensate from a steam heating plant, said connections having a conduit leading to the vacuum pump with one section thereof discharging into the bottom of the condenser tank whereby any steam and vapor returning with the condensate will flow into the body of liquid contained in said condenser tank, another section of the conduit running from the top of said condenser tank to the vacuum pump.

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