July 23, 1929. A. C. DURDIN, JR 1,721,590

VACUUM CONDENSATION PUMP

Filed Oct. 29, 1927

Fig. 2.

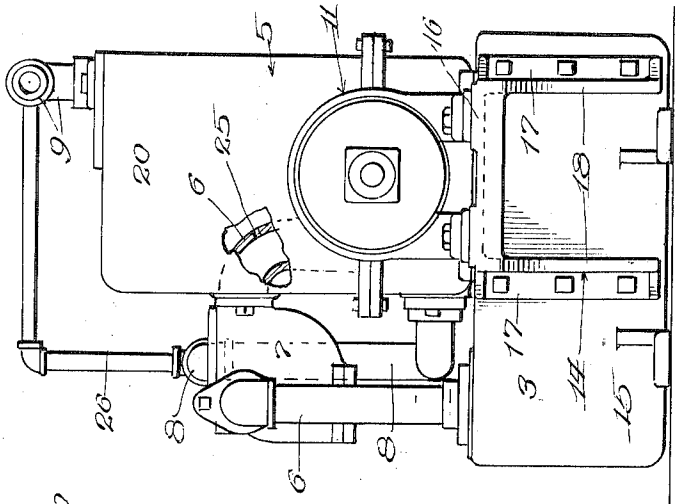


Fig. 3.

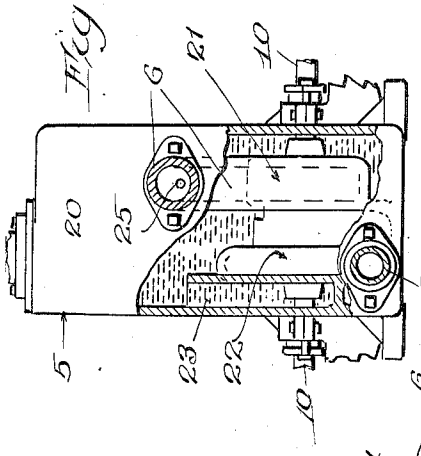
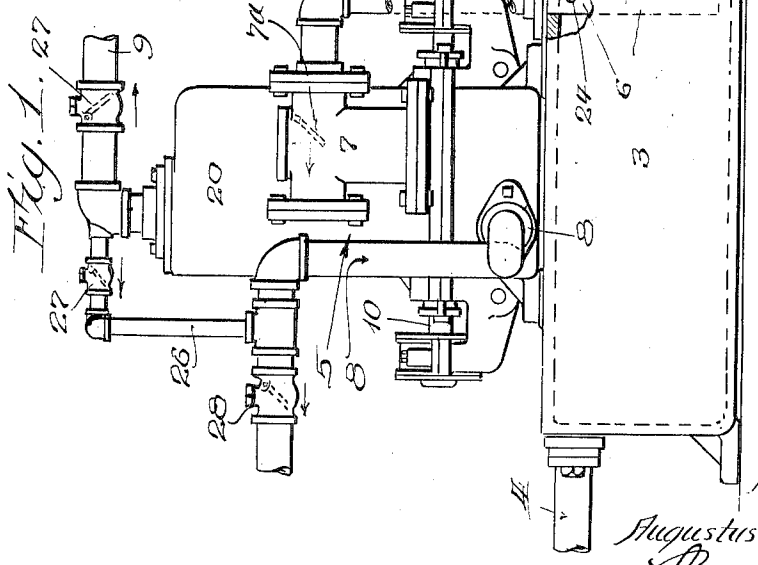


Fig. 1.



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UNITED STATES PATENT OFFICE.

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VACUUM CONDENSATION PUMP.

Application filed October 29, 1927. Serial No. 229,560.

This invention relates to vacuum condensation pumps, and its principal object is to increase the efficiency of apparatus of this character. The invention has particular reference to vacuum condensation pumping outfits which are in the form of a unit, ready for installation in connection with a steam heating plant. Such a unit ordinarily comprises a receiver for receiving water of condensation, steam, air and other hot condensates, a pumping apparatus mounted on the receiver and communicating therewith, and an electric motor mounted on the receiver and operating to drive the pumping apparatus. It has been found that the heat radiated from the receiver and also conducted through the metal thereof, to the electric motor impairs the efficiency of the motor, with a corresponding reduction in the efficiency of the pumping apparatus, and I have discovered that by mounting the motor on a bracket, secured to the receiver, but disposed beyond one side thereof, whereby the motor is out of the path of the currents of hot air that rise from the receiver, and whereby much of the heat conducted by the bracket is dissipated with the air, that the motor runs at a maximum efficiency and consequently operates the pumping apparatus at its greatest efficiency. When pumping apparatus, employing a vacuum pump of the fluid piston or throwing water type is employed, it some times happens that the throwing water for the vacuum pump is drawn back to the boiler (when the latter cools) and one of the objects of this invention is to eliminate such a possibility. The invention consists, therefore, in a pumping apparatus for hot liquids and gases in which the pump is mounted on the receiver and operates to exhaust the contents of the receiver, and in which the motor which drives the pump is mounted on a bracket secured to the receiver, but disposed beyond one side thereof whereby the motor is supported out of direct contact with the receiver and at one side thereof. The invention further consists in a vacuum condensation pump provided with vents arranged to prevent the escape of the throwing water for the vacuum pump, due to the lowering of the pressure in the boiler. The invention further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly illustrated in the accompanying drawing, in which:

Fig. 1 is a side elevation of a vacuum condensation pump, illustrating a simple embodiment of the present invention; Fig. 2 is an end elevation thereof, looking in the direction of the arrow 2 in Fig. 1 and Fig. 3 is a front elevation of certain pumping apparatus, showing the enclosing wall thereof partly broken away.

Referring to said drawing, which illustrates one embodiment of the invention, the reference character 3 designates a receiver which connects with the return pipe 4 of the steam heating system and receives water of condensation, air and other hot condensates, such as are withdrawn from a steam heating system. The receiver acts as the base of the pumping unit and upon it is mounted the pumping apparatus 5, which includes a reservoir or receptacle 20, bolted or otherwise secured to the receiver 3, and containing a rotary vacuum pump 21 and a rotary water pump 22, having a shaft 10 common to both pumps. A conduit 6 leads from the interior of the receiver, through a combined strainer or screen 7, and check valve 7^a and into the reservoir where it connects with the inlet side of the vacuum pump 21. The discharge side of the vacuum pump 21 opens into the reservoir 20, and discharges liquid and other condensates into the reservoir, from which the air and other gases escape through an outlet pipe 9 at the top thereof. The inlet to the water pump opens to an upright water passage or conduit 23 in the reservoir which leads to a point above the water pump 22 and prevents the water pump from exhausting liquid in the receptacle below the inlet to the conduit 23, whereby a sufficient body of liquid is always left in the reservoir to prime the vacuum pump 21. From the water pump 22 leads a discharge pipe 8 which conveys the water back to the boiler or other receptacle where it is desired to deliver it. In the operation of the apparatus, the receiver 3 becomes very hot and radiates considerable heat.

The electric motor for driving the pump shaft 10 is seen at 11 and its motor shaft 12 is connected to the pump shaft 10 by a coupling 13. These shafts are in alignment with each other, as is well understood, but the motor is disposed entirely beyond one side of the receiver whereby it is out of the path of currents of hot air that rise from the receiver. A supporting bracket 14 is provided for supporting the motor 11,

which bracket is also disposed at one side of the receiver and bolted or otherwise secured to a side wall 15 thereof. The bracket 14 is formed with a platform 16 upon which the motor stands, and with legs 17 and diagonal brace members 18, thereby providing an open work structure which absorbs but little heat and dissipates the greater portion of the heat absorbed, into the surrounding air. The legs 17 of the bracket or the wall 15 may be provided with pads 19 to space the bracket from the wall to thereby minimize the amount of heat conducted to the bracket.

The receiver 3, pumping apparatus 5, and motor 11 form a unitary structure which is assembled at the factory and shipped to the place of installation ready for assembling with the rest of the steam heating system. It will be observed from the construction and arrangement of the parts, that the efficiency of the motor is not impaired because of its proximity to the receiver, consequently the unit may operate at a maximum efficiency. The motor bracket being disposed at one side of the receiver and being formed of open work structure, it acts to support the motor out of the path of currents of hot air rising from the receiver and conducts but little of the heat to the motor, consequently the motor may operate at a maximum efficiency despite its proximity to the hot receiver.

To further increase the efficiency of operation of the apparatus, I provide an aperture 24 in the pipe or conduit 6 at a place within the receiver adjacent the top thereto (see Fig. 1) through which aperture 24, air and other gases may enter the pipe 6 at a place above its suction end. This aperture enables the vacuum pump to withdraw gases from the receiver while it is exhausting the liquid therefrom, consequently the effective vacuum at the bottom of the pipe 6 is considerably greater than if the pump were exhausting liquid only.

In case the check valve 7^a becomes leaky there is a tendency for the water to be drawn back into the receiver 3 from the reservoir 20, when the pump is inactive, due to the fall of pressure in the heating system and receiver. To overcome this, I provide an air vent 25 in the pipe 6 within the reservoir at a place near the top of the pipe. In case the pressure in the receiver lowers, air and other gases in the reservoir will be drawn through the vent 25 and into the receiver, until the pressure in the receiver and reservoir is balanced and consequently the water in the reservoir will be permitted to remain therein.

It has been found that in some situations there is a tendency for the water to be exhausted from the reservoir when the boiler cools down. To overcome this difficulty, I run the discharge pipe 8 above the water line in the reservoir, which line is at the top of the conduit 23 for the water pump 22 and run an air pipe 26 from the discharge pipe, as seen in Fig. 1, to the air outlet 9, and place check valves 27 in said pipes 26, 9. A check valve 28 is also placed in the discharge pipe 8 beyond its connection with the air pipe 26. The check valves open in the directions of the arrows adjacent thereto. When the pressure in the boiler and discharge pipe 8 falls below atmospheric pressure, instead of exhausting the water from the reservoir, a vacuum is created in the reservoir above the water as well as in the pump and consequently the water cannot be exhausted below the top of the conduit to the water pump. A sufficient body of water is, therefore, left in the reservoir to prime the vacuum pump when the apparatus is started again.

More or less variation of the exact details of construction is possible without departing from the spirit of this invention; I desire, therefore, not to limit myself to the exact form of the construction shown and described, but intend, in the following claims, to point out all of the invention disclosed herein.

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

1. A vacuum condensation pump unit, comprising in combination, a base in the form of a receiver for receiving water of condensation and other hot condensates, a pump for exhausting the contents of said receiver, said pump being located directly above and mounted on said receiver and communicating with the interior thereof, said pump having a pump shaft, a bracket secured to one side wall of said receiver and projecting laterally away from said side wall and an electric motor disposed beyond one side of said receiver and mounted on said bracket, said motor having a motor shaft in alignment with said pump shaft and coupled thereto.

2. A vacuum condensation pump unit, comprising in combination, a base in the form of a receiver for receiving water of condensation and other hot condensates, a rotary vacuum pump for exhausting the contents of said receiver, mounted above and upon said receiver and communicating with the interior thereof, said vacuum pump having a pump shaft, an open work bracket secured to one side wall of the receiver and disposed entirely to one side thereof, and an electric motor mounted on said bracket and disposed entirely beyond one side of the receiver and having a motor shaft in alignment with said pump shaft and coupled thereto.

3. A vacuum condensation pump unit, comprising a receiver for hot condensates, a

vacuum pump located directly above said reservoir and mounted thereon and communicating with the interior thereof, and an electric motor for driving said pump located entirely beyond one side of said receiver and indirectly supported thereby.

4. In a vacuum condensation pump, the combination of a receiver for liquids and gases, a vacuum pump mounted thereon, a suction pipe leading from the bottom of the receiver to said vacuum pump, there being a provision for lightening the column of water passing through said suction pipe comprising a relatively small air inlet aperture in said suction pipe and located within the receiver adjacent the top thereof.

5. In a vacuum condensation pump, the combination of a receiver for liquids and gases, a reservoir mounted thereon, a rotary vacuum pump discharging into said reservoir, and a suction pipe leading from said receiver to the inlet side of said vacuum pump and having a check valve opening toward the pump, there being an air vent in said suction pipe located in the reservoir, substantially as and for the purpose set forth.

6. In a vacuum condensation pump, the combination of a reservoir having a valve controlled air outlet, a rotary, fluid piston, vacuum pump and a water pump in said reservoir, means in said reservoir for maintaining a water level, a valve controlled discharge pipe leading from said water pump and a valve controlled air pipe connecting said discharge pipe with said air outlet.

7. In a vacuum condensation pump, the combination of a receiver for liquids and gases, a vacuum pump, and a suction pipe leading from the bottom of the receiver to said vacuum pump, there being a provision for lightening the column of water passing through said suction pipe comprising an air inlet opening within the receiver and located adjacent the top thereof and communicating with the interior of the suction pipe.

8. In a vacuum condensation pump, the combination of a receiver for liquids and gases, a reservoir, a rotary vacuum pump discharging into said reservoir, and a suction pipe leading from said receiver to the inlet side of said vacuum pump and having a check valve opening toward the pump, there being an air inlet for said suction pipe located in the reservoir, substantially as and for the purpose set forth.

9. In a vacuum condensation pump, the combination of a reservoir, and a rotary vacuum pump discharging into said reservoir, and having a suction pipe, provided with a check valve opening toward the pump, there being and air inlet for said suction pipe located in said reservoir.

10. In a vacuum condensation pump, the combination of a reservoir having an air outlet, a vacuum pump discharging into said reservoir, and a water pump discharging water from said reservoir, and means for maintaining a head of water in said reservoir when the air pressure on the discharge side of the water pump falls below atmospheric pressure.

11. In a vacuum condensation pump, the combination of a reservoir, and a rotary vacuum pump discharging into said reservoir, and having a suction pipe provided with a check valve opening toward the pump, there being an air inlet for said suction pipe communicating with said reservoir.

12. In a vacuum condensation pump, the combination of a receiver, for water, air and other condensates, and having an inlet pipe, a reservoir, a vacuum pump having an inlet conduit leading from said receiver, and discharging into said reservoir, and a strainer interposed in the conduit between the receiver and vacuum pump.

13. In a vacuum condensation pump, the combination of a reservoir having a valve controlled air outlet, a rotary fluid piston vacuum pump discharging into said reservoir, a water pump discharging water from said reservoir, means in said reservoir for maintaining a water level therein, a valve controlled discharge pipe leading from said water pump and a valve controlled air pipe connecting said discharge pipe with said air outlet.

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