

Nov. 17, 1931.

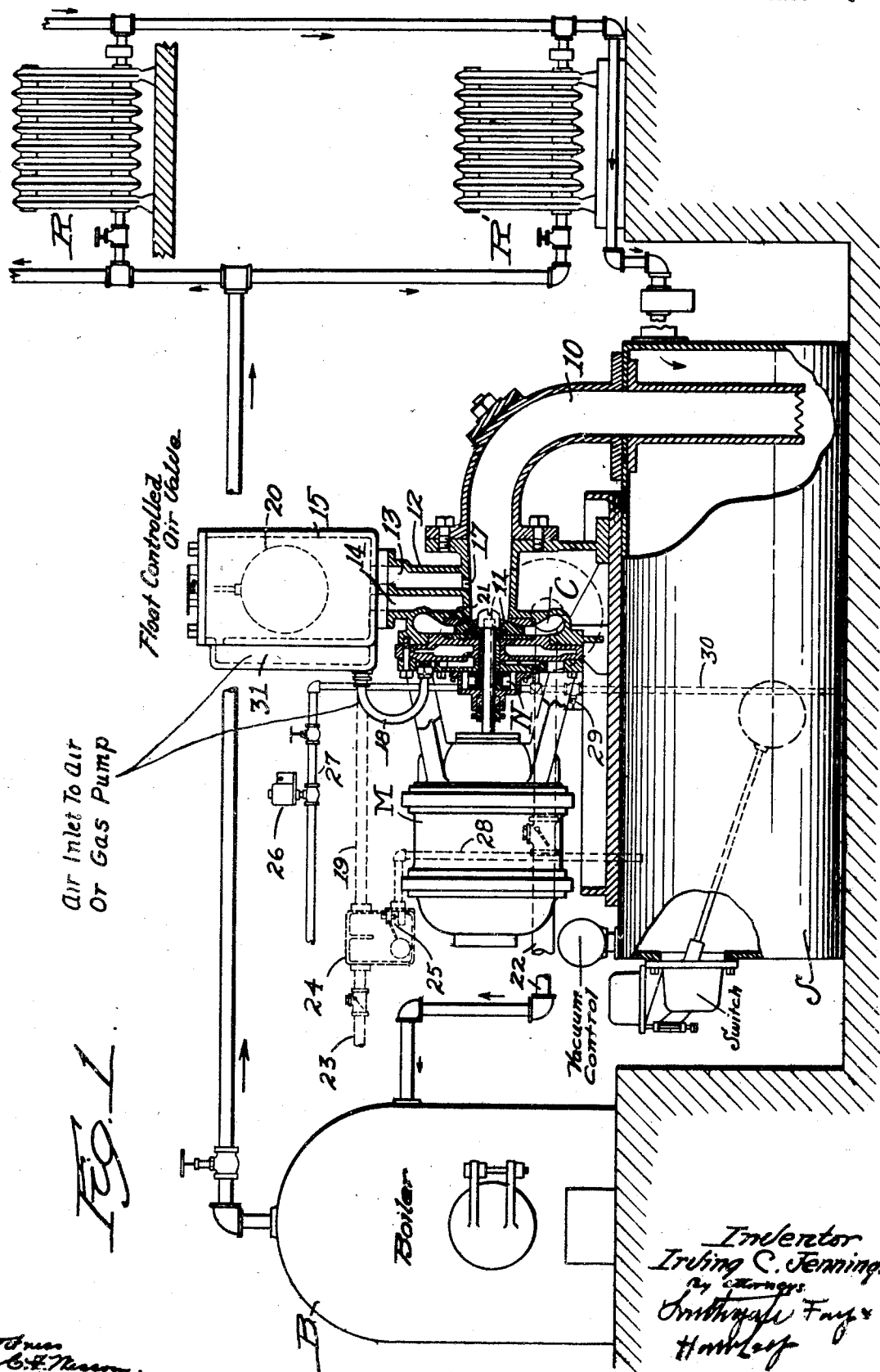
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1,832,398

VACUUM STEAM HEATING SYSTEM

Filed May 17, 1929

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

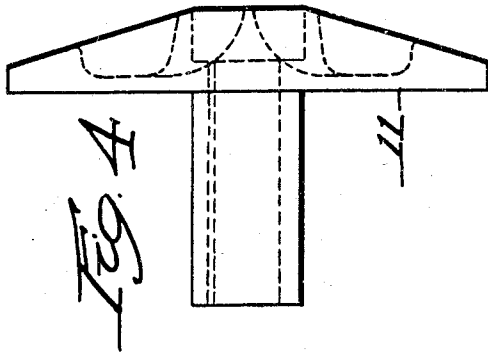


Fig. 4

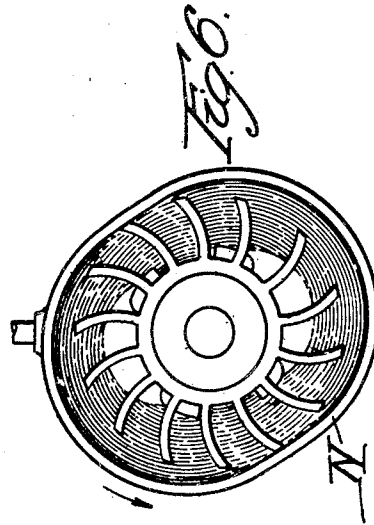


Fig. 6

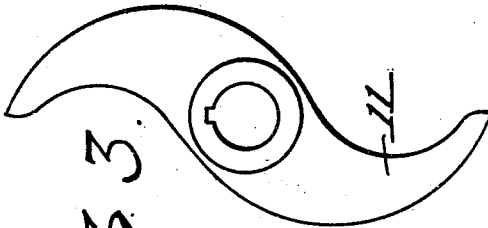


Fig. 3

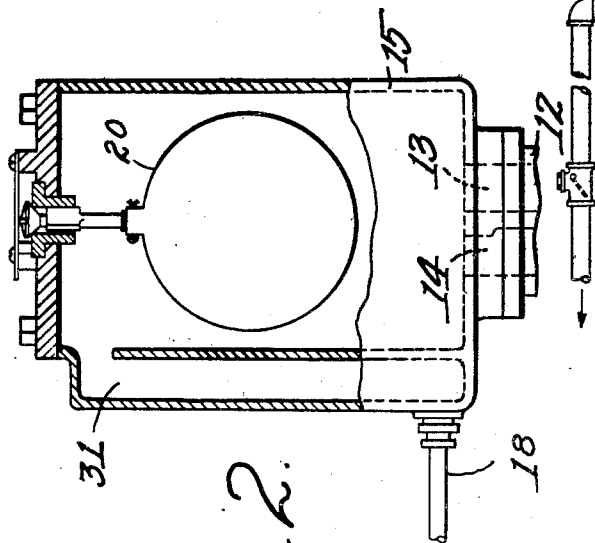


Fig. 2

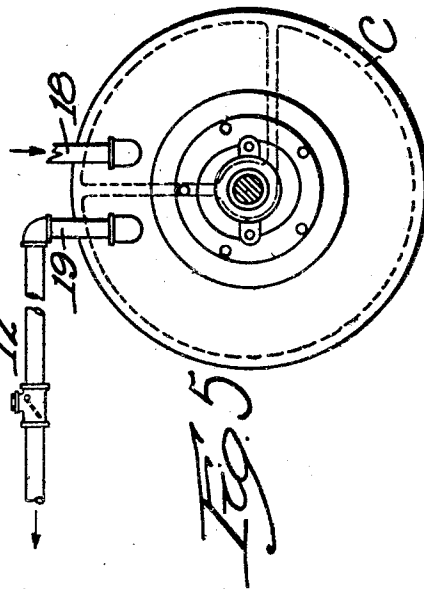


Fig. 5

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VACUUM STEAM HEATING SYSTEM

Application filed May 17, 1929. Serial No. 363,924.

The object of this invention is to improve vacuum steam heating apparatus and particularly the vacuum steam heating apparatus shown and described in Letters Patent reissued to me June 26, 1923, No. 15,637.

The apparatus shown and described in this patent consists in its main features of a closed separating tank to which the returns from the heating system are led, an air or gas pump of the Nash type connected to establish and maintain the desired vacuum, and a centrifugal water pump connected to draw the water of condensation from the separating tank and return the same to the boiler.

It is very advantageous to use a centrifugal water pump in this location as it is very simple and efficient in operation and requires little, if any, attention. But as a centrifugal pump cannot be employed to lift and pump water unless it is primed, a centrifugal water pump cannot be advantageously used in the combination specified unless the water is allowed to flow by gravity from the separating tank to said water pump.

In many buildings the pumping apparatus is arranged on a basement floor, on which floor or at lower levels are arranged a number of steam radiators. As the separating tank has to be arranged above the water pump, complications result when the pumping apparatus is put in a building of the character described, and additional pumping apparatus or trapping apparatus has to be employed to lift the water of condensation from its low level as it escapes from the low radiators up into the separating tank.

To overcome this difficulty, I have improved the combination so that the pumping apparatus can be arranged above the level of the separating tank by adding a simple and efficient priming mechanism to act in conjunction with the pumping apparatus, whereby the tank can be set below the lowest radiator.

The priming mechanism which I preferably employ consists merely in adding some connections from the air or gas pump, whereby the air or gas pump will perform both functions, first, of establishing and maintaining the vacuum in the heating system;

and second, of automatically priming the water pump whenever the water pump should act to take water from the separating tank and return the same to the boiler.

Thus, by very little additional expense I can overcome the difficulty previously described and adapt the apparatus for use in locations having low drainage.

The improvement is illustrated in the accompanying two sheets of drawings which show the best form of apparatus now known to me in practicing the invention, in which

Fig. 1 is an elevation, partly in section, of a vacuum steam heating apparatus, the pumping apparatus, and the piping and heating apparatus being shown on different scale;

Fig. 2 is a sectional elevation of an air relief valve which is employed;

Figs. 3 and 4 are a front and side elevation of the impeller of the water pump;

Fig. 5 is an end view of the pump, illustrating the connection of the air or gas induction and eduction pipes; and

Fig. 6 is a sectional view of the air or gas pump.

Referring to the drawings and in detail, S designates the closed separating tank, N the air or gas pump, and C the centrifugal water pump, the pumps being driven by an electric motor M, which is controlled by a water level switch and a vacuum control switch arranged as described in my reissue Letters Patent above referred to.

B designates the steam boiler from which steam is led through a supply line to the radiators R and R' of the heating system, the returns from the radiators being led through suitable piping and a return line to the separating tank S. These parts may be of any usual construction.

The boiler, steam piping, and radiators are drawn on a smaller scale than the pumping apparatus to illustrate the combination.

It will be noted that the pumping apparatus is located above the level of the separating tank and preferably on top of the separating tank, although the pumping apparatus may be located at a different point from the tank provided the tank is set at the necessary low

level. This allows the water of condensation to flow to the tank from radiators set on the same floor of the building as that on which the pumping apparatus is arranged or from a lower level. The separating tank may be conveniently set in a small pit or depression, if desired.

Air or gas and water is drawn from the separating tank through a pipe 10 which extends downwardly in the tank to a short distance above the bottom thereof. The pipe 10 directs the water drawn up therein into the impeller 11 of the centrifugal water pump C. This impeller may be of any desired form, a two bladed or winged structure being illustrated in Figs. 3 and 4.

As the centrifugal water pump cannot act effectually as a lift or suction pump unless it is first primed or the eduction pipe thereto filled with water, the following priming device is employed which acts in conjunction with the air or gas pump N. A riser 12 is arranged on the pump casing to which the pipe 10 is connected. This riser is provided with passages 13 and 14.

A hole or restricted orifice 17 is formed in the riser 12 to communicate with the passage 13, the parts being arranged so that a passageway is formed through the orifice 17, passageway 13, into the tank 15.

The air pump employed preferably is of the well known Nash type and is shown in section in Fig. 6.

The induction pipe 18 of this pump is connected through the passageway 31 to the tank 15 at the high point shown to prevent water passing over into the air pump, so that the pump can exhaust the pipe 10 through the orifice 17, passageway 13, and tank 15. The eduction or discharge pipe 19 of the air pump is led to any convenient vent.

The small amount of water for sealing the air pump may be supplied from an outside source through the pipe 27, Fig. 1, preferably turned on automatically when the pump starts by the solenoid valve 26. This water is discharged with the air through eduction pipe 19, thrown to waste or used again. An alternate arrangement of obtaining sealing water is shown in Fig. 1 in dotted lines where water is drawn by the air pump from near the bottom of the tank S through the pipe 30 and discharged with the air through the eduction pipe 19. The eduction pipe 19 may connect to a separator 24 in which the water passing out in the exhaust will be separated and returned to the tank S by means of ball float valve 25 and pipe 28, the air escaping to the atmosphere through pipe 23.

The pipe 27 is provided with a shut-off valve and the pipe 30 is provided with a shut-off valve 29 so that either one of the two arrangements last described may be employed.

The tank or riser extension 15 is provided with a ball-cock valve 20 constructed as illus-

trated in Fig. 2, and arranged so that if water rises up in the tank 15, the valve will be opened and atmospheric air will be admitted to the tank.

The riser 12 is provided with an additional orifice 21 extending to the face of the impeller 11 of the water pump.

The operation is as follows: If the separating tank is filled with water of condensation above the lower end of the pipe 10, the air or gas pump N will exhaust the air or gas in the pipe 10 through the induction pipe 18, tank 15 and passageway 13 and will create a vacuum in the pipe 10 greater than the vacuum in the separating tank S. This will cause the water to rise up in the pipe 10 and pass to the impeller 11 of the centrifugal water pump which will pump the water through the eduction pipe 22 to the boiler.

Any air contained in the centrifugal water pump can pass back through the hole or orifice 21 to the passage 14.

This operation will put the centrifugal water pump quickly in operation, so that the same will lift the water from the separating tank and pump the same back to the boiler.

When the water has been exhausted from the separating tank S below the level of the pipe 10, the centrifugal water pump will cease operating and become air-bound, requiring very little power for its continued rotation. But the air pump continuing its operation will exhaust the air or gas from the separating tank through the orifice 17, passageway 13, tank 15, induction pipe 18, and eduction pipe 19, and this action will establish and maintain the desired vacuum in the return side of the heating system.

It will be noticed that the separating tank can be set very much lower than the pumping apparatus, if desired, as a considerable lift of the water can be obtained by the air pump.

If the tank 15 should fill up with too much water while the water pump is being primed, the ball-cock valve 20 will be opened by the rise of the water in said tank and atmospheric air will be admitted in time to prevent any overflow of water into the passageway 31, and thus into the air pump.

By using the air pump, both to establish and maintain the vacuum in the heating system and to prime the water pump, the desired results previously described will be obtained without adding any other pumping mechanism, the riser and tank being in effect simply a small amount of additional piping.

It is obvious of course that the riser and tank can be made simply out of piping but the arrangement illustrated is a desirable one for purposes of economical manufacture.

The details and arrangements herein shown and described may be greatly varied by a skilled mechanic without departing from

the scope of my invention as expressed in the claims.

Having thus fully described my invention, what I claim and desire to secure by Letters Patent is:

1. In a vacuum steam heating apparatus having supply and return lines, the combination of a closed separating tank to which the return line is connected, an air or gas pump, a centrifugal water pump arranged above the separating tank, connections arranged so that the air pump will prime the centrifugal pump and so that when the water is removed from the tank the centrifugal pump will become air bound and the air pump will act to maintain the vacuum in the heating system.

2. In a vacuum steam heating apparatus having supply and return lines, the combination of a closed separating tank connected to the return line, an air or gas pump, a water pump arranged above the separating tank, and connections whereby the air pump is arranged both to establish and maintain the vacuum in the heating system and to prime the water pump.

3. In a vacuum steam heating apparatus having supply and return lines, the combination of a closed separating tank to which the return line is connected, an air or gas pump, a centrifugal water pump arranged above the separating tank, and connections whereby the air pump is arranged both to establish and maintain the vacuum in the heating system and to prime the water pump.

4. In a vacuum steam heating apparatus having supply and return lines, the combination of a closed separating tank to which the return line is connected, an air or gas pump, a water pump arranged above the separating tank, a pipe extending part way down into the separating tank and to the water pump, and connections from the air pump to said pipe, whereby the air pump is arranged both to establish and maintain vacuum in the heating system and to prime the water pump.

5. In a vacuum steam heating apparatus having supply and return lines, the combination of a closed separating tank to which the return line is connected, an air or gas pump, a centrifugal water pump arranged above the separating tank, a pipe extending part way down into the separating tank and connected to the water pump, a riser extending upwardly from said pipe, and connections from the air pump to said riser, whereby the air pump is arranged both to establish and maintain the vacuum in the heating system and to prime the water pump.

6. In a vacuum steam heating apparatus having supply and return lines, the combination of a closed separating tank to which the return line is connected, an air or gas pump, a centrifugal water pump arranged above the separating tank, a pipe extending part

way down into said separating tank and connected to the water pump, and a riser extending upwardly from said pipe and having passages up and down in the same and a connection from the air pump to the down passage, whereby the air pump is arranged both to establish and maintain the vacuum in the heating system and to prime the water pump.

In testimony whereof I have hereunto affixed my signature.

IRVING C. JENNINGS.

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