

Oct. 24, 1933.

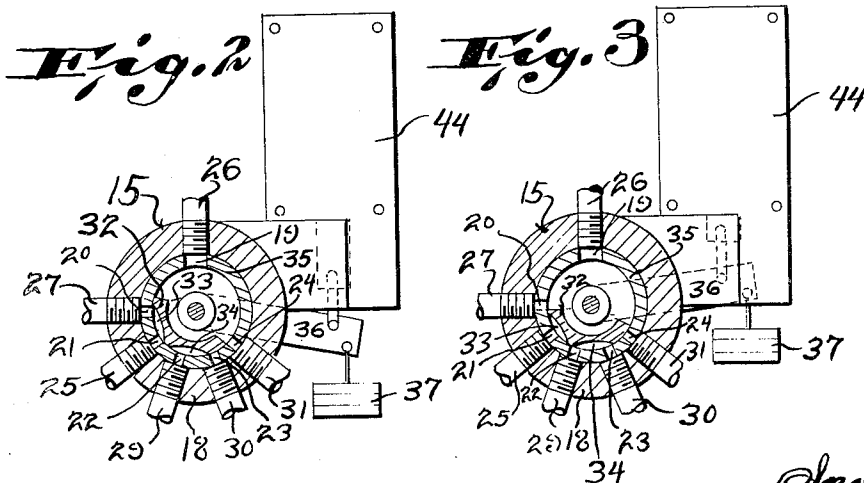
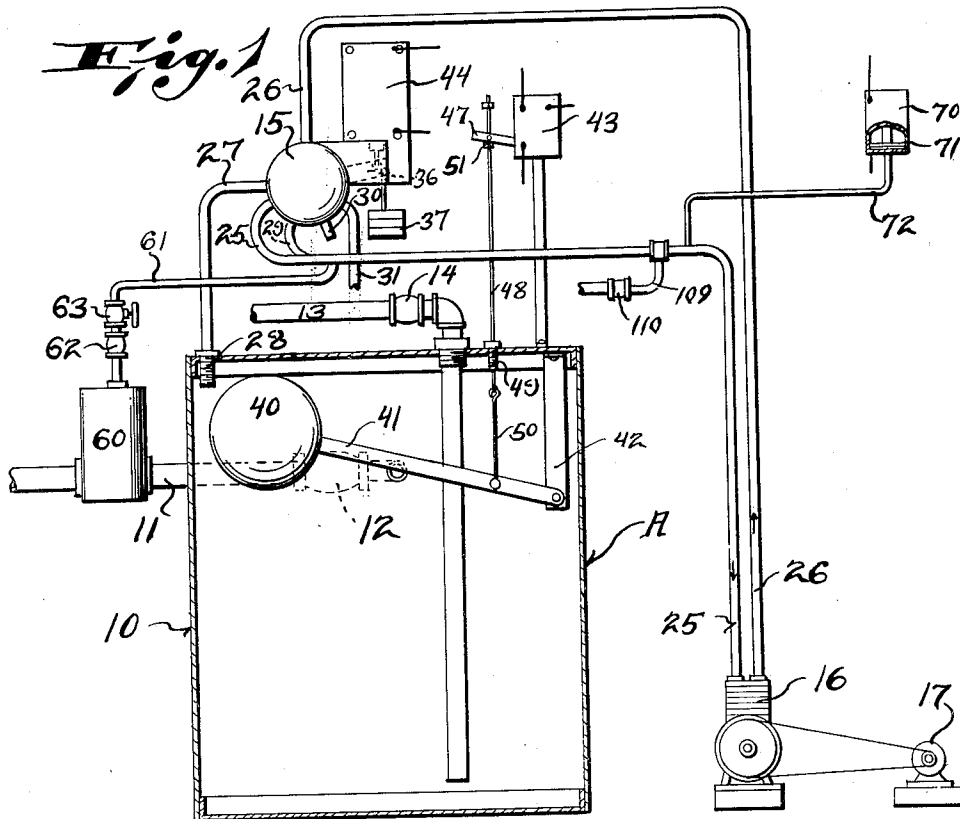
O. GYLSTROM

1,932,037

PUMP FOR STEAM HEATING SYSTEMS

Filed Dec. 31, 1931

2 Sheets-Sheet 1



Inventor
Olef Gylstrom.
By *Wm. W. Wm.*
Attorneys

UNITED STATES PATENT OFFICE

1,932,037

PUMP FOR STEAM HEATING SYSTEMS

Olaf Gylstrom, Milwaukee, Wis.

Application December 31, 1931

Serial No. 584,133

2 Claims. (Cl. 103—235)

This invention appertains to steam heating systems and more particularly to steam heating systems of the so-called vacuum type.

In heating systems of this character, it is customary to create a vacuum on the return line from the radiators for withdrawing entrapped air and water of condensation from the radiators and to collect the water of condensation in a suitable receiving tank and force this water back to the boiler.

Considerable difficulty is experienced in the handling of the water for returning the same to the boiler and various pumping equipment have been provided for this purpose, which function more or less unsatisfactory. In all of the systems that I am familiar with, a separate pump is provided for creating the vacuum or suction on the line, and an independent pump for forcing the water from the receiving tank back to the boiler. In all instances, the receiving tank is utilized as an air and water separator.

It is one of the primary objects of my invention to provide a single pump or working element for creating both the vacuum on the line and for delivering the water of condensation from the receiving tank back to the boiler, whereby the vacuum system will be materially simplified and will be enabled to operate at a very much lower cost than the usual systems.

Another salient object of my invention is the provision of the use of an air compressor for creating both the vacuum on the return line and a pressure in the receiving tank for forcing the water of condensation therefrom, the utilization of air pressure from the pump for forcing the water from the tank entirely eliminating the use of a water pump for this purpose, which, as stated above, is very unsatisfactory, especially where the temperature of the water is great.

A further important object of my invention is the provision of the use of an air compressor in conjunction with a vacuum steam heating system, a novel float operated valve being employed for alternately creating a suction and pressure in the receiving tank from the air compressor, the valve acting to connect the intake side of the pump with the tank when the water in the tank is at a low level, and for connecting the outlet pressure side of the pump with the tank, when the water is at a high level for forcing the water from said tank.

A further object of my invention is the provision of means for maintaining a suction or vacuum on the return line of the heating system when the intake end of the pump is disconnected

from the tank and the outlet end of the pump is connected with the tank, whereby a vacuum can still be placed on the line irrespective of whether the pump is utilized as a vacuum creating means, or as a pressure creating means.

A still further object of my invention is to provide a novel device for handling the water of condensation in a vacuum steam heating system of the above character, which will be durable and efficient in use, one that will be simple and easy to manufacture, one which can be placed upon the market at a reasonable cost, and one that can be installed in a convenient and expeditious manner.

With these and other objects in view, the invention consists in the novel construction, arrangement and formation of parts, as will be hereinafter more specifically described, claimed and illustrated in the accompanying drawings, in which:

Figure 1 is a detailed side elevation illustrating my improved device incorporated with the receiving tank, the tank shown in cross section, the view showing my arrangement diagrammatically;

Figure 2 is a sectional view through the control valve illustrating the position thereof for creating a suction in the receiving tank;

Figure 3 is a similar view illustrating the position of the valve for creating a pressure in the receiving tank;

Figure 4 is a detail side elevation illustrating a means for mechanically actuating the valve from a float in the receiving tank;

Figure 5 is a diagrammatic view illustrating one type of circuit which can be utilized with my device.

Figure 6 is a view similar to Figure 4, illustrating the means for controlling the vacuum switch from the float-operated valve lever.

Referring to the drawings in detail, wherein similar reference characters designate corresponding parts throughout the several views, the letter A generally indicates my improved device for handling the water of condensation in a vacuum steam heating system.

In accordance with my invention, I provide a receiving tank 10 which can be of any desired type and capacity and this tank has leading into the same, adjacent to the upper end thereof, the return pipe 11 of the steam heating system, and it is to be understood that the various returns of the radiators are connected therewith. An inwardly opening one-way check valve 12 can be arranged within the return pipe 11 adja-

cent to the tank 10. Extending into the tank 10, through the top wall thereof is the discharge pipe 13, which leads to the boiler. The pipe preferably extends into the tank 10 short of the bottom wall thereof, as is clearly shown in Figure 1 of the drawings. Arranged in the pipe 13 adjacent to the tank 10 is a one-way outwardly opening check valve 14. This allows water of condensation to be forced through the pipe 13 to the boiler, but prevents the return of the water from the boiler to the tank.

Arranged above the tank at any preferred point, I provide my novel valve 15 for turning the suction and compressed air to and from the tank 10. This valve 15 operates in conjunction with an air compressor 16, which can be of any desired make or size, best suited for the purpose intended. This air compressor 16 is preferably driven from an electric motor 17, and as shown, pulleys and a pulley belt is utilized as the drive medium between the motor and the air compressor.

Referring more particularly to the valve 15, it can be seen that the same embodies a stationary casing 18 having ports 19, 20, 21, 22, 23 and 24 formed therein. The intake or suction pipe 25 of the air compressor leads to and is connected with the intake port 21 of the valve casing. The outlet pipe 26 of the air compressor leads to and is connected with the port 19 of the valve casing. A pipe 27 leads from the port 20 of the valve casing and is connected with the upper end of the tank 10, as at 28, for a purpose, which will be later set forth. A branch pipe 29 is connected with a valve casing 15 and with pipe 25 and communicates with the port 22 in said casing. An air intake suction pipe 30 communicates with the port 24 and this pipe can lead to any suitable point of discharge, such as a sewer, or the like.

Rotatably arranged within the casing 15 for controlling the opening and closing of the various ports, is mounted the valve body 32. This valve body 32 is of a substantially semi-cylinder shape and it has formed on its periphery at spaced points passageways 33 and 34, which are employed at different times for connecting certain of the ports together. A valve shaft is formed on or secured to the valve body and rotatably extends through one side of the valve casing and this valve shaft 35 has secured thereto, an operating crank arm 36.

Secured to the outer end of the crank arm 36 is a weight 37 which normally holds the valve body in the position shown in Figure 2 of the drawings.

I provide novel means for actuating the valve body and the position of the valve body depends upon the height of the water of condensation within the tank 10.

Arranged within the tank 10 is a float 40. In the present instance, I have shown the float 40 connected with an arm 41 which is pivotally mounted on the bracket 42 carried by the tank. Obviously, when the tank is filled with water, the float 40 will be raised and when the tank is empty, the float will be lowered. Adjacent to the tank 10 and exteriorly thereof, I arrange the float switch 43 and this switch 43 is provided for opening and closing the circuit to a solenoid 44. This solenoid includes the usual coil 45 and movable core 46. The float switch 43 embodies a movable switch lever 47 for opening and closing the circuit and this switch lever 47 is actuated from the float 40 by means of a push rod 48.

This push rod 48 slidably extends through a guide 49 carried by the tank and the inner end of the push rod is connected by means of a link 50, with the float lever 41. The upper end of the push rod 48 is provided with spaced stops 51 for actuating the switch lever 47.

From the description so far, it can be seen that my improved device operates as follows: Considering that the tank 10 is only partially filled with water, and the float 40 is in its lowered position, the circuit through the solenoid will be open and the weight 37 will hold the valve body in the position shown in Figure 2 of the drawings. Considering that the air compressor 16 is functioning, a suction will be created on the line 25 and air will be forced out under pressure through the line 26. Thus, a suction or vacuum will be created through the valve in view of the fact that the ports 20 and 21 are connected by the passageway or cavity 33.

Through the medium of the pipe 27, a suction will be created in the tank 10, and this suction in turn will be imparted to the return pipe 11, the check valve 12 being moved to its open position. The steam heating system will now function in the ordinary manner, and as the water of condensation and entrapped air enters into the tank, the water will drop to the bottom of the tank and the air will separate and rise therefrom. The air under pressure from the pipe line 26 will enter into the valve casing through the port 19, and as the port 24 is uncovered, the air will flow into the pipe 31, which as stated, can lead to any suitable outlet.

When the water raises beyond the predetermined level, the float 40 will be raised to such a position as to actuate the switch lever 47 and thus close the circuit through the solenoid 44. The solenoid 44 will then become energized and will draw up on its core 46 against the weight 37 and will move the valve body to the position shown in Figure 3 of the drawings.

By referring to Figure 3 of the drawings, it can be seen that the valve body is so disposed as to permit the ports 19 and 29 to communicate with one another and thus, the air under pressure from the pipe 26 flows into the tank 10. This creates a pressure in the tank on top of the water and the water will be forced into the pipe 13, past the check valve 14 into the boiler. The intake pipe 25 is now connected by means of a branch pipe 29, cavity 34 and port 23, with the air intake pipe 30 which communicates with the atmosphere.

Thus, in this position of the valve, air is being taken in by the compressor from the atmosphere. After the water has been forced from the tank, the float again lowers, operating the switch for opening the circuit to the solenoid, allowing the valve body to return to the position shown in Figure 2, where the cycle, as described, again takes place.

It may be advisable to still create a slight vacuum on the return line 11, while the tank is being emptied of the water circulated therein. To take care of this contingency, I can provide a small water reservoir 60 in the pipe line 11, and connect the reservoir by means of a suction pipe 61, with the intake pipe 25 of the air compressor. A one-way check valve 62 and a hand valve 63 can be placed in the suction pipe 61. When the valve is in the position shown in Figure 3 for forcing the water from the tank, the hand valve 63 can be opened and a suction will be created in the tank 60 through the medium

of the pipe 61 and intake pipe 25, and any water of condensation will collect in the tank 60. As soon as the valve returns to the position shown in Figure 2, the check valve 62 will automatically close and any water collected in the enlargement or supplemental tank 60 will be drawn into the main tank 10.

In connection with my device, I can provide means for controlling the motor 17 in conjunction with the solenoid and in Figure 5, I have illustrated one type of electric circuit for this purpose. In connection with the circuit, it is to be understood that the various electrical appliances used therewith form no part of my present invention, and all of the same are purchased in the open market.

Thus, the solenoid 44, the float switch 43 are all of conventional character, as is the vacuum switch 70, and the magnetic contactor 80. The vacuum switch 70 includes a diaphragm 71 or similar appliance, which is acted upon by the suction in the line pipe 25, and the casing of the vacuum switch is connected by means of a small suction pipe 72 with the intake pipe 25.

In the present instance, the circuit has been shown for a three wire system, and thus, wires 81, 82 and 83 are led from a suitable outlet box or source of electrical energy. These three wires lead to the magnetic contactor 80 and leading from the magnetic contactor are line wires 84 and 85. The wires 86, 87, and 88 lead to the electric motor 17. As shown, the wire 84 leads to one terminal of the coil 45 for the solenoid 44 and the other terminal of the coil has connected thereto, a wire 86 which leads to the float switch. The wire 85 leads to one terminal of the vacuum switch 70, and another terminal of the vacuum switch has connected thereto a wire 87 which leads to the other terminal of the float switch. A branch wire 88 leads from the wire 85 to the float switch.

During the normal operation of the system, a suction is created on the vacuum switch through the medium of the pipe 72, and thus the motor 17 will be constantly operated.

A hand switch 89 can be placed in the wire 87 for permitting the disconnection of the vacuum switch at night, so that the air compressor can be used solely as a pump for forcing the water of condensation from the tank 10. The current to the motor 17 is controlled both by the vacuum and float switches and the wiring is such that both or either can be controlled.

In some instances, it may be advisable to operate the valve 15 mechanically instead of by a solenoid and in Figure 4 of the drawings, I have illustrated such a means.

In this instance, I provide an operating lever 90 which can be substantially of the bell crank type, and this lever is pivoted at its angle, as at 91, on the casing of the valve 15. The lever is actuated directly from the float 40 in the tank 10 and a rod 92 is provided for this purpose.

The inner end of the lever 90 is provided with a head 93 having spaced ears 94 thereon for lying on opposite sides of the crank 36 of the valve. These ears 94 can carry set screws 95 for engaging the crank and obviously these set screws can be adjusted for proper degree of contact with the crank. Thus, as the lever 90 is actuated by the float, the set screws will contact with the crank for changing the position of the valve body.

It is highly advisable that the action of the

valve body be quick and of the snap type. To facilitate the quick action of the valve body, I provide a swinging lever 96. This lever is rockably mounted as at 97 above the operating lever 90 and is provided with a V-shaped actuating point 98. This point 98 normally engages a roller or pin 99 carried by the operating lever and a contractile coil spring 100 normally urges the lever 96 toward the roller or pin 99. When the position of the lever 90 is changed, one inclined face or the other of the point 98 will engage the roller or pin 99 and the tension of the spring 100 will be such as to quickly throw the operating lever 90.

In order to control the operation of the motor 17 in the system, when a mechanically operated valve is used, I can mount a float-controlled vacuum switch 105 on the bracket 106 utilized for supporting the valve casing. This vacuum switch 105 is connected in the electric circuit for the motor and can be of the same type as the vacuum switch 70 shown in Figure 1 of the drawings. This vacuum switch has connection by means of a pipe (not shown) with the intake pipe of the air compressor 16. Projecting from one side of the vacuum switch is the float controlled switch lever 107 and this switch lever is actuated by means of a rod 108 pivotally connected with the lever 90.

Referring to Figure 1 of the drawings, it will be noted that I arrange a branch pipe connection 109 with the intake pipe 25 of the air compressor. This branch pipe 109 has interposed in the length thereof, an outwardly opening check valve 110. This permits the escape of air from the pipe 25 into the atmosphere should the pipe become overloaded.

From the foregoing description, it can be seen that I have provided an exceptionally simple and durable mechanism for creating a vacuum in a steam heating system and for handling the water of condensation.

Changes in details may be made without departing from the spirit or the scope of this invention, but what I claim as new is.

I claim:

1. In a steam heating system, a receiving tank for the water of condensation having a return pipe from the radiators leading into said tank adjacent to the upper end thereof, a water discharge pipe communicating with the lower end of the tank for the boiler, oppositely opening check valves in said pipes, an air compressor having an intake pipe and an outlet pipe, a valve, including a movable valve body for connecting either the intake pipe or the outlet pipe with the tank, means including a float for operating the valve body according to the height of the water in the tank, an auxiliary reservoir in the return pipe adjacent to said tank, a suction pipe connected with the auxiliary reservoir and the intake pipe and a valve in said suction pipe.

2. In a heating system, a receiving tank for the water of condensation having a return pipe from the radiators leading into the same and a water discharge pipe leading therefrom for the boiler, a single pump operatively connected to the tank for either creating a suction in the tank or for forcing air under pressure into the tank, and means for creating a suction in the return pipe in advance of the tank from said pump, as for the purpose specified.

OLAF GYLSTROM.