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HEAT CONTROL SYSTEM

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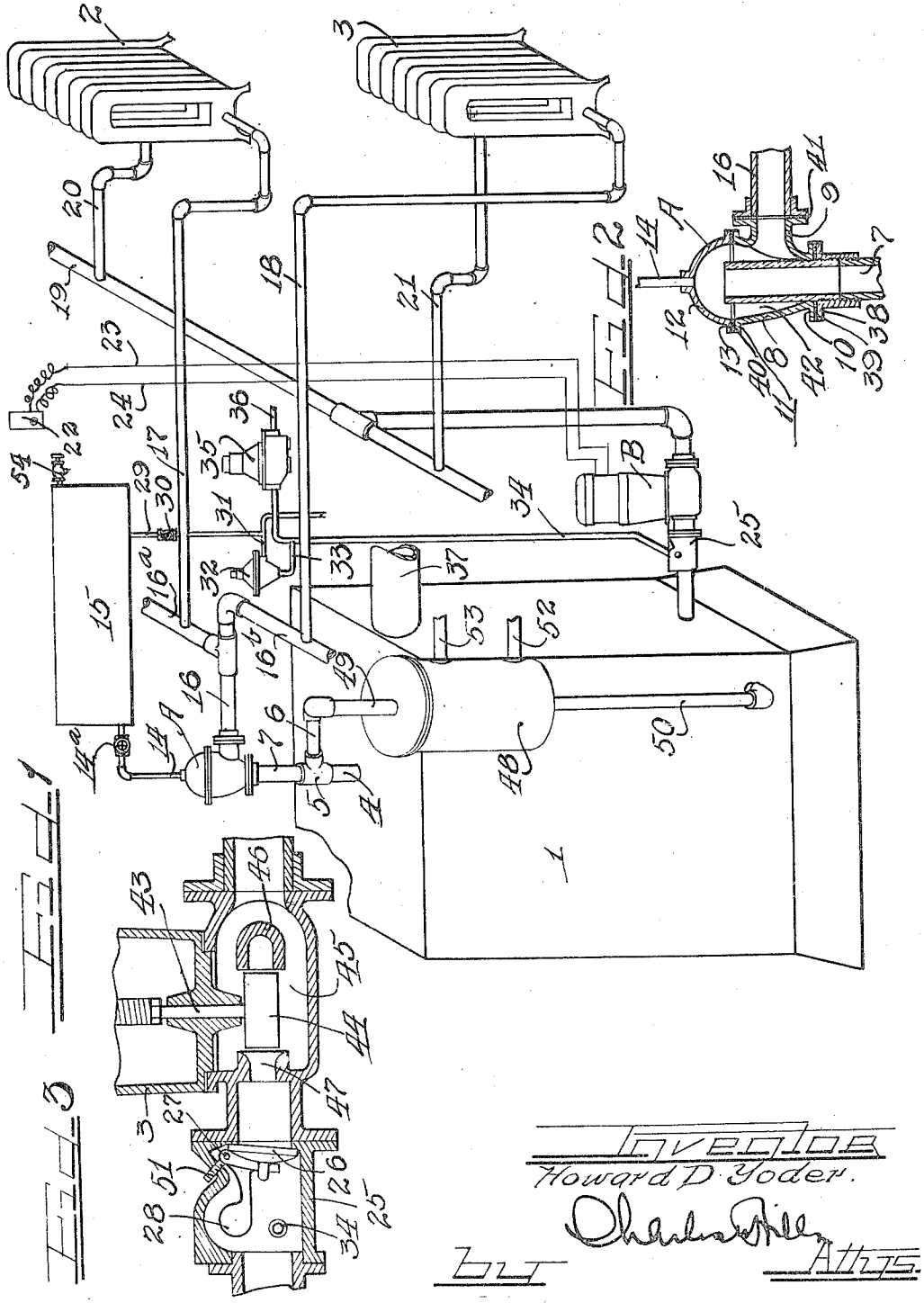


Fig. 1

Fig. 3

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HEAT CONTROL SYSTEM

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5 Claims. (Cl. 237—63)

An object of the present invention is to provide a hot water heating system wherein water circulation is created or stopped in accordance with room temperature conditions and wherein an unrestricted supply line is employed, and wherein means are provided for preventing heat flow through the unrestricted supply line when the water circulation is stopped.

Another object of the invention is to provide, in a hot water heating system wherein water is forcibly circulated, means for preventing heat flow through the supply line, when the circulation is stopped, without the use of valves or like structures.

A further object of the present invention is to prevent, in a hot water heating system wherein the water is forcibly circulated, heat flow through the supply line when the circulation is stopped, by thermal means interposed in the supply line which prevents flow of convection currents through the supply line and relieves the system of air and vapors created by reason of the continuation of operation of the boiler and cessation of water flow.

Another and still further object of the present invention is to provide, in a hot water heating system of forced circulation type, for the prevention of heat flow through the supply line while water circulation is stopped.

Generally speaking, the invention contemplates the provision of a trap in the supply line for preventing heat flow to the supply line when the water circulation is stopped, and which trap at the same time vents air and vapors out of the system.

The invention furthermore contemplates the provision of a forced flow pump and a check valve, elsewhere in the system.

The above, other and further objects of the present invention will be apparent from the following description, accompanying drawing, and appended claims.

The accompanying drawing illustrates, diagrammatically, a hot water heating system embodying the principles of the present invention and the views thereof are as follows:

Figure 1 is a diagrammatic view of a heating system, constructed in accordance with the principles of the present invention, and showing the supply and return lines between the boiler and radiators, with a trap in the supply line, and a force flow pump and check valve in the return line.

Figure 2 is a vertical sectional view through the illustrated form of trap, constructed in accordance with the principles of the present invention.

Figure 3 is a fragmental vertical sectional view through a portion of the pump and also through the check valve, showing the flap in closed position.

The drawing will now be explained.

A hot water heater or boiler 1, of any well-known form, and fired by coal, oil or gas, is diagrammatically represented. Radiators 2 and 3 disposed at points remote to the heater are connected thereto by supply and return lines.

The supply line, as illustrated, contemplates a riser 4 communicating with the water space of the boiler 1, in which riser is interposed a T 5 from which T leads a branch pipe 6, to be later described.

Connected to the T 5 is a short piece of pipe 7 the upper end of which is constructed preferably of such material as to have low heat conducting characteristics.

A trap, designated generally at A, is applied over the upper open end of the pipe 7.

The trap A, as illustrated, comprises a body 8 having an outlet connection 9, a bottom flange 10 and an upper flange 11. A cap 12 flanged at 13 to lie against the flange 11 of the body forms the upper portion of the trap and with the body provides an enlarged chamber. The cap 12 is apertured to receive a small pipe 14 which in turn is connected to a tank 15 into which air and vapors from the trap A are delivered and wherein such vapors are condensed. A valve 14a is interposed in the pipe 14 for the purpose of controlling air and vapor flow to the tank.

Connected to the outlet 9 of the trap A is the pipe section 16 which is connected through suitable connections with the supply lines or branches designated 16a and 16b. A supply connection 17 connects the supply section 16a with the inlet of the radiator 2, and a similar connection 18 connects the supply section 16b with the inlet of the radiator 3. Additional radiators would be similarly connected to the supply line of the circulating system.

A return line 19 is connected by means of branches 20 and 21 with the outlets respectively of the radiators 2 and 3. The return line 19 enters the heater 1, adjacent the bottom thereof so that the cooled water may be returned to the water within the boiler for reheating and recirculation. Interposed in the return line is a force flow pump, designated generally at B, of any known make. This pump is actuated by an electric motor which in turn is controlled by means of a thermostat 22, or thermostats,

placed in a room, or in rooms, for automatic circulation of the water through the system. Thermostat 22 is connected by wires 23 and 24 with a motor to operate the pump, or stop pump operations, in accordance with temperature conditions in the room where the thermostat is placed.

Between the pump B and the heater 1, is interposed a loaded check valve 25 constructed so as to close water admission to the heater 1 when the circulation is stopped, that is when the pump is not in operation, and to permit circulation when the pump is operating.

While any suitable loaded valve structure may be used, the one chosen for illustration herein includes a flap member or valve 26 pivoted at 27 to swing about a horizontal axis. A weight 28 is attached to the flap 26, and tends to urge said flap 26 towards its seat to stop water flow when seated. The parts are so constructed, however, that the flap 26 is swung open to allow water flow when the pump B is in operation.

Leading from the tank 15 is a pipe 29 having a valve 30 in it which communicates with a drain or sewer for emergency removal of condensate in the tank 15. A branch 31 leads from the pipe 29 to a relief valve 32 from which a connection 33 is made to a pipe 34 connected into the return line of the circulating system. A reducing valve 35 is connected to the pipe 34 and also by means of a pipe 36 to a source of water supply, such as a city main.

Water to the heater 1 is supplied from the pipe 36 thru the reducing valve 35, pipe 34 into the return line adjacent the boiler.

A stack or chimney connection 37 is provided for connecting the combustion chamber of the boiler with a stack or chimney through which the products of combustion may pass to the atmosphere.

The trap A is secured to the pipe 7 by means of a flange 38 between which flange and the flange 10 of the body of the trap is interposed a gasket 39. A similar gasket 40 is interposed between the flanges 11 and 13. These gaskets are made of material highly resistant to heat conduction to prevent, or to lessen rather, the conduction of heat from the boiler 1 to the trap A. A suitable gasket 41 is interposed between the flange of the outlet 9 and the flange of the supply line pipe 16.

The trap A is so constructed that the end of the pipe 7 terminates above the bottom of the chamber formed therein, so that below such pipe end, within the chamber, a pool or pocket 42 results.

Figure 3 illustrates the shaft 43 of the motor as driving an impeller 44, disposed in the chamber 45 of the pump casing, for forcing water through the system. A deflector 46 is positioned ahead of the impeller 44 to divide the stream of water entering the chamber 45.

With the system filled with water, and the boiler fired, the operation is as follows:

When the thermostat 22 operates to actuate the pump B, water is forcibly circulated through the system, such circulation continuing until the pump is stopped by operation of thermostat 22.

The water rising from the boiler 1 passes into the trap A and then through the supply line 16, through the branches 16a and 16b to the various radiators 2 and 3. The water is returned to the boiler through the return line 19 and the check valve 25, which is open, because of operation of the pump B. As soon as the thermostat 22 stops operation of the pump B, circulation stops, and the check valve 25 closes thus stopping circulation of water through the supply line of the system.

However heated bubbles continue to rise through the riser 4, pipe 7 and enter the trap A where the heated bubbles become jammed underneath the cap or crown 12 of the trap. Cessation of water circulation will therefore create a pool in the pocket 42 which water, because of the cessation of circulation, becomes cool. The rising heated bubbles being lighter than the cooler water, cannot pass downwardly through the water in the pocket 42 into the supply line, and the cooler water, being denser, cannot enter the tube 7 to establish a convection circuit. The air and vapors within the trap then pass therefrom through the pipe 14 into the tank 15 where the vapors are condensed. The velocity of the water and bubbles entering the chamber of the trap A is so reduced that the flow of water is incapable of carrying the bubbles in suspension through the trap against the normal tendency of the bubbles to rise and be vented. This makes it impossible for the heated bubbles to pass downwardly through the water in the pocket 42 and into the supply line.

Due to the fact that a convection circuit is prevented, under these circumstances, there will be no heat flow from the boiler 1 to the supply line. Consequently no heat will pass to the radiators 2 and 3, as long as the loaded valve 25 is closed, which is as long as the pump B is at rest.

A tank 48, for containing hot water for domestic purposes, may have its contents heated by a connection 49 between the pipe 6 and the upper portion of the tank, with a return connection 50 from the lower portion of the tank to the lower portion of the water space of the boiler 1.

The heating system herein described may be utilized in the winter time for heating the building and also for supplying hot water for domestic purposes.

In the summer time, when it is desired to prevent circulation of heat to the radiators, the loaded valve 25 may be closed and kept closed by suitable screws 51 or the like engaging the movable portion thereof, whereupon circulation through the radiators is prevented. The boiler 1 therefore may be utilized, in the summer time, for heating the domestic hot water supply without supplying any heat to radiators of the heating system.

The provision of the trap A in the supply line and the provision of the forced flow pump B and the check valve 25 in the return line make it possible to utilize the boiler for heating the domestic hot water supply in the summer time without transmitting any heat through the supply line of the system to the radiators.

The upper end of pipe 7 being of low heat conducting material, and the interposition of the gaskets 39 and 40, prevents or retards the conduction of heat to the water in the pocket 42, and the supply line, so that there is no appreciable heat passage to the supply line, when the water circulation is stopped. The cooler water in the pocket 42 is denser than the hotter water, consequently the cooler denser water cannot rise to enter the end of the pipe 7.

In the meantime conduction and convection are taking place between the heat trap and the boiler and some heat passes beyond the trap by conduction. This however is held to a minimum

because of the low heat conductivity of the upper end of the pipe 7 and the gaskets 39 and 40. The conductivity of water of course is very low so that passage of heat by conduction, to the supply line is negligible.

The trap A functions properly to prevent heat flow to the supply line, when circulation is stopped, because of the fact that heat tends upwardly and it becomes choked by the water seal in the chamber of the trap.

The water to be heated by the auxiliary heater 48 is supplied to and withdrawn therefrom by means of connections 52 and 53.

The tank 15 is provided with a valve controlled air vent 54.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

The invention is claimed as follows:

1. In a hot water heating system, in combination, a boiler, a plurality of radiators, supply and return lines between said boiler and radiators, said supply line between said boiler and radiators being open for free passage of water to the radiators at all times during normal operation of the system and adapted to deliver water directly from the boiler to the radiators, the parts being so arranged that all water delivered to the supply line passes through the radiators before returning to the boiler, means for forcibly circulating water through said lines, means in the return line for preventing water circulation through said lines when said first mentioned means is at rest, and a trap in said supply line for preventing heat flow to the supply line when the water circulation is stopped, said trap comprising an up-pass and a down-pass and an air vent in the upper portion of the down-pass.

2. In a hot water heating system of the forced circulation type, in combination, a boiler, heat radiating means, supply and return lines between said boiler and said heat radiating means, said supply line being free of mechanical restricting means, a check valve in said return line loaded to resist circulation of water by convection, pump means for forced circulation of water through said check valve, boiler and radiating means, and trap means in said supply line unrestrictive of the flow of water therethrough but providing when said pump means is at rest a fluid seal against the flow therepast of heat by conduction or convection.

3. A heat trap comprising a body forming an enlarged chamber, a riser pipe entering said chamber and terminating therein above the bottom thereof to provide a liquid pocket thereabout, said pipe having low heat conductive characteristics to prevent substantial heat interchange between the liquid in said pipe and the surrounding liquid in said pocket, and means for venting vapors from said chamber.

4. In a hot water heating system, in combination, a boiler, a plurality of radiators, supply and return lines between said boiler and radiators, said supply line between said boiler and radiators being open to the free passage of water at all times during normal operation of the system, a trap consisting of an up-pass and a down-pass and a chamber in said supply line, the parts being so arranged that all water delivered to the trap passes directly to the radiators, means for forcibly circulating water through said system, means in the return line for preventing water circulation through said system when said first mentioned means are at rest, said trap being effective to prevent heat flow in the supply line when circulation of water is stopped, and means for venting vapors from said trap.

5. In a hot water heating system of the forced circulation type, a supply line mechanically unobstructed to free passage of water to the radiators at all times, means for forcibly circulating water through said system, means in the return line of said system for preventing water circulation through the system when said circulating means is at rest, and a trap in the supply line of said system comprising an enlarged chamber, an up-pass entering said chamber and terminating therein above the bottom thereof and spaced from the walls thereof, an outlet from said chamber to the supply line communicating with the chamber below the extremity of the up-pass, the space about said up-pass within the chamber constituting a cool water seal to prevent heat flow by convection to the supply line when the water circulation is stopped.

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