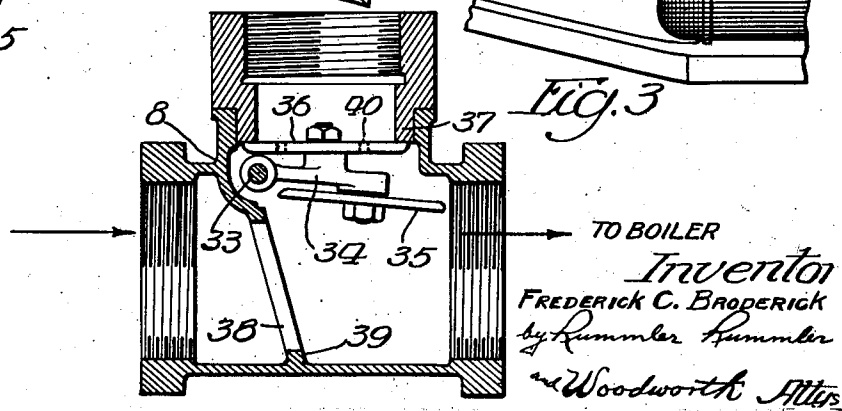
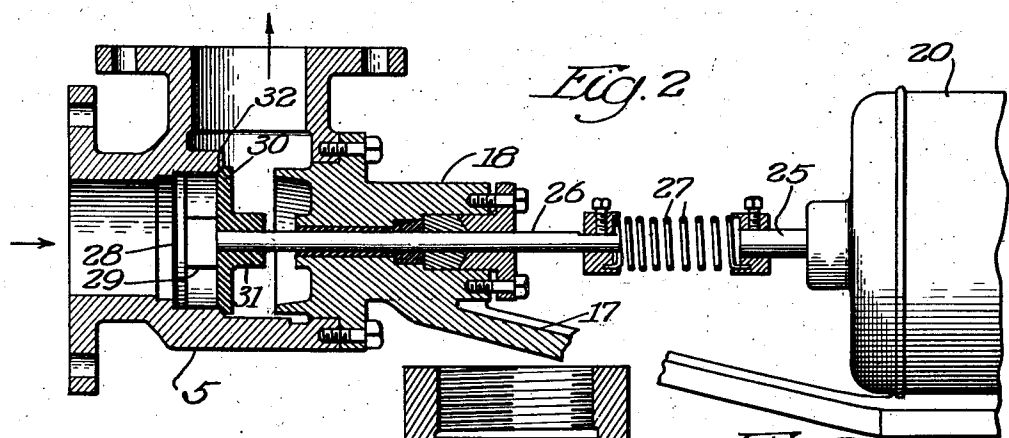
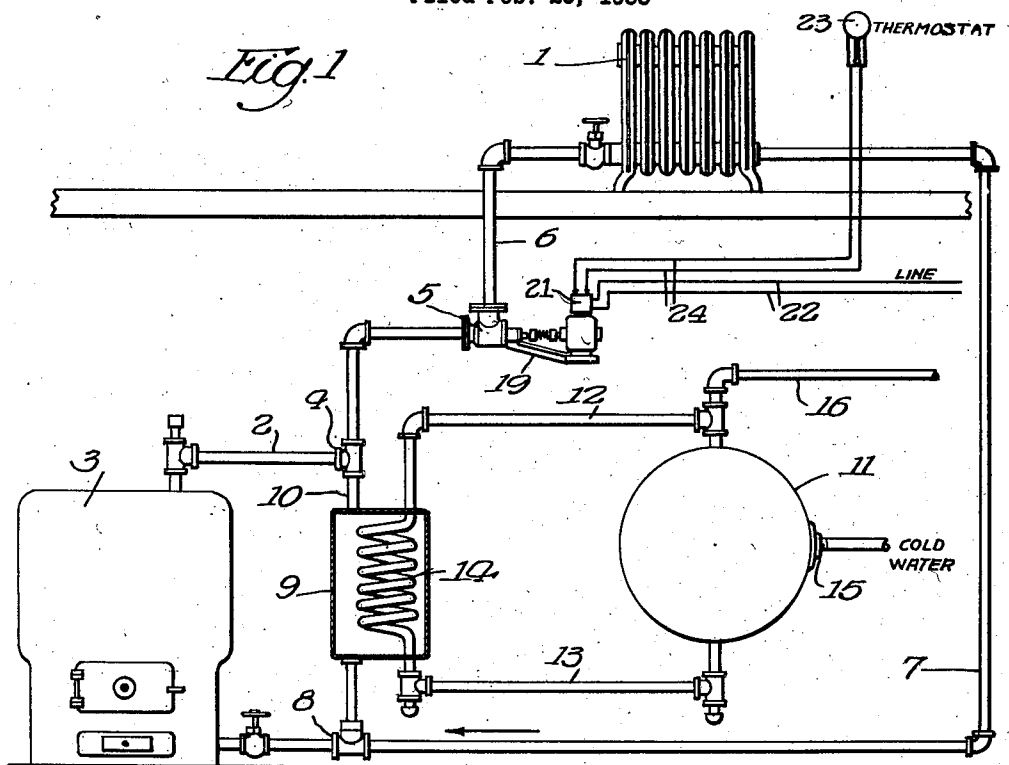


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HOT WATER HEATING SYSTEM

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9 Claims. (Cl. 237—19)

This invention relates to heating systems in which the heating medium such as hot water is forced through the radiation circuit by means of a pump under thermostatic control.

5 The purposes of the invention are to provide such a system with improvements which insure the positive shutting off of both the supply and return conduits of the radiation circuit when the pump is not in operation, including an improved rotary pump, which acts as a valve in the supply conduit, and a two-way check valve in the return conduit, the latter providing for by-passing hot water from the boiler through a water heater.

10 Thus, when the boiler water is not circulated through the radiator circuit it is by gravity circulation passed through a water heater. This water heater has separate connections to a hot water storage tank, which in turn has the usual connections to the hot water supply system of the building.

20 The purposes of the invention are accomplished by means of an arrangement and constructions as illustrated in the accompanying drawing, in which—

25 Figure 1 is a diagram of the improved hot water heating system.

Fig. 2 is a longitudinal section of the pump and showing partly broken away the driving motor therefor.

30 Fig. 3 is a sectional view of the two-way check valve used in this system.

35 The improved heating system is designed to avoid complicated arrangements of circuit connections or equipment while providing for positive and rapid circulation of the heating medium when required, according to thermostatic control of the system, and at other times no circulation can occur in the heating system and the hot water from the boiler is then used exclusively for supplying heat to a storage tank for hot water.

40 The essential equipment for this system is a boiler having supply and return conduits connected therewith, these conduits leading to the various radiators of the building but having a cross connection through a hot water heater. This heater includes a coil or other means for receiving heat which is in an independent circuit leading to and from the hot water storage tank. Included in the radiator circuit is a rotary pump having an operating motor which is under thermostatic control. The rotary element of the pump is a valve which automatically unseats when the pump is set in operation. A two-way check valve is also included in the system and is responsive to the flow of water under the action of the pump

to open the return line of the heating system to the boiler. When the pump is not in operation this check valve shifts to close the radiator return conduit and open a by-pass so that the hot water from the boiler then circulates through a water heater instead of through the radiator circuit.

Referring to the drawing, the diagram in Fig. 1 represents room heaters for a building by the radiator 1. The hot water supply conduit 2 connected with the boiler 3 may communicate with the supply side of the radiator through a T-valve 4 and conduit connections therefrom leading to pump 5 having a supply connection 6 with the radiator. The return line 7 from the radiator passes through check valve 8.

A water heater tank 9 is in a by-pass connection 10 from the T-fitting 4 to the check valve 8.

A hot water storage tank 11 is connected through the conduits 12 and 13 with a coil 14 in the heater 9 and which receives heat from the boiler water circulating through tank 9 when the boiler water is permitted to circulate through this tank. The cold water supply for the storage receptacle 11 is indicated at 15 and the hot water supply conduit for the building is indicated at 16.

The pump construction 5 is illustrated by Fig. 2. This pump is supported by a casting 17 including an integral bearing 18 for the pump and a supporting base 19 upon which is mounted the pump motor 20. The latter is an electric motor under control of a switch 21 in a motor circuit 22.

The switch is under the control of a room thermostat 23 in a switch operating circuit 24 not illustrated in detail but which as customary receives low voltage from a transformer in line 22. The motor shaft 25 is coupled with a pump shaft 26 by means of a coil spring 27. The pump shaft 26 carries fast a centrifugal pump impeller 28 having the radial vanes 29 integral with a valve disc 30 and hub 31. Spring 27 is under compression and by thrust through the shaft 26 holds the valve 30 against the seat 32 formed on the inner surface of the pump body 5.

When the motor shaft 25 is rotated the spring 27 winds up sufficiently under the reactance of the load on the impeller or rotor 28 to shift shaft 26 and the rotor carried thereby to the right, Fig. 2, unseating valve 30 and permitting circulation of the heating medium through the pump.

This construction is a combined motor operated valve and pump, with the function of pos-

tively circulating the heating medium when required and positively preventing circulation under a temperature differential when heat is not required. It is an economy in equipment over independent motor actuated valves and pumps.

The double check valve illustrated by Fig. 3 consists of a housing within which is seated a support 33 around which may oscillate an arm 34 carrying valve discs 35 and 36. When the pump is in operation the flow of water through valve 8 in the direction indicated by the arrows causes the valve discs 35 and 36 to assume the position illustrated by Fig. 3, in which disc 36 is seated against the annular shoulder 37. When the pump is not in operation the weight of the oscillatory valve element and the gravity circulation of water from and to the boiler through the heater 9, holds the valve seated against port 38 formed in flange 39 of the valve body.

The valve disc 36 is provided with one or more perforations 40, which serve to permit recirculation of some of the cooler returned water from the radiators when the pump is in operation. The hot boiler water is thus reduced in temperature to some extent before being delivered to the radiators.

In the operation of this heating system, when heat is not required in the radiators, the valve disc 35, Fig. 3 closes port 38 preventing the flow of water on the return side of the radiator system back to the boiler, and disc 36 forming a part of the pump rotor, Fig. 2, remains on its seat, closing the radiator feed conduit. The hot water in the boiler then circulates through conduit 2 and down through conduit 10 and the heater tank 9 back to the boiler. The work performed by the boiler at this time is then to heat the water circulating through coil 14 from and to the hot water storage tank 11.

When the thermostat 23 closes its circuit 24, switch 21 closes the motor circuit 22 and the pump is set in operation, forcing circulation through the radiator system, and thereby heating the radiators. The flow of hot water through the radiator system results in shifting the valve, Fig. 3, so that it is lifted from port 38 and closes the outlet of heater 9, through which at this time there is some reverse current, caused by the suction of the pump drawing water upwardly through the perforations 40 in disc 36.

When the pump motor is in operation, spring 27 is wound up sufficiently to unseat valve 30, but when the room temperature is raised to such point that thermostat 23 opens the circuit 24, and the pump motor stops, spring 27 through a thrust of shaft 26 again seats the valve 30, and prevents further circulation of hot water through the radiator system.

Hot water cannot back up through the return conduit 7 because check valve disc 35 is then held to its seat, closing the passageway from the radiator return conduit 7 to the return connection to the boiler.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that certain details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. In a hot water heating system, the combination with a boiler, radiation means having supply and return conduits connected with said boiler, and a by-pass between said supply and return conduits located adjacent said boiler, said

by-pass including a water heating receptacle, of means in one of said conduits disposed between said radiation means and said by-pass for forcing circulation of water from the said boiler through said radiation means, a thermostat positioned to be affected by said radiation means and arranged to control said circulating means, and a check valve positioned at the junction of said by-pass and said return conduit and arranged to be actuated by the flow of water from said circulating means to check the flow of boiler water through said by-pass, said circulating means having a valve element arranged to close said one of said conduits automatically and prevent gravitational circulation of boiler water to the radiation means when said circulating means is not in operation.

2. In a hot water heating system the combination with a boiler, radiation means having supply and return conduits connected with said boiler, and a by-pass between said supply and return conduits located adjacent said boiler, said by-pass including a water heating receptacle, of means in said supply conduit for forcing circulation of water from said boiler through said radiation means, a thermostat positioned to be affected by said radiation means and arranged to operate said circulating means, and a two-way check valve positioned at the junction of said by-pass and said return conduit and arranged to be actuated by the flow of water from said circulating means to control the flow of boiler water through said by-pass, said check valve being arranged to prevent gravitational flow of water through said return conduit toward said radiation means when said circulating means is not in operation, and said circulating means having a valve element arranged to close said supply conduit automatically and prevent gravitational circulation of boiler water therethrough to the radiation means when said circulating means is not in operation.

3. In a water heating system, the combination with a boiler, a radiator having supply and return conduits connected with said boiler, and a circulating means in one of said conduits for forcing circulation of water from said boiler through said radiator, of a by-pass including a water heater connecting said supply and return conduits between said circulating means and said boiler, a two-way check valve positioned at the junction of said by-pass and the return conduit arranged to normally close said return conduit against flow of water therethrough toward said radiator and to be actuated by the flow of water from said circulating means to open said return conduit and block the passage of water through said by-pass, and a valve normally closing said supply conduit between said by-pass and said radiator arranged to be actuated by said circulating means to open said supply conduit.

4. In a hot water heating system the combination with a boiler, radiation means having supply and return conduits connected with said boiler, and a by-pass between said supply and return conduits located adjacent said boiler, said by-pass including a water heating receptacle, and all comprising a water filled system arranged to permit thermal-gravitational circulation of boiler water to and from said water heating receptacle, of valve means in each of said supply and return conduits located between said by-pass and said radiation means and arranged to normally resist passage of boiler water to said radiation means, a thermostat positioned to be af-

fectured by said radiation means, and means controlled by said thermostat arranged to actuate said valve means to permit circulation of boiler water to and from said radiation means.

5 5. In a hot water heating system the combination with a boiler, radiation means having supply and return conduits connected with said boiler, and a by-pass between said supply and return conduits located adjacent said boiler, said
10 by-pass including a water heating receptacle, of valve means in said supply conduit located between said by-pass and radiation means and arranged to normally resist passage of boiler water to said radiation means, a two-way valve means
15 located at the junction of said by-pass and the return conduit and arranged to normally close said return conduit against flow of water there-through toward said radiation means and to be shiftable to open said return conduit and check
20 the passage of water through said by-pass, a thermostat positioned to be affected by said radiation means, and means controlled by said thermostat arranged to actuate both said valve means to permit circulation of boiler water to and
25 from said radiation means, and check the flow of water through said by-pass.

6. In a hot water heating system of the class described the combination with a boiler, a radiator, a supply conduit leading from said boiler
30 to said radiator, and a return conduit leading from said radiator to said boiler, all arranged in a water filled circuit, of a water heating device associated with said boiler and arranged to receive heat from the boiler water by thermal grav-
35 itational circulation thereof, a valve in said supply line arranged to normally resist circulation of boiler water to said radiator, a valve in said return line arranged to prevent passage of boiler water therethrough to said radiator, a thermostat
40 positioned to be affected by said radiator, and means controlled by said thermostat arranged to actuate said valves to permit circulation of boiler water to and from said radiator.

7. A hot water heating system of the class described comprising a boiler, a radiator, supply and return conduits between said boiler and radiator, a by-pass between said supply and return
45 conduits located adjacent said boiler, a two-way check valve located at the junction of said by-pass and said return line, a shiftable arm in said valve and a pair of valve discs carried on
50 said arm, one of said discs being arranged to normally close said return line on the side of said valve nearest said radiator, the other of said discs being arranged to check the passage of

boiler water through said by-pass upon shifting of said arm, said other disc having an aperture therethrough to permit a predetermined minimum flow of boiler water through said by-pass, a thermostat positioned to be affected by said radiator, and means controlled by said thermostat
5 arranged to shift said arm and valve discs to open said return line and check the flow of water through said by-pass.

8. In a hot water heating system the combination with a boiler, radiation means having supply and return conduits connected with said boiler, a by-pass between said supply and return conduits located adjacent said boiler, said by-pass including a water heating receptacle, of valve means in
10 said supply conduit located between said by-pass and radiation means and arranged to normally resist passage of boiler water to said radiation means, a two-way valve means located at the junction of said by-pass and the return conduit
15 and arranged to normally close said return conduit against flow of water therethrough toward said radiation means and to be shiftable to open said return conduit and check the passage of water through said by-pass, said two-way valve
20 means being arranged to permit a minimum flow of water through said by-pass when shifted to a position checking the flow therethrough, a thermostat positioned to be affected by said radiation means, and means controlled by said thermostat
25 arranged to actuate both said valve means to permit circulation of boiler water to and from said radiation means and check the flow of water through said by-pass.

9. A hot water heating system of the class described comprising a boiler, a radiator, a supply conduit leading from said boiler to said radiator, a return conduit leading from said radiator to
35 said boiler, a by-pass conduit pipe connected between said supply and return conduits, a water heating receptacle in one of said conduits, means in said supply conduit arranged to resist circulation of boiler water therethrough to said radiator and located on the radiator side of the
40 junction of said by-pass and supply conduits, means in said return conduit arranged to resist the passage of boiler water therethrough toward said radiator, said water heating receptacle being located on the boiler side of both said resistance means, a thermostat positioned to be
45 affected by said radiator, and means controlled by said thermostat arranged to effect circulation of boiler water to and from said radiator.

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