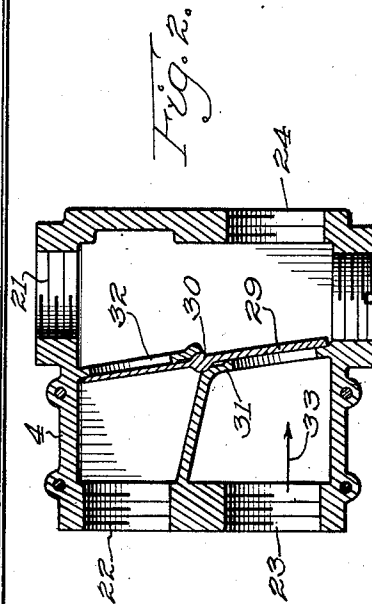
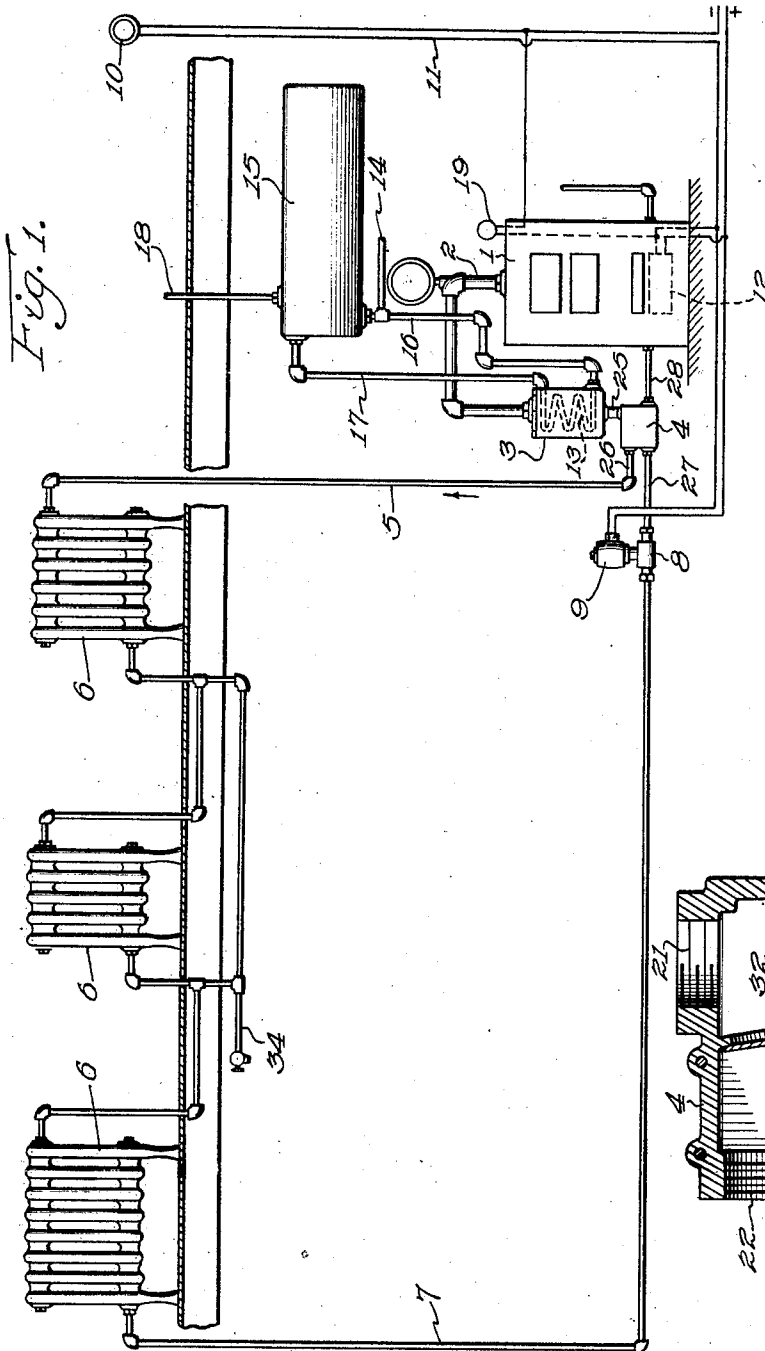


Sept. 18, 1934.

F. C. BRODERICK
HOT WATER HEATING SYSTEM

1,973,842

Filed March 5, 1931



Witness
Arthur M. Franke

Inventor
Frederick C. Broderick
by Rummer, Rummer
Woodworth Attys:

UNITED STATES PATENT OFFICE

1,973,842

HOT WATER HEATING SYSTEM

Frederick Charles Broderick, Winnetka, Ill.

Application March 5, 1931, Serial No. 520,290

10 Claims. (Cl. 237-19)

This invention relates to hot water heating systems, particularly to a means of circulating water through the closed circuit of the system to and from the boiler, in connection with improved means for automatically controlling circulation and utilizing the heat of such water when not required in the heating system for maintaining a separate supply of hot water for domestic use.

Certain features disclosed in the drawing hereof but not claimed herein, are made the subject of a copending application filed July 21, 1934, Serial No. 736,385.

The objects of the invention are to provide a simplified hot water heating system with improved circulation means for automatically shutting off the supply of water to the heating system and by-passing it through a water heater upon the attainment of a predetermined room temperature, and thus utilizing heat not required in the heating system for other purposes; a further purpose of the invention is to provide in such a system an improved velocity pressure operated valve in combination with water circulating means under thermostatic control, whereby the valve is employed to direct the flow of heated water through the heating system or entirely through a separate circuit.

The objects of the invention may be accomplished by means of a construction such as that shown in the accompanying drawing, wherein:

Figure 1 is a diagrammatic view illustrating the general arrangement of the invention.

Fig. 2 is an enlarged sectional view of a velocity operated valve which serves to control the flow of the heating water through a hot water heating device and through a house heating system, or exclusively through the former.

A preferred means for carrying out the invention consists generally in providing a circuit for hot water from a boiler through a water heating device and then through a series of radiators back to the boiler. A pump is provided in this circuit for effecting the flow therethrough, and this pump is under the control of a thermostat subject to the temperature of air heated by the radiators. A unitary valve structure for both the radiator feed and return lines is provided so that both these lines may be either opened or closed depending upon the velocity pressure of the water and the operation of the pump. When the pump is not operating, the valve is seated, shutting both the radiator feed and return lines, and compelling the water to circulate exclusively through a hot water heating section, or heat

storage reservoir, the function of which is to maintain a separate supply of heated water as, for example, for domestic purposes. Thus, when the heat of the boiler water is not required for heating both the radiator heating system, or the heat radiating section, and the water heating section, it is utilized exclusively in the latter so as not to be wasted.

Referring to the drawing the boiler 1 may be of usual construction, either solid fuel or fluid fuel burning, and the heated water from the boiler leaves it through the main supply conduit 2 and passes through a hot water heater or heat storage reservoir 3 and from thence through a valve 4 to a supply conduit 5 of a hot water space heating radiator system, or heat radiation section. The radiators in this system are indicated at 6 and are connected in series to the return conduit 7. This conduit leads to a pump 8 operated by motor 9. A thermostatic device 10 controls the operation of the motor 9. This thermostatic device is subject to room temperature and upon a predetermined drop in temperature closes a circuit 11 which controls the flow of current from the main line to the pump motor 9, and also may control the operation of burner 12 in case the boiler is heated by the combustion of fluid fuel. If solid fuel is employed for heating the boiler, the thermostat circuit would be arranged for controlling the setting of the furnace dampers as well as the operation of pump motor 9. The operation of the oil burner may also be controlled independently of the pump motor 9 by a boiler thermostat 19.

The hot water heating section, or heat storage reservoir 3, comprises a coil 13 housed in an enlargement of the supply conduit 2 and forming part of a separate water circuit to which fresh water is supplied by the feed water pipe 14. The water heated in coil 13 circulates through a storage tank 15 from which conduit 16 leads to the coil, and conduit 17 serves to conduct the heated water from the coil to the storage tank. Water is drawn from the tank as required through the conduit 18.

The valve 4 comprises a valve body having the internally threaded apertures 21, 22, 23 and 24 respectively for receiving the conduit 25 connecting the valve with the water heater 3, conduit 26 connecting it with the radiator heating system supply conduit 5, conduit 27 for connecting the valve with the return side of pump 8 and conduit 28 returning to the boiler. The valve 29 is pivoted at 30 within the valve body and is normally held against its seats 31 and 32 formed within the valve body, by the lower half of the valve being heavier

than the upper half. When the valve is closed, both the supply and return sides of the house heating system are closed, and the water from the boiler is circulated exclusively through the hot water heating section 3.

When heat is required in the house heating system or heat radiating section, the thermostat 10 starts the motor 9, and the operation of pump 8 serves to cause the water to impinge upon the lower half of valve 29 and open this valve, the water circulating in the direction indicated by arrow 33, Fig. 2. The water from the boiler then circulates through the water heater 3 thence through the valve and through the house heating system.

Variations in the connections may be made from the particular illustration shown in the drawing, for example, the water from the boiler may flow in series, as shown, through the heater 3 and the hot water heating system or the heater 3 may be wholly independent of both the valve 4 and the radiator circuit, one essential feature of the improvement being the combination of the pump and the velocity operated valve means 4 whereby both the supply and return lines of the radiators are simultaneously opened or closed. The latter insures that no circulation will take place through the radiator heating system when the pump is not in operation.

Since the valve closes both the radiator feed and return lines, the hot water cannot circulate into the radiators on the principle of the one-pipe steam systems, as it would if only one of the lines were closed, and thus bring about a house temperature that is higher than the temperature for which the thermostat 10 is set. When the pump is not operating, the valve is seated, as flow of water under the action of the pump is required to unseat the valve against the action of gravity.

The customary fittings, such as shut-off valves for the main conduits of the heating system are omitted and means for draining the system are not shown, except that separate radiators may be drained by means indicated by the numeral 34, Fig. 1.

In the operation of the construction as illustrated, when heat is required in the house heating system, the thermostat 10 closes the circuit for the pump motor 9 and the pump then propels water from the heating system through the conduit 27 and against the lower half of valve 29 as indicated by the arrow 33 in Fig. 2. The valve is thus moved away from its seats 31 and 32, and the water from the boiler circulates through the water heater 3, through the upper half of the valve 4, the supply conduit 5, radiators 6, and from the radiators through the conduits 7 to the pump. From the pump 8 the water passes through the conduit 27, the lower half of the valve 4, and conduit 28 to the boiler. When the thermostat 10 opens the pump motor circuit, valve 29 swings by gravity to its closed position, and circulation of the water from the boiler is exclusively through hot water heater 3 to the return side of the boiler through the ports 21 and 24 of the valve 4. The burner 12 may be stopped at the same time, but the excess heat which the boiler water receives is utilized for heating the water circulating through coil 13, to and from the supply tank 15.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that certain details of the construction 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, of a water heater, conduits connecting said water heater with the boiler, and including a two-way valve structure having a valve element for directing the flow of water through said valve structure, a space heating circuit including a radiator and supply and return conduits for the radiator, the said radiator conduits being connected separately with said valve structure, said valve element being arranged to close both said radiator supply and return conduits and allow circulation of hot water from the boiler exclusively through said hot water heater and back to the boiler and to be shiftable to a position opening both the radiator supply and return conduits and directing circulation through said hot water heater and the radiator circuit serially and then back to the boiler, a thermostat positioned to be affected by said radiator, and means controlled by said thermostat to effect shifting of said valve element.

2. In a hot water heating system, the combination with a boiler, of a water heater, conduits connecting said water heater with the boiler, and including a two-way valve structure having a shiftable valve element for directing the flow of water through said valve structure, a space heating circuit including a radiator and supply and return conduits for the radiator, the said radiator conduits being connected separately with said valve structure, said valve element being arranged to normally close both said radiator supply and return conduits and allow circulation of hot water from the boiler exclusively through said water heater and back to the boiler and to be shiftable by a forced flow of water to a position opening both radiator supply and return conduits and allowing circulation through said hot water heater and the radiator circuit serially and then back to the boiler, a thermostat positioned to be affected by said radiator, and a pump in the radiator circuit controlled by said thermostat for forcing circulation of water through said radiator and shifting said valve element.

3. In a hot water heating system, the combination of a boiler, water heater, valve mechanism, and a radiator, all of which elements are connected in series, a return connection leading from the radiator to said valve mechanism and thence to said boiler, said valve mechanism being arranged to normally close circulation therethrough to and from the radiator and provide a by-pass from said heater to said boiler, said valve mechanism being also arranged to be actuated by a forced flow of water therethrough to open and permit circulation to and from said radiator and to simultaneously close said by-pass, and an intermittently operated pump arranged to force circulation through said radiator and to actuate said valve mechanism.

4. In a hot water heating system, the combination of a boiler, a supply conduit leading from the boiler, a return conduit leading to the boiler, a unitary valve structure connected with both of the said boiler supply and return conduits, radiators, radiator supply and return conduits connected between said valve structure and said radiators and communicating through said valve structure with the said boiler supply and return conduits respectively, said valve structure including a shiftable gravitationally seated valve element arranged to normally close communication between the respective boiler and radiator conduits, and means for shifting said valve element

into a position opening communication between the respective boiler and radiator conduits comprising a pump connected with one of said conduits for forcing water therethrough and against said valve element to open the latter.

- 5 5. In a hot water heating system, the combination with a boiler and radiation means, of a unitary valve housing having supply and return connections with said boiler and other supply and
10 return connections with said radiation means, said boiler supply and return connections normally communicating with each other directly through said valve housing, and said valve housing being arranged to provide communication between both
15 said supply connections and both said return connections, a water heater disposed in one of said connections between said valve housing and said boiler, shiftable valve means within said valve housing arranged to normally close both of said
20 radiator supply and return connections, said valve means being shiftable to open said radiator supply and return connections to communication with said boiler supply, and return connections respectively and to simultaneously close direct communication
25 between said boiler supply and return connections, a thermostat positioned to be affected by said radiation means, and means controlled by said thermostat to effect shifting of said valve element.
- 30 6. In a hot water heating system, the combination of a boiler, a supply conduit leading from the boiler, a return conduit leading to the boiler, a unitary valve structure connected with both
35 of the said boiler supply and return conduits, radiators, radiator supply and return conduits connected between said valve structure and said radiators and communicating through said valve structure with the said boiler supply and return
40 conduits respectively, said valve structure including shiftable valve means arranged to normally close communication between the respective boiler and radiator conduits, a thermostat positioned to be affected by said radiators and means controlled by said thermostat to shift said valve
45 means into a position opening communication between the respective boiler and radiator conduits.

- 50 7. In a hot water heating system, the combination with a boiler, a water heating section, a heat radiating section, suitable supply and re-

turn connections for said sections, and a circulating pump, all connected in series, of valve means arranged to automatically stop circulation through said radiating section and permit circulation through said water heating section alone, when said pump is stopped. 80

8. A hot water heating system, comprising a boiler, a heat storage reservoir, a heat radiating section, and a circulating pump operating intermittently, all connected in series, return connections between said storage reservoir and said boiler, return connections between said radiating section and said boiler, and valve means arranged to automatically stop circulation through said radiating section and permit circulation through said storage section exclusively when said pump is stopped. 85

9. In a hot water heating system, the combination of a boiler, water heater, valve mechanism, and a radiator, all of which elements are connected in series, said water heater being disposed between said valve mechanism and said boiler, a return connection leading from the radiator to said valve mechanism and thence to said boiler, a passage between said boiler and water heater by-passing said valve mechanism, said valve mechanism being arranged to normally close circulation therethrough to and from the radiator, said valve mechanism being also arranged to be actuated by a forced flow of water therethrough to open and permit circulation to and from said radiator, and an intermittently operated pump arranged to force circulation through said radiator and to actuate said valve mechanism. 90 95 100 105 110

10. In a hot water heating system, the combination with a boiler, a water heater, a radiator, all of which are connected in series, and a return connection leading from the radiator to the boiler, of valve means arranged to normally close circulation to and from the radiator, said water heater being disposed between the valve means and the boiler, a passage between the water heater and the boiler by-passing the valve means, a thermostat positioned to be affected by the radiator, and means controlled by the thermostat to actuate said valve means to permit circulation to and from the radiator. 115 120 125

FREDERICK CHARLES BRODERICK. 125

55 130

60 135

65 140

70 145

75 150