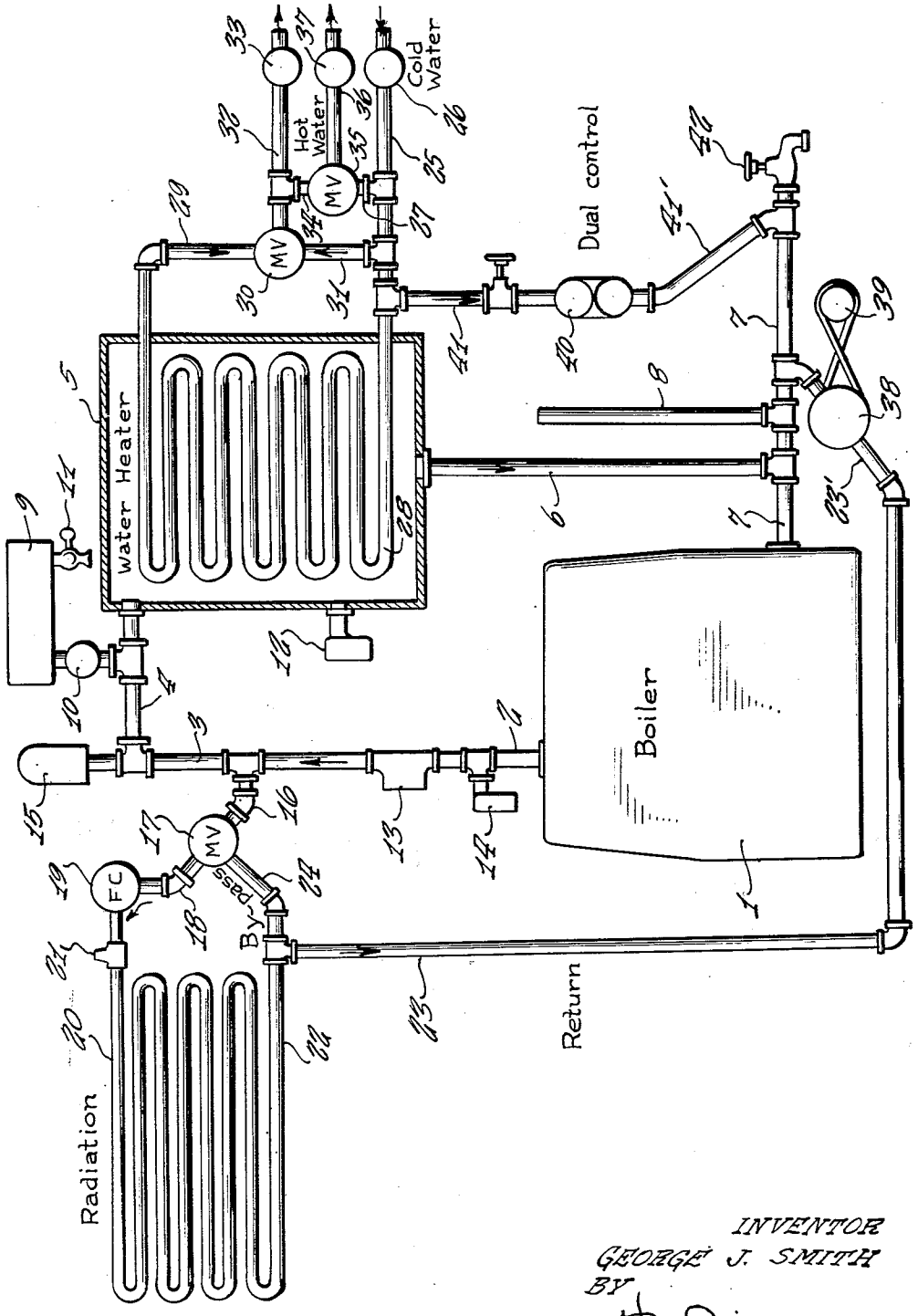
Feb. 12, 1957 G. J. SMITH 2,781,174

DUAL HEAT-HOT WATER TANKLESS SYSTEM

Filed April 27, 1954



INVENTOR
GEORGE J. SMITH
BY
ATTORNEY

United States Patent Office

2,781,174

Patented Feb. 12, 1957

2,781,174

DUAL HEAT-HOT WATER TANKLESS SYSTEM

George J. Smith, Jersey City, N. J.

Application April 27, 1954, Serial No. 425,917

3 Claims. (Cl. 237—8)

The present invention is directed to a dual system adapted to furnish heat for hot water supply and heat for heating the premises.

Systems of this kind have previously been used but in general they consisted essentially of a boiler and radiation whereby heat in the form of hot water is caused to circulate through a piping system to the radiation and return it to the boiler. Purely as an adjunct thereto there was provided a take-off in the nature of a heat exchanger which was intended to heat water stored in a tank for obtaining the requisite temperature for domestic and other uses of such water. Usually the take-off consisted of a chamber of relatively small size through which the water from the boiler was adapted to circulate. The chamber contained a coil through which the water for the hot water supply circulated and such water was stored in a relatively large storage tank.

To a certain extent, such a dual system was satisfactory but there were numerous disadvantages inherent in such a system. For instance, the heating of the hot water supply was slow and the temperature to which it was raised was variable. If a large or continuous demand for hot water occured, the system could not supply the hot water at the proper temperatures. It is highly desirable in modern installations, and particularly in such applications as restaurants and the like, to have a large supply of hot water at a high and uniform temperature in order that the dishes and other articles washed or rinsed with such water shall be self-drying without the necessity of using towels or dish cloths. For this purpose it was generally necessary to install a separate hot water supply system at considerable additional expense both of installation and of operation.

The present invention is intended and adapted to overcome the difficulties and disadvantages inherent in dual systems of the type described, it being among the objects of the invention to provide a hot water heating system combined with radiation heating for the premises, which is small, compact, low in cost of installation and economical in operation and maintenance.

It is also among the objects of the present invention to provide a dual system whereby hot water at uniform and high temperature is supplied continuously without the necessity of a large storage tank for said hot water and to prevent high temperature deterioration, and radiation loss.

It is further among the objects of the present invention to provide a system in which water is heated in a boiler to a very high temperature and which water is tempered both for heating purposes and for the hot water supply, the operation therefor being substantially automatic.

In practicing the invention there is provided a boiler and a water heater with a connection from the boiler to the heater and return. The heater contains coils so that cold water may enter the coils and be heated to a high temperature and then conducted to one or more mixing valves which are thermostatically controlled where the hot water is blended with sufficient cold water to give a

temperature desired at the operative level. Usually there are two such mixing valves so arranged that hot water at two different and uniform temperatures are obtained.

The connection from the boiler to the water heater has a branch leading to the radiator and supplied with a thermostatic mixing valve. The return water from the radiator enters a mixing valve which is set to blend the return water with the hot water to give it the desired temperature for the radiator. Various controls are provided at various points so that the operation of the system is practically automatic.

In the accompanying drawing constituting a part hereof and in which like reference characters indicate like parts, the single figure is an elevational view, partly diagrammatic and partly in cross-section, illustrating one form of the invention.

The boiler 1 which may be heated by gas, oil or other fuel, and being of any suitable type having heating surfaces therein for heating water, has a pipe connection 2 extending from the top thereof. A pipe 3 connected therewith leads into and through pipe 4 and the water heater chamber 5. From the bottom of the heater a pipe 6 connects with pipe 7 returning the water to the lower part of the boiler. In operation, the water flows from the boiler to the heater and return by convection currents induced by the heat. An air chamber (not shown), positioned at the end of pipe 8 is provided to take up the expansion of the water in the system as is well known. In place thereof, there may be provided an expansion tank 9 at a high level connected to pipe 4 and having a cut-off valve 10. Tank 9 is also provided with a draw-off valve 11. Boiler responsive thermostat 12 of the immersion type, for control of the heat in the boiler, is provided in heater 5. In connection 2 is a surface boiler responsive thermostat 13 and also contained in said connection is a thermometer or tridicator 14. An automatic water vent 15 is inserted in the connection between pipes 3 and 4.

From connection 2 there is a branch 16 which leads into thermostatic mixing valve 17. A pipe 18 from said mixing valve connects into flow-control valve 19. Radiation 20 is connected to flow-control 19 and an air bleeder 21 is provided in the system. Return pipe 22 from radiation 20 connects with return pipe 23 which leads into pipe 7. A by-pass 24 from pipe 22 leads to mixing valve 17.

A cold water inlet pipe 25 controlled by valve 26 has a branch 27 leading therefrom, the pipe 25 connecting with coil 28 in heater 5. The upper end of coil 28 is connected by pipe 29 to thermostatic mixing valve 30. A branch 31 from pipe 25 also is connected into mixing valve 30. The exit pipe 32 from mixing valve 30, having a valve 33, leads to taps, machines or the like for use of hot water. A branch 34 from exit pipe 32 enters thermostatic mixing valve 35 together with branch 27. Said branch 34 has a check valve therein to prevent water from mixing valve 35 backing up into pipe 32. Exit pipe 36 from mixing valve 35, having a valve 37, leads to points of use of hot water.

At the junction of pipe 25 and coil 28 there is provided a pipe 41 controlled by a valve and having a dual-control reducing and relief valve 40 in the line. A pipe 41' connects to pipe 7 and a drain cock 42 is provided for draining the system. A re-circulator 38 driven by motor 39 is inserted in return pipe 23'.

In operation of the system it may be assumed that no heating of the radiation is required, in which case, flow-control 19 and circulator 38 are not in operation. The heat in the boiler is on due to boiler responsive thermostat 12 until the temperature in heater 5 is the basic temperature generally maintained in the system when no demand is made on it. We may assume that hot water from exit

pipe **32** is to be supplied at say 180° F. for certain uses and that hot water from exit pipe **36** is to be used at a lower temperature, say 140° F. When, for example, valve **33** is opened, hot water from coil **28** enters mixing valve **30** and is blended with cold water from lead **31** thereby tempering the water to 180° F. for use. If at the same time or independently thereof, hot water at 140° F. is required, valve **37** is opened and water begins to flow first through mixing valve **30** and then into mixing valve **35** where the water is further tempered by cold water from branch **27** to give the proper temperature. When no water is being used and the temperature in heater **5** is the basic temperature, boiler responsive thermostat **12** will cut off the heat from the boiler.

If it is necessary or desirable to heat the radiation, the system is controlled by a thermostat (not shown) whereby flow-control **19** and circulator **38** are caused to function allowing hot water from connection **2** to enter mixing valve **17**. At the same time cool water from return pipe **22** flows through by-pass **24** into mixing valve **17** in the proper proportion to give an exit water temperature of the pre-determined degree. The water thus tempered flows through pipe **18** and into the radiation.

Although I have described the invention setting forth a single, specific embodiment thereof, various changes in the details of construction may be made within the scope of the invention. For instance, the connection from the boiler to the heater need not be at the top of the heater, but may be in the bottom thereof at one side. The return pipe from the heater may be located in the bottom at the opposite side of the heater; or the heater may be so arranged that there is an air space at the top thereof which replaces the expansion-tank **9**. It also allows compression to take place at high temperature of the water and thus avoids a possible rupture of or damage to the system. Mixing valve **17** need not be automatic in its operation, but it may be manually operative in some cases.

These and other changes may be made without departing from the principles herein set forth, and the invention is to be broadly construed in accordance with the claims appended hereto.

What I claim is:

1. A combined hot water supply and heating system comprising a water-containing boiler with means for heating the water therein to a relatively high temperature, a hot water heater at a level above said boiler, a connection from the top of said boiler to the top of said heater, a return pipe from the bottom of said heater to the bottom of said boiler, whereby there is provided a closed circuit flow of water between said boiler and heater, an inlet for cold water into the lower portion of said heater in indirect contact with and adapted to be heated by conduction by the water circulating through said heater, a hot water exit for said heated water at the upper portion of said heater and leading to points of use, house heating radiation, a branch from said connection above said boiler to said radiation, a return from said radiation to said boiler and joining with said first return pipe at the bottom of said boiler, a thermostatic mixing valve in said branch between said connection and said radiation, a by-pass from said radiation entirely above the level of said boiler to said mixing valve to permit mixing of radiation return water with heated water passing through said mixing valve, and a branch from said cold water inlet to said first return pipe, a hot water thermostatic mixing valve in said exit and a lead from said cold water inlet to said hot water mixing valve, an outlet for tempered water from said hot water mixing valve, a second hot water thermostatic mixing valve with connections thereto from said tempered water outlet and said cold water inlet, and an exit from said second hot water mixing valve to provide further tempered hot water.

2. A combined hot water supply and heating system comprising a water-containing boiler with means for heating the water therein to a relatively high temperature, a hot water heater at a level above said boiler, a connection from the top of said boiler to the top of said heater, a return pipe from the bottom of said heater to the bottom of said boiler, whereby there is provided a closed circuit flow of water between said boiler and heater, an inlet for cold water into the lower portion of said heater in indirect contact with and adapted to be heated by conduction by the water circulating through said heater, a hot water exit for said heated water at the upper portion of said heater and leading to points of use, house heating radiation, a branch from said connection above said boiler to said radiation, a return from said radiation to said boiler and joining with said first return pipe at the bottom of said boiler, a thermostatic mixing valve in said branch between said connection and said radiation, a by-pass from said radiation entirely above the level of said boiler to said mixing valve to permit mixing of radiation return water with heated water passing through said mixing valve, and a branch from said cold water inlet to said first return pipe, a hot water thermostatic mixing valve in said exit and a lead from said cold water inlet to said hot water mixing valve, an outlet for tempered water from said hot water mixing valve, a second hot water thermostatic mixing valve with connections thereto from said tempered water outlet and said cold water inlet, and an exit from said second hot water mixing valve to provide further tempered hot water, a circulator in the lower part of said radiator return, said heater return pipe entering said boiler at a point nearer than the entrance of said radiator return whereby the radiator return water is pumped past the said heater return entrance into the boiler, creating no back pressure in the heater return pipe.

3. A combined hot water supply and heating system comprising a water-containing boiler with means for heating the water therein to a relatively high temperature, a hot water heater at a level above said boiler, a connection from the top of said boiler to the top of said heater, a return pipe from the bottom of said heater to the bottom of said boiler, whereby there is provided a closed circuit flow of water between said boiler and heater, an inlet for cold water into the lower portion of said heater in indirect contact with and adapted to be heated by conduction by the water circulating through said heater, a hot water exit for said heated water at the upper portion of said heater and leading to points of use, house heating radiation, a branch from said connection above said boiler to said radiation, a return from said radiation to said boiler and joining with said first return pipe at the bottom of said boiler, a thermostatic mixing valve in said branch between said connection and said radiation, a by-pass from said radiation entirely above the level of said boiler to said mixing valve to permit mixing of radiation return water with heated water passing through said mixing valve, and a branch from said cold water inlet to said first return pipe, a hot water thermostatic mixing valve in said exit and a lead from said cold water inlet to said hot water mixing valve, an outlet for tempered water from said hot water mixing valve, a second hot water thermostatic mixing valve with connections thereto from said tempered water outlet and said cold water inlet, and an exit from said second hot water mixing valve to provide further tempered hot water, a circulator in the lower part of said radiator return, said heater return pipe entering said boiler at a point nearer than the entrance of said radiator return whereby the radiator return water is pumped past the said heater return entrance into the boiler, creating no back pressure in the heater return pipe, an automatic flow control valve in the branch between said mixing valve and said radiation.

(References on following page)

5

References Cited in the file of this patent

UNITED STATES PATENTS

1,843,566	Lake	Feb. 2, 1932
2,110,952	Glenn	Mar. 15, 1938
2,159,284	Miller	May 23, 1939
2,176,539	Moore	Oct. 17, 1939
2,322,872	Moore	June 29, 1943
2,348,610	Colby	May 9, 1944
2,404,597	McLain	July 23, 1946

6

2,515,885	Midyette	July 18, 1950
2,520,446	Thrush	Aug. 29, 1950
2,700,506	Berntson	Jan. 25, 1955
2,721,706	Schoerner	Oct. 25, 1955

OTHER REFERENCES

"Powers" Bulletin No. 258H, June 1939, published by the Powers Regulator Company, Chicago, Illinois, pages 6–8.