

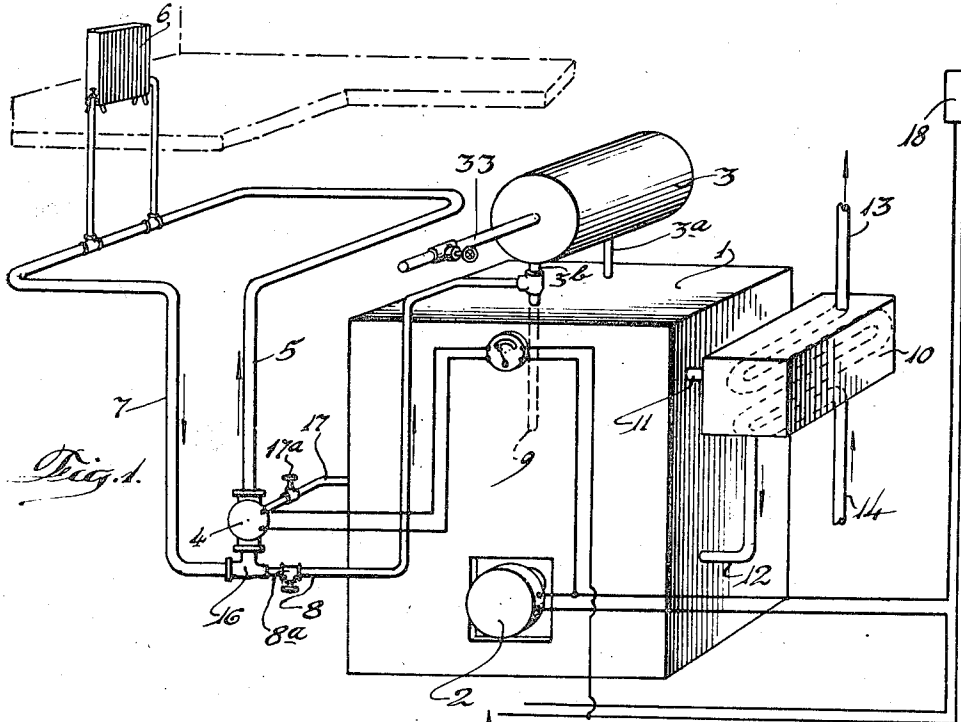
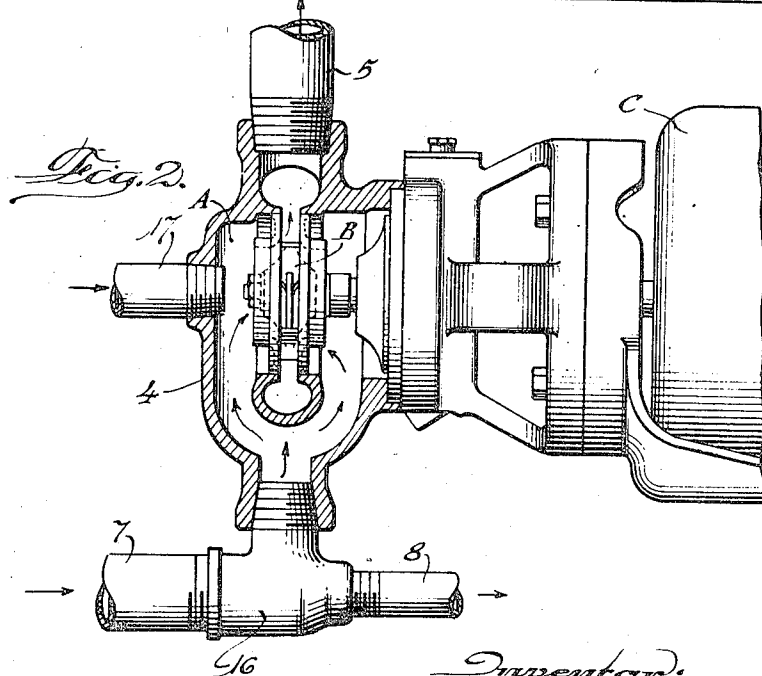
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HEATING SYSTEM

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## UNITED STATES PATENT OFFICE

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## HEATING SYSTEM

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This invention relates to a heating system in which a system for house heating, or the like, is combined with a system for heating domestic supply of hot water from the boiler and in which the heater will simultaneously provide heating for the house heating system and heating for the domestic water system, yet by a series of controls when the house heating system is inoperative the domestic water supply will be heated as required.

A further object of this invention is to provide mechanism for so modulating the temperature of the hot water supplied to the radiators or similar heating apparatus that the increase of temperature to the maximum point will be gradual by commingling the relatively cool return from the radiators, or the like, with the newly heated water from the boiler.

This will provide for such a gradual increase in temperature in the radiators that there will be no "overshooting" in such heating and prompt cessation of heating will occur when the desired temperature is reached. This is important in mild weather, avoids overheating and resulting waste of fuel and avoids undesirable sudden expansion strains and resulting noises.

A further object of my invention is to provide a modulating pump for commingling the hot water from the boiler with the relatively cool water from the return pipes.

A further object is to so relate a domestic hot water heater to the boiler that when water in the boiler becomes dangerously low, the failure to provide heated water in the domestic system will call attention to the low level of water in the boiler.

Another object is to so relate the domestic water heater to the boiler that it will always draw water from a zone of water in the boiler least affected by the return of relatively cooler water either from the radiating system or from the domestic water heater.

Another object is to so mount the expansion tank that air is purged from the water before entering the radiators.

Another object is to construct such a system as to dispense with flow valves.

These and such other objects as may appear are attained by my invention, one embodiment of which is shown in the accompanying drawings, in which

Fig. 1 is a diagrammatic layout of one form of a complete system embodying my invention.

Fig. 2 is a detail view showing the modulating pump partially in cross section.

In the drawings 1 indicates the boiler, which

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may be heated by any suitable device. 2 indicates the motor and associated mechanism for supplying oil, or the like, to the heating burner, not shown, inside of the combustion chamber of the boiler. 3 is a conventional expansion tank provided with any usual form of air vent, 3<sup>a</sup>. 4 indicates the pump for pumping the heating medium to the system, here shown as a radiating system for house heating. Any number and kind of heat radiating devices, such as radiators, may be used. 5 is a conduit for conveying heating medium to the radiators 6. 7 is the return pipe leading to a T 16 from which a part of the return fluid is diverted to the boiler return 8, shown as a gooseneck pipe which conveys the boiler return from a point above the boiler and below the level of the pipe 11 conducting water to the heat exchange 10 for domestic hot water. That part of the return fluid which is not pumped directly to the boiler from the T 16 is commingled with the freshly heated water from the boiler which is conveyed from the boiler through pipe 17 into the water chamber A of the pump 4. From the pump 4 the commingled water from the boiler and from the return is pumped at a modulated temperature through the pipe 5 and thus through the radiating system. No flow valves are necessary.

Suitable commingling of the hot water from the boiler and the relatively cool water from the return pipe 7 can be attained by a suitable proportioning of the capacity of the pipes 8 and 17. The same result can be attained by providing the pipes 8 and 17 with suitable valves, as indicated at 8<sup>a</sup> and 17<sup>a</sup>.

In the form so far explained with the tank mounted on the boiler, air will be vented or passed to the tank 3 through the pipe 3<sup>a</sup> from the boiler before the water of circulation leaves the boiler. Hence practically all air is kept from the radiating system.

With the return piping 8 arranged as shown, a vent pipe 3<sup>b</sup> also connects the highest point in piping 8 with the expansion tank.

As an alternative, the return piping 8 may connect directly with the boiler at a point corresponding with the discharge end of piping 9 as shown, in which event the vent pipe 3<sup>b</sup> will not be necessary.

The operation of the fuel feeding device 2 or other heating device and of the pump 4 is controlled through a thermostat 18 mounted at any suitable point, such control operating in any well known conventional manner.

Other forms of pump may be used and the

modulation may be attained by the use of any known form of mixing valve arranged in advance of the pump inlet.

In operation when the thermostat 18 calls for heat the burner is actuated and the pump 4 is set in operation. Thereupon the water in the system is circulated by action of the pump. A part of this water passes through the return pipe 8 to the boiler and a portion to the pump 4. Heated water from the boiler is drawn into the pump through the pipe 17 and is commingled in the pump with the water from the return. Thereupon water from the return and from the boiler at the resulting modulated temperature is forced into the heating system through the pipe 5. By this operation the temperature of the water supplied to the heating system is gradually raised until the desired temperature is attained and the demand of the thermostat 18 is satisfied.

The return water through the pipe 8 to the boiler will be discharged into the boiler through pipe 9 at a point substantially below the water level in the boiler and below the pipe 11 supplying the heat exchanger 10. By this means cooling of the hottest water in the upper part of the boiler is retarded and a supply of suitably hot water is maintained in the upper section of the boiler for heating the domestic water supply by means of a usual form of heat exchanger 10.

If desired, by means of any suitable water level control, not shown, an expansion space may be provided between the water level in the boiler and the top of the boiler, in which event the expansion tank may be dispensed with and a suitable air escape valve may be mounted in the top of the boiler.

Referring to Fig. 2, the centrifugal pump there shown comprises a water chamber A which receives water from the boiler through the pipe 17 and water from the heating system return through the pipe 7 and T 16. The commingled water from these two sources is projected by the impeller B through the pipe 5 to the heating system.

C is a conventional form of motor for actuating the conventional form of centrifugal pump illustrated.

For supplying domestic hot water when the pump 4 and the house heating system are not in operation, I provide any suitable form of Aquastat, such for example as is shown in my Patent No. 2,073,676, the thermo-sensitive member of which is exposed to the temperature of the water at any selected point in the boiler. The Aquastat, as in common practice, is preferably capable of being set to maintain any selected water temperature.

When the pump is not in operation and when the Aquastat demands heat, it will set in operation the burner mechanism 2 or any suitable heat control apparatus, such as dampers, in a familiar manner. The heated water will pass from the upper portion of the boiler through the pipe 11 into any usual heat exchange chamber 10 and thence back to the boiler through the return pipe 12, thereby heating water in any usual form of coil commonly in use in such devices. From such coil the heated water is drawn as desired through the pipe 13 and is replaced by cold water coming in from any suitable source of supply through pipe 14. Under these conditions the circulation through the heat exchange chamber 10 will be a gravity circulation. Water will be drawn into the heat exchange chamber

from a hot body of water in the upper portion of the boiler. When the heat demand of the Aquastat is satisfied the fire control device 2 will be suitably actuated so as to avoid increasingly heating the water in the boiler.

If now the heating system is set in operation in response to the thermostat 18, only a portion of the cold water from the return of the heating system will be discharged into the boiler and that proportion will be discharged through the pipe 9 into the water in the boiler at a point below the level from which the pipe 11 draws water for the heat exchanger. By this arrangement the cooling of water in the boiler by the cold water from the returns will be retarded with a minimum of interference with the operation of the heat exchanger for domestic hot water and with a reduced cooling of the water in the boiler. Consequently the water in the boiler will be more rapidly heated than if the entire body of cold water from the returns were discharged into the boiler and the hot water supplied to the heating system will be gradually raised in temperature. These results are attainable by the use of the novel arrangement of pump, pipes and valves as shown.

If for any reason the water level in the boiler drops below the intake of pipe 11, leading to the heat exchanger, there will be no hot water in the domestic hot water system. This failure of hot water will call attention to the fact that the water level in the boiler is dangerously low and so will serve as an alarm.

Where I have referred to radiators or a radiating system it will be understood that I include any type of heat exchange means involving a conduit for a heating medium which serves to heat a space within which such conduit is located.

Obviously my invention is not limited to hot water heating. For example, it may be used where heated air, steam or vapor is the heating medium which is circulated for space heating.

The apparatus disclosed lends itself to zone heating where a separate heating circuit pump and commingler connects with a single boiler of sufficient capacity. Any circuit may be easily and quickly disconnected from the boiler without disturbing the operation of the other circuits. Obviously shut off valves may be provided, if desired, between the pump and radiators in the supply and return conduits.

Also, with the system shown, practically all air will be vented from the heating fluid in the system before reaching the radiators.

I claim:

1. In a hot water system comprising a boiler, a pump, radiating elements, a supply pipe from said pump to said radiating elements, a return pipe from said radiating elements and means for continuously directing a portion of the flow of return water to the pump and a portion to the boiler, said means comprising a three port connection, one port leading from the return pipe, another to the pump, and the other to the boiler, said port leading to the boiler being of less capacity than the return pipe and a conduit from the boiler to the pump for directing freshly heated water to the pump, said conduit being of less capacity than that of the supply pipe from the pump to the radiating elements.

2. In a hot water system comprising a boiler, a pump, radiating elements, a supply pipe from said pump to said radiating elements, a return pipe from said radiating elements, means for continuously directing a portion of the flow of

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return water to the pump and a portion to the boiler, said means comprising a three port connection, one port leading from the return pipe, another to the pump, a return conduit leading from the other port to the boiler, a supply conduit from the boiler to the pump, manual valves in said conduits for proportioning the flow of return and supply water to the pump, an expansion tank on said boiler and connected therewith, said return conduit leading to a point above the boiler and into said boiler therefrom and a pipe connecting said return conduit to said tank at a point above the boiler.

3. In a hot water system comprising a boiler, a pump, radiating elements, a supply pipe from said pump to said radiating elements, a return pipe from said radiating elements, means for continuously directing a portion of the flow of return water to the pump and a portion to the boiler, said means comprising a three port connection, one port leading from the return pipe, another to the pump, a return conduit leading from the other port to the boiler, an expansion tank on said boiler and connected therewith, said return conduit leading to a point above the boiler and into said boiler therefrom and restricted in capacity between the three port connection and the boiler and a pipe connecting said return conduit to said tank at a point above the boiler.

4. In a hot water system comprising a boiler and radiating elements, means for circulating a mixture of return water and boiler water to said radiating elements, comprising a pump having two inlet ports and one outlet port, a supply pipe connecting the boiler to one of the inlets, a conduit connecting the outlet port with the radiating elements, a return conduit leading from the radiating elements to the boiler and a fitting in said return conduit connecting the other pump inlet port with the return conduit, the portion of the return conduit leading from said fitting to the boiler being restricted to be of less capacity

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than the portion leading to said fitting whereby some of the return water will enter the pump at all times during pump operation, be mixed with boiler water and be circulated to the radiating elements.

5. In a hot water system comprising a boiler and radiating elements, means for circulating a mixture of return water and boiler water to said radiating elements, comprising a pump having two inlet ports and one outlet port, a supply pipe connecting the boiler to one of the inlets, a conduit connecting the outlet port with the radiating elements, a return conduit leading from the radiating elements to the boiler and a fitting in said return conduit connecting the other pump inlet port with the return conduit, the portion of the return conduit leading from said fitting to the boiler being restricted to be of less capacity than the portion leading to said fitting, said supply pipe being restricted to be of less capacity than the conduit leading to the radiating elements whereby the flow of boiler and return water to the pump is proportioned, mixed by said pump and circulated to the radiating elements whenever the pump is in operation.

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