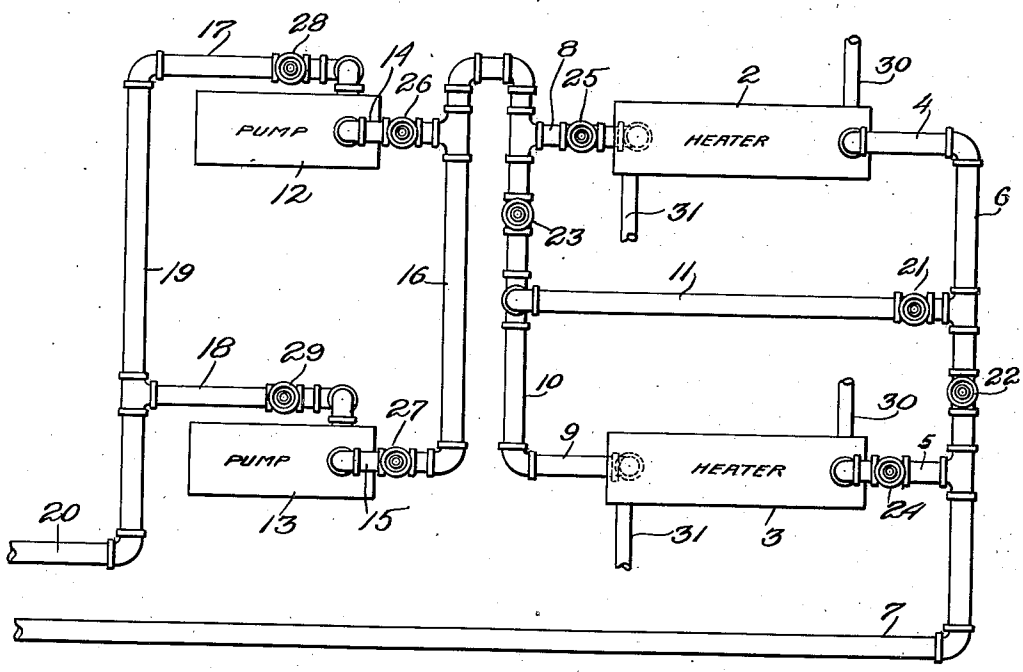
J. C. HARTWELL.

HOT WATER HEATING SYSTEM.

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1,378,348. **Patented May 17, 1921.**



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UNITED STATES PATENT OFFICE.

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HOT-WATER HEATING SYSTEM.

1,378,348. Specification of Letters Patent. Patented May 17, 1921.

Application filed September 7, 1915. Serial No. 49,137.

To all whom it may concern:

Be it known that I, JOSEPH C. HARTWELL, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented new and useful Improvements in Hot-Water Heating Systems, of which the following is a specification.

This invention relates to the water heating and circulating parts of hot water heating systems having a forced circulation, and is intended to provide a system of this character which will possess great flexibility and adaptability to different conditions of use, and will also have a high degree of efficiency in proportion to the size and number of the heating units employed. Briefly described, the invention is characterized by the employment of a number of individual hot water heaters so combined with the other parts of the system that they may be arranged for the circulation of water through them either in series or in parallel, as well as individually or collectively, and preferably, for producing the circulation, the system includes independent circulating pumps equal in number to the heaters and arranged in parallel in such manner that one or more of the pumps may be used, as conditions may require. For the purpose of explaining the invention it will suffice to describe a system having two heaters and two pumps, as the arrangement and mode of operation of any greater number will be readily understood.

A system embodying my invention and containing the parts above referred to as preferably arranged and combined is illustrated in the accompanying drawing, in which the figure shows the heaters and pumps diagrammatically, together with the pipes and valves immediately associated therewith.

According to the arrangement illustrated the two heaters 2 and 3 have their outlets connected respectively by branch pipes 4 and 5 to a cross pipe 6 leading to the main supply pipe 7, through which the heated water is conveyed to the usual radiating pipes or fixtures (not shown). The inlets to the heaters 2 and 3 are connected respectively by branch pipes 8 and 9 to another cross pipe 10, into one end of which the water is forced. A pipe 11 connects the cross pipes 6 and 10, its connection with the pipe 6 being located between the branch pipes 4 and 5 and its connection with the pipe 10 being located between the branch pipes 8 and 9. The outlets from the circulating pumps 12 and 13 are connected respectively by branch pipes 14 and 15 to a cross pipe 16 leading to the cross pipe 10 which supplies the heaters, and the inlets to said circulating pumps 12 and 13 are connected respectively by branch pipes 17 and 18 to a cross pipe 19 leading to the main return pipe 20 of the circulating system.

The piping above described is provided with three gate valves 21, 22 and 23, of which the valve 21 is located in the pipe 11, the valve 22 is located in the cross pipe 6 between the branch pipe 5 and the pipe 11, and the valve 23 is located in the cross pipe 10 between the branch pipe 8 and the pipe 11. In addition, the branch pipes 5 and 8 are preferably provided with gate valves 24 and 25 respectively, although these are not essential to the operativeness of the system. Preferably, also, the branch pipes 14, 15, 17 and 18 leading from and to the circulating pumps are provided respectively with gate valves 26, 27, 28 and 29, although the passage through either pump may obviously be closed by a single valve.

The heaters 2 and 3 and the pumps 12 and 13 may be of any usual or suitable construction, but as it is advantageous in some cases to employ steam for supplying heat to the heaters as hereinafter described I have shown each of said heaters as provided with an inlet pipe 30 and an outlet pipe 31 for conveying steam to and from it.

As thus constructed the system is adapted to be used as follows: Assuming that the valves which control the circulation through one or both of the pumps are open and that the valves 24 and 25 are also open, the heaters 2 and 3 may be arranged in parallel by opening the valves 22 and 23 and closing the valve 21. The water will then flow through both heaters from the cross pipe 10 to the cross pipe 6 and thence to the main supply pipe 7, passing partly through one heater and partly through the other. By opening the valve 21 and closing the valves 22 and 23 the two heaters may be connected in series, in which case the water will flow first through the heater 2, thence by way of the

pipe 11 to and through the heater 3, and from the latter to the cross pipe 6 and supply pipe 7. If the valves 21 and 23 are closed and the valve 22 is open the heater 2 alone will be in operation, and by then closing the valve 24 the heater 3 may be isolated from the system for the purpose of cleaning or repairing it. Likewise, if the valve 23 is open and the valves 21 and 22 are closed the heater 3 alone will be in operation, whereupon by closing the valve 25 the heater 2 may be isolated for cleaning or repairs. Thus the valves 24 and 25 serve primarily for isolating the respective heaters, but it will be seen that the closing of the valve 24 will serve the same purpose as the closing of the valve 23 in case the heater 2 is to be used alone, and that the closing of the valve 25 will serve the same purpose as the closing of the valve 22 in case the heater 3 is to be used alone, provided that in either case the valve 21 is also closed and that neither heater is required to be completely isolated. Also, if the valves 23 and 24 are closed the valve 21 may be left open when the heater 2 is to be used alone, and said valve 21 may also be left open in case the heater 3 is to be used alone, provided the valves 22 and 25 are closed. This possibility of control by different valves is useful in case any of the valves themselves get out of repair.

The manner in which the flow through the circulating pumps is controlled by their respective valves will be obvious. When all these valves are open both pumps may be used for circulation, and either pump may be completely isolated by closing both of the associated valves.

When the heaters are utilized in parallel relation the arrangement is adapted to meet the maximum heating demand on the system, and has the advantage that it reduces the frictional resistance to the circulation of the water, as compared with a system having a single heater, and therefore reduces the amount of power required to produce the necessary circulation. If the two heaters are unequal in tube capacity the flow through each heater can be regulated as desired by appropriately adjusting the valve or valves controlling the pipe connections to that heater. When the heaters are utilized in series relation all the circulating water has to pass through each heater, and hence with this arrangement the water can be heated to a comparatively low temperature in the first heater and then brought up by the second heater to the higher temperature required, according to the demand on the system. In such case economy of operation can be effected by utilizing waste steam, such as the exhaust steam from the circulating pump or pumps for example, for supplying heat to the first heater, the heat at higher temperature being supplied to the second heater by live steam or otherwise. The series arrangement is thus particularly adapted for high-temperature heating. When the heat demand on the system is light it can be met by using a single heater only, and this heater can be supplied with heat by waste steam or live steam, according to the temperature required. Either or both of the heaters may be otherwise supplied with heat, if preferred, the parts indicated at 2 and 3 in the drawing being intended to represent any form of heater suitable for use in a hot water circulating system.

It will be seen that the arrangement of heaters above described gives the system great flexibility and capacity of adaptation to meet the heating demand under different conditions of use, and this flexibility is promoted by the employment of as many circulating pumps as there are heaters, since it will suffice to run a single pump when the demand is light. So far as the arrangement of the heaters is concerned, however, the circulation may be produced by any adequate means, and the arrangement of the piping and valves associated with the heaters may be modified in various ways without departing from my invention, so long as the heaters are capable of arrangement either in parallel or in series and are combined with means for producing an adequate circulation of water through the system of which they form a part.

I claim:—

1. In a hot water heating system arranged for the continuous circulation of water therein, the combination of a plurality of water heaters independently connected to the circulating system on the supply and return sides of the same, means for supplying heat to the several heaters independently of one another, means included in the system for effecting a forced circulation of water through it, and means for causing the circulating water to pass through the heaters either in series or in parallel relation.

2. In a hot water heating system arranged for the continuous circulation of water therein, the combination of a plurality of water heaters independently connected to the circulating system on the supply and return sides of the same, means for supplying heat to the several heaters independently of one another, a plurality of circulating pumps included in said system in parallel relation, and means for causing the circulating water to pass through the heaters either in series or in parallel relation.

3. In a hot water heating system arranged for the continuous circulation of water therein, the combination of a plurality of water heaters independently connected to the circulating system on the supply and return sides of the same, valves controlling the direct flow from one heater to the supply side

of the system and from the return side of the system to another heater, respectively, pipe connections between the outlet side of the former heater and the inlet side of the latter heater, a valve controlling said pipe connections, and means included in the system for effecting a forced circulation of water through the same.

4. In a hot water heating system arranged for the continuous circulation of water therein, the combination of a plurality of water heaters independently connected to the circulating system on the supply and return sides of the same, valves controlling the direct flow from one heater to the supply side of the system and from the return side of the system to another heater, respectively, pipe connections between the outlet side of the former heater and the inlet side of the latter heater, a valve controlling said pipe connections, and a plurality of circulating pumps included in the system in parallel relation.

5. In a hot water heating system arranged for the continuous circulation of water therein, the combination of a plurality of water heaters, independent branch pipes connecting the outlets from said heaters with the circulating system on the supply side, independent branch pipes connecting the inlets to said heaters with the circulating system on the return side, a pipe providing a connection between the outlet from one heater and the inlet to another heater, a valve controlling the latter pipe, valves controlling the connections between said pipe and the supply and return sides of the system, respectively, additional valves for isolating the respective heaters, and means included in the system for effecting a forced circulation of water through the same.

6. In a hot water heating system arranged for the continuous circulation of water therein, the combination of a plurality of water heaters, independent branch pipes connecting the outlets from said heaters with the circulating system on the supply side, independent branch pipes conecting the inlets to said heaters with the circulating system on the return side, a pipe providing a connection between the outlet from one heater and the inlet to another heater, a valve controlling the latter pipe, valves controlling the connections between said pipe and the supply and return sides of the system, respectively, additional valves for isolating the respective heaters, a plurality of circulating pumps included in the system in parallel relation, and valves for isolating either pump.

7. In a hot water heating system arranged for the continuous circulation of water therein, the combination of a plurality of water heaters independently connected to the circulating system on the supply and return sides of the same, means included in the system for effecting a forced circulation of water through it, means for causing the circulating water to pass through the heaters either in series or in parallel relation, and means for cutting off the flow of water through either heater without affecting the flow through any other heater.

8. In a hot water heating system arranged for the continuous circulation of water therein, the combination of a plurality of water heaters independently connected to the circulating system on the supply and return sides of the same, means included in the system for effecting a forced circulation of water through it, means for causing the circulating water to pass through the heaters either in series or in parallel relation, and valves included in the connections between the heaters and the supply and return sides of the system whereby any heater may be isolated from the system without interfering with the operation of any other heater.

In testimony whereof I have hereunto subscribed my name this 2nd day of September, 1915.

JOSEPH CHARLES HARTWELL.

Witnesses:
ALBERT JOHN LOEPSINGER,
JOSEPH HAROLD OATES.