No. 713,504. Patented Nov. 11, 1902.

G. C. SAVAGE.

WATER HEATING AND DISTRIBUTING SYSTEM.

(Application filed Apr. 23, 1902.)

(No Model.)

Fig. 1.

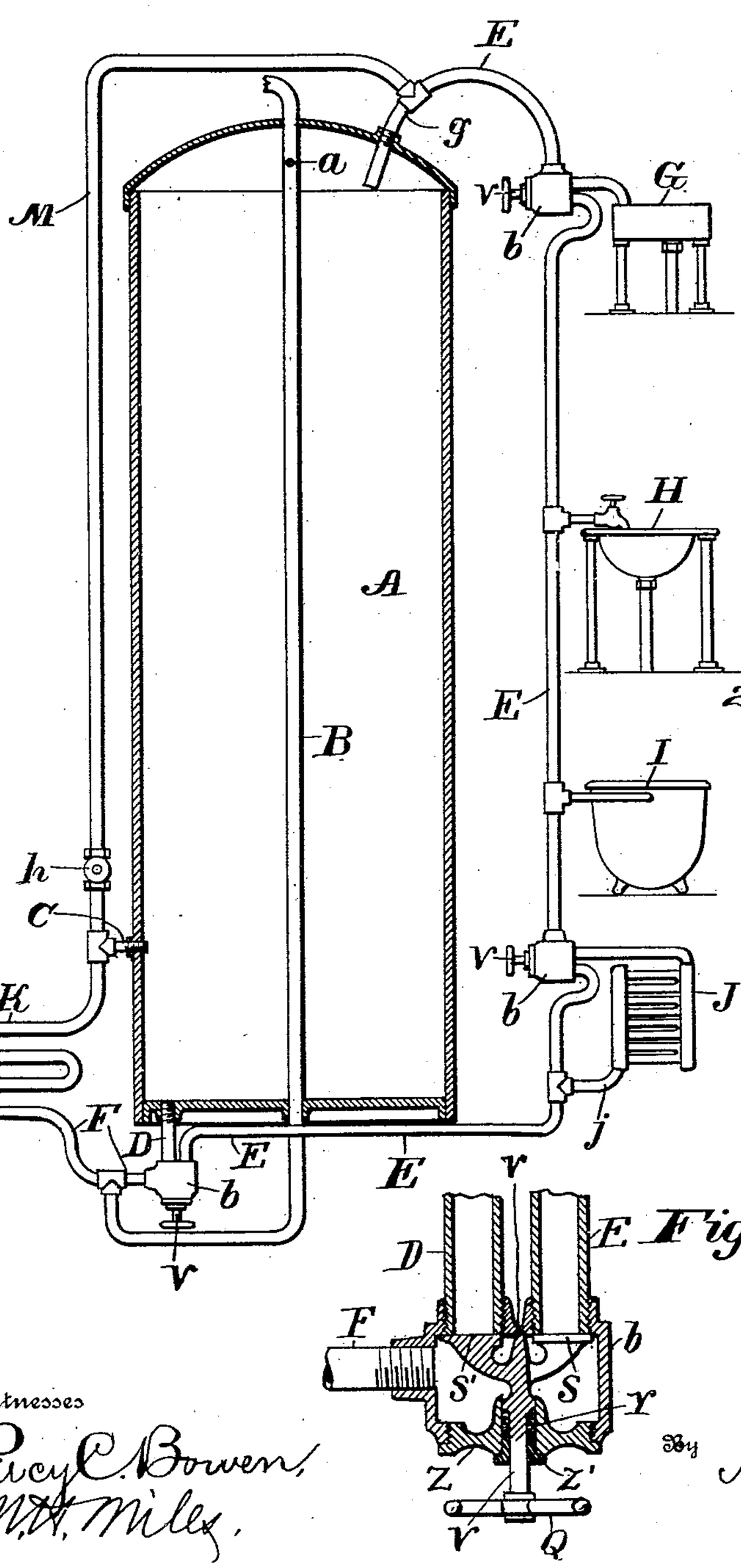

Fig. 3.

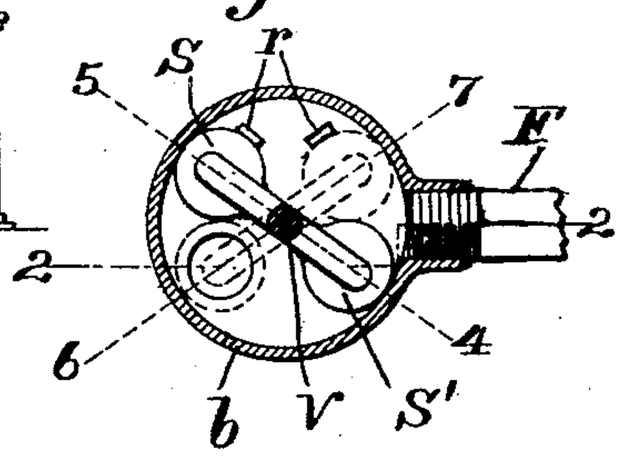

Fig. 4.

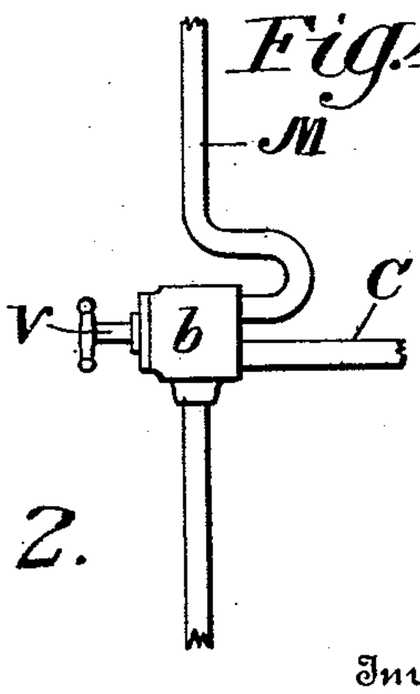

Fig. 2.

Witnesses

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UNITED STATES PATENT OFFICE.

GILES CHRISTOPHER SAVAGE, OF NASHVILLE, TENNESSEE.

WATER HEATING AND DISTRIBUTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 713,504, dated November 11, 1902.

Application filed April 23, 1902. Serial No. 104,335. (No model.)

To all whom it may concern:

Be it known that I, GILES CHRISTOPHER SAVAGE, a citizen of the United States, and a resident of Nashville, Davidson county, State of Tennessee, have invented certain new and useful Improvements in Water Heating and Distributing Systems, of which the following is a specification.

My invention relates to water heating and distributing systems, and more especially to such systems as are used in houses for supplying hot water and for heating purposes.

My objects are to provide a system of this character in which the cold-water supply may be conducted to the hot-water back in the furnace or range or like heating structure before entering the tank or reservoir and in which two circuits may be provided, whereby the water may be readily heated in the reservoir in the quickest and most efficient manner, through which it is circulated by means of the short circuit and then distributed through the long circuit to the various points desired—such as to washstands, sinks, bath-tubs, and radiators; to provide means for preventing the thumping and bubbling of the water in the tank or reservoir due to excessive superheating of the water; to provide means for preventing the drawing off or siphoning of the water from the cylinder or reservoir when the cold-water supply is shut off, and to provide an improved controlling means for readily controlling the course of the water through either of the two circuits in such a way that no interference with the circulation in either circuit will occur when such controlling means are operated to change the course of the water through the system.

With these objects in view my invention consists in the novel construction and details thereof, as hereinafter more fully described and more particularly pointed out in the claims, with reference to the accompanying drawings, in which—

Figure 1 is a sectional elevation of an apparatus embodying my improvements. Fig. 2 is a vertical sectional view of my improved controlling-valve on the line 2 2, Fig. 3. Fig. 3 is a sectional plan view of the same, and Fig. 4 is a detail of a modification.

In the drawings, in which the same reference characters relate to the same or corresponding parts in all the views, the letter A indicates a stand-boiler or reservoir, which is connected to a cold-water supply through a pipe B, preferably passing downwardly through said reservoir and communicating through a pipe F to the hot-water back K, the latter being of any suitable form and located in the usual way in the range or furnace. The pipe F may be designated the "common return-pipe," as it connects with the return of both circuits, as will be seen from the description to follow.

It will be observed that instead of discharging directly into the boiler or reservoir A, as is common in this type of water-heaters, the cold-water-supply pipe B communicates first with the hot-water back through the pipe F, and the latter is connected through a branch pipe C, forming the hot-water inlet, to the side of the boiler a short distance above the bottom. A pipe D leads from the bottom of the reservoir into a valve casing or chamber, to which the pipe F is connected. There is thus provided what I term the "short circuit" of my heating system, whereby the cold water passes through the pipe B to the pipe F, the hot-water back K, and the pipe C, through the reservoir A, down through the pipe D, forming the return of the short circuit, the valve-casing *b*, and thence through the pipe F. This water, it will be observed, is heated on its way through the hot-water back and passing into the reservoir rises to the top, the cold water in said reservoir descending and passing through the short circuit in the same manner.

The pipe leading to what I term the "long circuit"—that is, the distributing-circuit of the system, which supplies the hot water to the various points desired for the purposes specified—connects with the top of the reservoir and is led in the usual way through the house, as indicated by E. Branch pipes connect the said main pipe with, for example, the sink G, the washstand H, the bath-tub I, and the radiator J, and the return of said distributing-pipe then leads back to the valve-casing *b*, common to the pipes F and D. In the valve-casing, which has two ports communicating with the returns of the pipes D and E, I place a valve so arranged that it will in one extreme position entirely close

the pipe E, thereby cutting off the long circuit, and in the other extreme position entirely close the pipe D, thereby shutting off the short circuit, so that a full opening for the circulation of water is provided either through the long or short circuit. When the valve occupies intermediate positions, one pipe will be partially open and the other closed to the same extent, so that the circulation may be distributed through both pipes or circuits, and at all times, therefore, there is a full opening for the circulation of the water—that is to say, an opening equal to the cross-sectional area of the pipe. I effect this result by what I term a "double-circuit valve," (shown in Figs. 2 and 3,) in which the letter V represents the valve-stem, from which project two arms terminating in disks S and S′ of sufficient diameter to cover the opening in either the pipes E or D. The openings or ports leading to the two pipes E and D are on the same side of the diametrical line of the valve-casing within which the valve is rotated, so that when the valve is moved one disk will uncover the opening to one pipe as the other disk closes the opening to the other pipe and to the same extent. For example, in Fig. 3, in the position indicated by the lines 5 4, the valve-disk S′ completely covers the opening to the pipe D, while the valve S fully uncovers the opening to the pipe E, and in the position indicated by lines 6 7 the reverse condition exists, while it is manifest that in intermediate positions the two pipes will be partially opened and closed. Suitable stops *r* are provided for limiting the movements of the valve. The valve-stem V projects through a stuffing-box in the cap Z to close the valve-casing, said stuffing-box having any suitable packing Y and covered by a cap Z′, and a stud *v* engages a recess in the valve-seat to assist in maintaining the valve in proper position, the stem turning in the bearings afforded by the cap and the said recess. Attached to the stem is a handle Q, preferably located in the same plane with the line passing diametrically through the two valve-disks, whereby the positions of the said disk may be readily indicated by the position of the said handle.

In order to prevent the drawing off of the water from the reservoir A by a siphoning action when the cold-water supply is shut off at the street or in the basement or the supply diminished from any cause, such as the bursting of the service-pipe or an unusual demand from other sources, I preferably provide the pipe B with a small orifice *a*, which furnishes communication between the pipe and the reservoir or boiler near the upper portion thereof, whereby air in the tank above the water-level will enter the pipe B and break the siphoning action. The orifice *a* and the inlet to the distributing-supply pipe E being below the top of the boiler, as shown in the drawings, an air-chamber is formed between the level of the water in the boiler and the top thereof, from which the air is supplied to the supply-pipe B through the orifice *a*, when the siphoning action referred to above takes place. Such air may be derived from the system, which while water-tight is not air-tight.

In order to prevent the thumping and bubbling of the water in the tank when it becomes superheated, I provide a relief-circuit for the water, consisting of a pipe M in communication with a branch-pipe C and the hot-water back and connecting with the boiler or reservoir through the long circuit-pipe above the tank at *g*. This pipe M may be provided with a two-way valve *h*, which is closed whenever there is no fire, or the said valve *h* may be omitted and my improved double-circuit valve inserted at the junction of the pipe C with the pipe M, as indicated in Fig. 4. This valve when operated to open communication to the reservoir through the branch pipe C will of course close communication through the pipe M, and vice versa, and, as above indicated, when there is no fire it should be so placed as to open communication through the pipe C to the tank and close the pipe M.

The pipe M is, in fact, a continuation of the pipe leading from the hot-water back and the pipe C a branch connecting the pipe M with the reservoir. When the water becomes excessively hot, it is obvious that it will be carried up through M and down into the reservoir if the long circuit is closed, or if the latter is opened it will pass through the pipe E and valve-casing *b*, return-circuit F, and the water-back. This pipe M, therefore, not only prevents thumping or bubbling, but also facilitates the flow through the pipe E. The heater is therefore not only in circuit with the boiler, but is in independent circuit with the distributing system as well.

It is obvious that I may also use my double-circuit valve to control the circuit to the various points where the water is needed—such as the sink, bath-tub, washstand, &c.—and in Fig. 1 I have indicated this valve applied to the main pipe at its point of connection with a faucetless sink and with the radiator and at such point it operates in the same manner as above described, the return from the radiator being through *j* to the pipe E. It should be observed that it is of particular utility in connection with a radiator, for it is obvious that by its use there the whole of the hot water in the long circuit may be passed through the radiator, or the radiator may be cut off, or said circuit may be divided, a part passing through the radiator and a part passing onto the circuit back to the hot-water back, as desired. I should add that, with my system or circulation when a radiator is in circuit, as shown, there is no need of the usual expansion-tank at the top of the system. It will be observed that when the relief-circuit M is open and the pipe C closed and the long circuit closed the circulation of water will take place through the pipe M, downwardly through the union *g* with the pipe E into the reservoir, and in such case the relief-

circuit acts to heat the water the same as a short circuit. This pipe M, as above indicated, should be closed when there is no fire, because when any hot water is drawn from any distributing-point from the long circuit, if the said pipe M were open, the result would be a flow of cold water through M into E and out at the open vent at the point of distribution—such as the bath-tub, sink, or wash-stand—whereas if this pipe M were closed the opening of a valve at any of the points indicated will permit the drawing of water from the reservoir, such water, it is assumed, being still in a heated condition.

By using my improved valve mechanism as a controlling means for directing the current to the point desired, either through the long or short circuit, I provide a means of safety in the circuit of the system, because there is at all times an opening for the free circulation of the water equal to the area of one of the pipes, and by connecting the radiator with the main pipe in the long circuit by such controlling-valve I provide not only for an efficient control of the quantity of water passing through the radiator, and thereby control the amount of heat radiated therefrom, but I also provide for as rapid circulation through the radiator as through any part of the long or short circuit when the valve is fully opened to divert the current in the long circuit through such radiator, and by so connecting the cold-water pipe with the hot-water back as to direct the cold water into said heating device before it enters the reservoir and by the use of my safety double-circuit valve in connection with the two circuits I not only facilitate the superheating of the water in the reservoir, but also increase the rapidity of circulation of the hot water through the system.

Connecting the pipe M with the long circuit and leading it directly from the hot-water back insures a very rapid circulation of hot water through the long circuit when desired. By closing the short circuit and opening the long circuit the hot water in such cases passes directly through the pipe M into the pipe E, through the valve-casing to the pipe F, into the hot-water back, and thence into the pipe M, any hot water drawn from any point being immediately replaced by the flow of cold water into the pipe F. The connection of the cold-water pipe to the common return-pipe F provides static pressure, which greatly facilitates the circulation of hot water through either circuit.

It will be understood from the foregoing that when it is desired to heat the water in the boiler or reservoir A the long circuit is closed by the valve V in the casing *b* and the short circuit open through the pipe D, the system being filled with water. The circulation due to the heating of the water in the hot-water back is then confined to the short circuit, thereby rapidly heating the water in the reservoir. When this water is sufficiently heated, the short circuit is closed and the long circuit opened by operating the valve V, whereupon the hot water passes upwardly through the pipe E, through the long circuit, through the return end to the valve-casing, thence through the pipe F and hot-water back. Any withdrawal of water from any distributing-point will immediately be followed by the introduction of water from the cold-water-supply pipe. Whenever there is any evidence of bubbling or hammering in the reservoir due to the excessive superheating of the water, it is only necessary to open the pipe M, whereupon the water will pass immediately through the pipe C, upwardly through M, and thence downwardly through the union *g* of the pipe E into the tank or through the pipe E, if open, during which course the water will become sufficiently cool to obviate all objection, and I find in practice that this construction effectually avoids this serious objection.

I claim as my invention—

1. In a water heating and distributing system, the combination of a reservoir, a water-heater, two systems of pipes, one forming a short circuit between the reservoir and heater, and the other a long circuit extending beyond the reservoir and heater, and a common return forming a part of both circuits, and valve mechanism whereby water may be caused to flow through either circuit, substantially as described.

2. In a water heating and distributing system, the combination of a reservoir, a water-heater, a system of pipes, one forming a short circuit between the reservoir and heater, and the other a long circuit extending beyond the reservoir and heater, a pipe common to the two circuits, and a valve in said pipe arranged to divide the flow of water through the system between the two circuits, substantially as described.

3. In a water heating and distributing system, the combination with a reservoir, of a hot-water back, a cold-water-supply pipe connected to said hot-water back, pipes connecting the reservoir with the hot-water back and constituting a short circuit for heating and circulating the water through the water-back and the reservoir, a pipe forming a part of a long circuit leading from the upper portion of the reservoir to the distributing-points and having its return connected with the short circuit, and a valve for controlling the passage of water from the return of either circuit, substantially as described.

4. In a water heating and distributing system, the combination with a reservoir, of a hot-water back communicating with the reservoir at two points to establish a short circuit for circulation of water through the hot-water back and the reservoir, a cold-water-supply pipe connected to the return of the short circuit, a distributing-pipe forming a part of a long circuit leading from the upper portion of the reservoir and having its return

connected with the return of the short circuit, and a valve at the junction of the two returns for controlling at will the passage of water from the two returns, substantially as described.

5. In a water heating and distributing system, the combination with a reservoir, of a hot-water back, a cold-water-supply pipe connected thereto, means providing a short circuit between the hot-water back and the reservoir and a long circuit between said water-back and reservoir for distribution, and means for controlling at will the circulation of water through either circuit, substantially as described.

6. In a water heating and distributing system, the combination of a boiler, a heater in circuit with the boiler, a distributing system in circuit with said heater, said system also being in independent circuit with the heater, substantially as described.

7. In a water heating and distributing system, the combination with a reservoir or boiler, of a hot-water back communicating with the reservoir, and a cold-water-supply pipe passing downwardly through the boiler and connected to the hot-water back, said pipe having an orifice opening into the boiler near the upper portion thereof, substantially as described.

8. In a water heating and distributing system, the combination with a hot-water back, of a reservoir or boiler, a pipe leading from the hot-water back into the upper portion of the boiler, a branch pipe between said pipe and the side of the boiler, a return-pipe connecting the bottom of the boiler with the water-back, a distributing-pipe leading from the upper portion of the boiler to the distributing point or points and having its return connected to the hot-water back, and a cold-water-supply pipe connected to the hot-water back outside of the boiler, substantially as described.

9. In a water heating and distributing system, the combination with a stand-boiler or reservoir, of a hot-water back, a pipe connecting the hot-water back with the side of the boiler, a distributing-pipe leading from the upper portion of the boiler to the distributing-points, a common return-pipe connecting the return of the distributing-pipe and the bottom of the boiler with the hot-water back, and a valve in said common return for controlling the passage of water in a short circuit through the hot-water back and the boiler or in a long circuit through the hot-water back, boiler and distributing-pipe, and a cold-water-supply pipe connected to the hot-water back, substantially as described.

10. In a water heating and distributing system, the combination with a stand-boiler or reservoir, of a hot-water back, a pipe connecting the hot-water back with the side of the boiler, a distributing-pipe leading from the upper portion of the boiler to the distributing-points, a common return-pipe connecting the return of the distributing-pipe and the bottom of the boiler with the hot-water back, and a valve in said common return for controlling the passage of water in a short circuit through the hot-water back and the boiler or in a long circuit through the hot-water back, boiler and distributing-pipe, and a cold-water-supply pipe communicating with the hot-water back through said common return, substantially as described.

11. In a water heating and distributing system, the combination with a reservoir or boiler, of a hot-water back, a pipe connecting the hot-water back with the side of the boiler, a valve-casing connected to the hot-water back, a return-pipe connecting the bottom of the boiler with said casing, a distributing-pipe leading from the boiler to the distributing point or points and having its return end enter the valve-casing, and a valve in said casing adapted to fully close either return and fully open the other, and a cold-water-supply pipe connected to the hot-water back, substantially as described.

12. In a water heating and distributing system, the combination with a reservoir or boiler, of a hot-water back, a pipe connecting the hot-water back with the side of the boiler, a valve-casing connected to the hot-water back, a return-pipe connecting the bottom of the boiler with said casing, a distributing-pipe leading from the boiler to the distributing point or points and having its return end entering the valve-casing, and a valve in said casing adapted to fully close either return and fully open the other, and a pipe for supplying cold water to be heated, substantially as described.

13. In a water heating and distributing system, the combination with a reservoir and a water-heater, a cold-water-supply pipe connected thereto, of a valve-casing communicating with the reservoir, distributing system and heater and having three ports, means providing a short circuit between the water-heater and reservoir and a long circuit between said water-heater and reservoir for distribution, and a valve in said casing arranged to control two of the ports and adapted to close one to the same extent that it opens the other, whereby the current may be fully directed through either of the circuits or divided between them in proportion to the opening of the ports to which the circuits are connected, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GILES CHRISTOPHER SAVAGE.

Witnesses:

R. S. DOAK,

G. H. SAVAGE.