H. S. HUMPHREY.

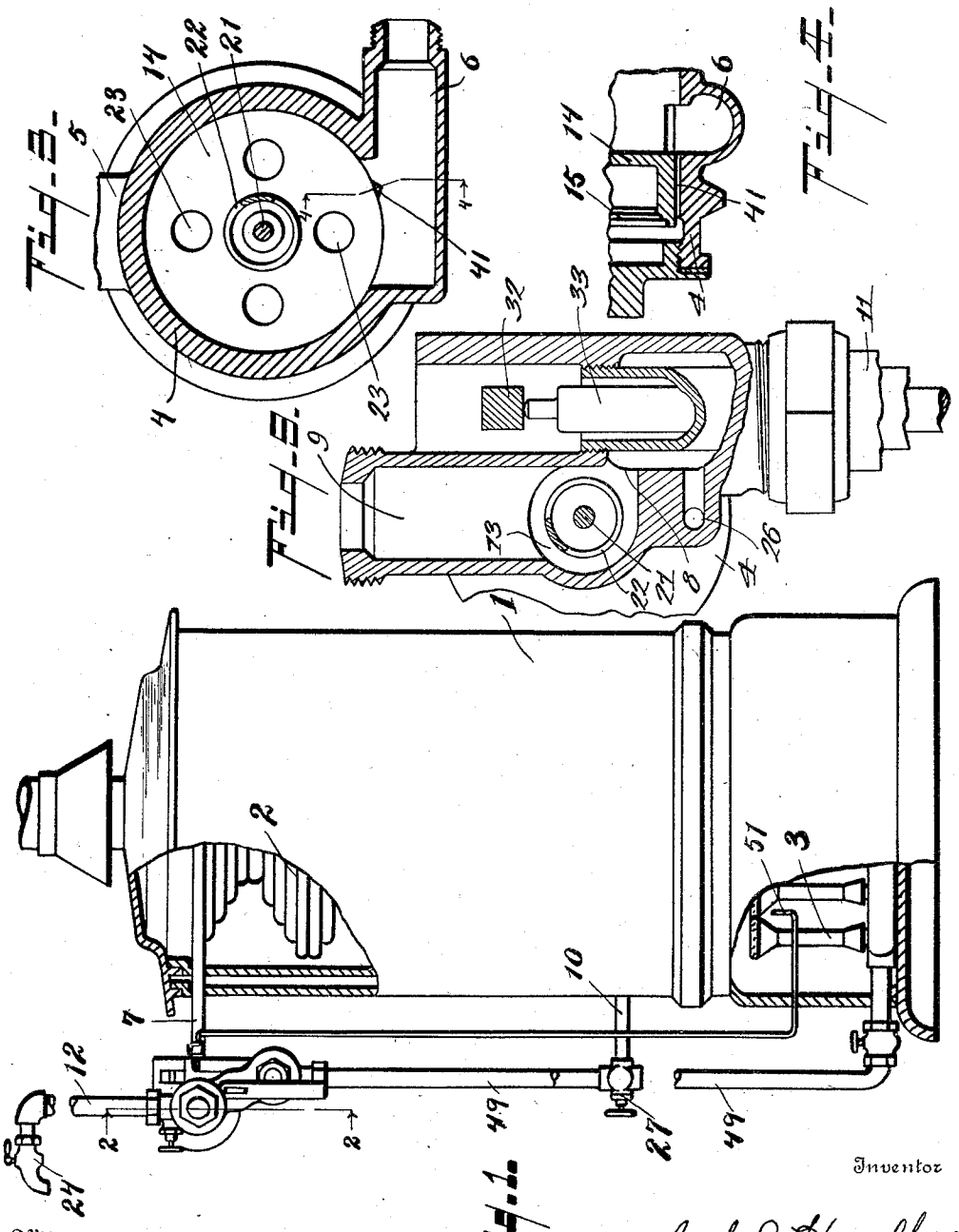
VALVE MECHANISM.

APPLICATION FILED JAN. 28, 1910.

1,007,699.

Patented Nov. 7, 1911.

3 SHEETS—SHEET 1.



Witnesses

Margaret L. Glasgow.

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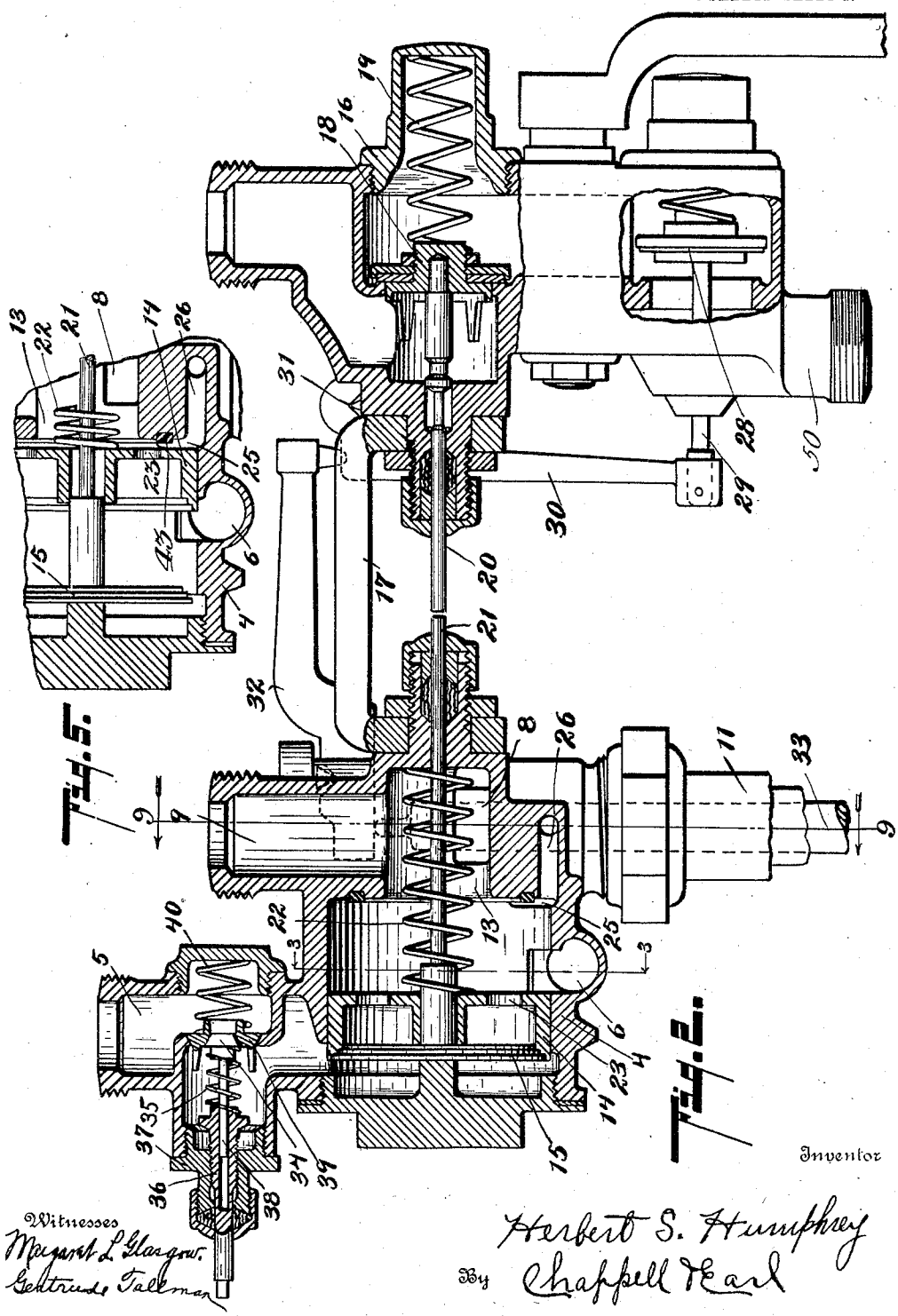

Fig. 5.

Fig. 2.

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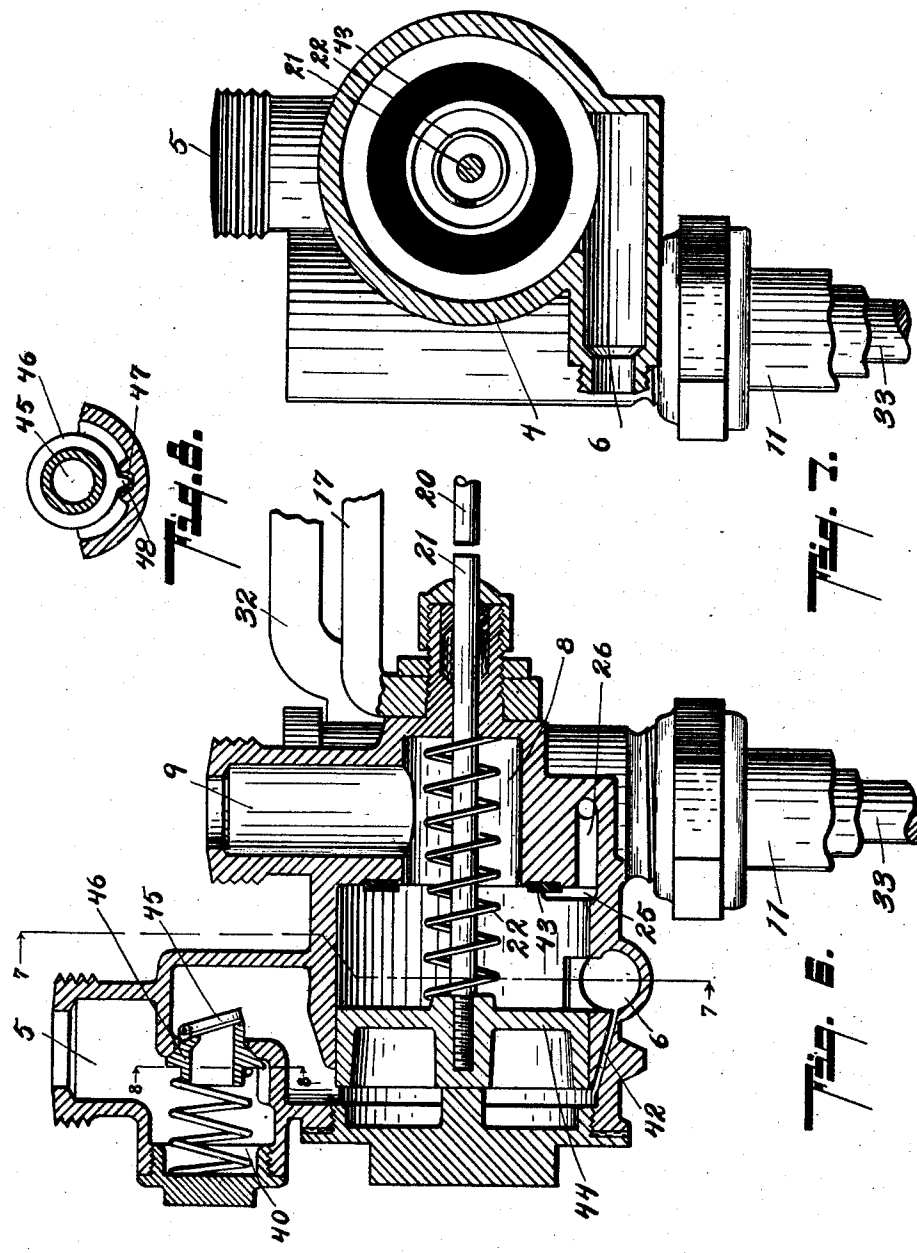

Fig. 7.

Fig. 8.

Fig. 6.

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VALVE MECHANISM.

1,007,699. Specification of Letters Patent. Patented Nov. 7, 1911.

Application filed January 28, 1910. Serial No. 540,579.

To all whom it may concern:

Be it known that I, HERBERT S. HUMPHREY, a citizen of the United States, residing at Kalamazoo, Michigan, have invented certain new and useful Improvements in Valve Mechanism, of which the following is a specification.

This invention relates to improvements in valve mechanism.

My improved valve mechanism is especially designed by me for use in connection with water heaters, and I have illustrated the same herein embodied in a water heater structure. It is, however, desirable and may be adapted for use in various other relations.

The main objects of this invention are: First, to provide in a water heater an improved valve mechanism in which the gas is automatically turned on by the drawing of water from the heater. Second, to provide in a water heater an improved valve mechanism in which the gas is automatically turned on by the drawing of water from the heater and one in which the gas valve is positively closed when the drawing of water is discontinued. Third, to provide in a water heater an improved water inlet valve adapted to serve also as a circulation valve. Fourth, to provide an improved water inlet valve adapted to serve also as a circulation valve, in which the circulation is not interrupted in the event of the inlet valve becoming non-operative through clogging, or the like. Fifth, to provide in a structure of the character described, an improved valve mechanism whereby variations in pressure in the supply system do not cause the actuation of the gas valve when water is not being drawn from the heater. Sixth, to provide an improved valve that is unlikely to become clogged in use. Seventh, to provide an improved valve mechanism which is effective as a safety device. Eighth, to provide an improved valve mechanism which is comparatively simple in structure and economical to produce and not likely to get out of repair in use.

Further objects, and objects relating to structural details, will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification.

The structure described constitutes one effective embodiment of my invention. Other embodiments would be readily devised by those skilled in the art.

The invention is clearly defined and pointed out in the claims.

A structure constituting an effective and preferred embodiment of the features of my invention is clearly illustrated in the accompanying drawing, forming a part of this specification, in which:

Figure 1 is a detail side elevation of a structure embodying the features of my invention. Fig. 2 is an enlarged detail section taken on a line corresponding to line 2—2 of Fig. 1. Fig. 3 is a detail section taken on a line corresponding to line 3—3 of Fig. 2. Fig. 4 is a detail section taken on a line corresponding to line 4—4 of Fig. 3, showing the by-pass passage for the inlet valve. Fig. 5 is a detail section corresponding to that shown in Fig. 2, with the valve member 14 in its open position, the coacting member 15 being in its initial position. Fig. 6 is a detail section, corresponding to that of Fig. 2, of a modification, in which the inlet valve is a single member. Fig. 7 is a detail vertical section taken on a line corresponding to the irregular line 7—7 of Fig. 6. Fig. 8 is a detail section through the check valve mechanism, taken on a line corresponding to line 8—8 of Fig. 6. Fig. 9 is a detail vertical section showing the relation of the hot water inlet and discharge passages to the circulation port.

In the drawings, similar reference characters refer to similar parts throughout the several views, and the sectional views are taken looking in the direction of the little arrows at the ends of the section lines.

Referring to the drawing, the heater 1 illustrated is of the coil type, the coils 2 being arranged within the heater casing, which is shown as double walled to prevent radiation.

The gas burners 3 are located below the heating coils. The supply water is delivered to the upper end of the coils through the inlet valve casing 4, which is provided with a cold water inlet 5 and a cold water discharge 6, the inlet being connected to the water supply and the discharge 6 to the upper end of the heater coils by the pipe 7. The valve casing is also provided with a hot water inlet 8 and discharge 9, the hot water inlet being connected to the delivery pipe 10 of the heater coils, preferably

through the thermostat tube 11. The discharge 9 is connected to the draw-off pipe or system 12.

The hot water inlet is preferably connected to the cold water discharge by means of the circulation passage or port 13, so that when water is not being drawn from the heater, it may circulate through the water coils and the thermostat 11. The water inlet valve is preferably of the piston type, as shown, and consists of an inner member 14 and an outer member 15, adapted to seat therein. When the inlet valve is in its open position, it closes or cuts off the connection between the hot water inlet 8 and the discharge 6, so that the supply water is directed through the heater.

The gas valve casing 16 is preferably connected to the water valve casing by means of the yoke 17, so that the parts are held in proper alinement. The gas valve 18 is held normally on its seat by means of the spring 19. The gas valve is opened by the water inlet valve in the embodiment illustrated. The stem 20 of the gas valve is arranged to be engaged by the stem 21 of the water valve. The stem 21 is carried by the member 15 of the water inlet, so that in the event of the member 14 becoming clogged or retained in its open position on account of sand or sediment, the member 15 is returned to its initial position by means of the gas valve return spring 19, thus permitting the gas valve to close when the drawing of water from the heater is discontinued, even though the valve member 14 shall be retained in its open position, as illustrated in Fig. 5. The inlet valve is normally returned to its closed position when the drawing of water is discontinued by the return spring 22.

The member 14 is preferably provided with ports 23, which are normally closed to the inlet water by the valve member 15. Should, however, the member 14 be retained in its open position, the water is free to circulate through the ports 23, not only the water contained in the heater, but any water drawn from the heater on the opening of a draw-off faucet, as 24, of the system. The heater is thus rendered inoperative until the valve 14 is freed; that is, the main gas valve will not open until the member 14 is freed.

The discharge port 6 is preferably located in the bottom of the valve chamber, and provided with a wide mouth extending well across the bottom of the chamber, so that the tendency is to carry or wash the sediment out of the valve chamber, thus reducing the possibility of clogging and also by keeping the valve chamber clean, reducing the wear on the valve and chamber walls. To further this result, I preferably provide a transverse groove 25 at the inner end of the valve chamber, and a discharge passage 26 opening into the discharge connection for the heater to the valve casing. The valve in its operation has a tendency to wipe any sediment that may collect in the valve chamber, either into the water discharge 6 or into the passage 26. When water is being drawn from the heater, any sediment that may collect in this passage 26 is sucked into the discharge and drawn off or it will settle into the thermostat tube 11, from which it can be drawn off by means of the valve 27 at its lower end. I preferably provide in this connection a thermostat actuated gas valve 28, the stem 29 of which projects to be engaged by the lever 32 which is acted upon by the thermostat rod 33, as shown in dotted lines in Fig. 2. The main advantage of this thermostat actuated valve is to regulate the temperature of the water passing through the heater.

To prevent the water passing to and from the heater upon variation in pressure in the water system, which passing of water to and from is objectionable in that the gas valve is thereby actuated when water is not being drawn from the heater, I provide a check valve 34, which is preferably located in the water inlet 5. This check valve is, in the structure shown in detail in Fig. 2, provided with a spring 35, the outer end of which bears against the adjusting member 36. This adjusting member is threaded into the cap 37. This member 36 is adapted to receive the stem 38 of the check valve to serve as a guide and support therefor.

The return check 34 is preferably seated in the pressure or safety valve 39, which is held normally closed by the spring 40. This spring 40 is of greater tension than the spring 35. This valve 39 is provided, so that in the event of an excessive pressure being generated in the heater owing to the water being confined therein by the check valve, to permit the vent or release of the pressure in the supply. This valve is not brought into action under ordinary operation of the heater, but in the event of the overheating of the water from any cause whereby an excessive pressure was generated therein, an escape or relief is provided through this valve.

The inlet valve is preferably provided with a by-pass passage 41, which, in the structure illustrated in Figs. 1 to 5, is in the form of a groove in the wall of the valve chamber. In the structure illustrated in the modification in Fig. 6, this by-pass is in the form of a passage 42 opening into the valve chamber and into the discharge 6.

I preferably provide a gasket or packing ring 43, against which the water inlet valve seats when in its open position to prevent leakage past the valve through the circulation port into the discharge 9. This packing ring or seat avoids the necessity for the close

fitting of the valve in its chamber, thus avoiding the necessity for great accuracy in manufacture, and also permitting the valve to be made loose so that it moves freely, reducing wear and the liability of clogging. By the provision of the circulation passage 13 connecting the valve chamber with the discharge, when the discharge is opened, the reduction of pressure in that side of the valve permits the valve to move freely and evenly until it is completely open. In its open position, it cuts off the circulation connection for the hot water inlet and discharge, as stated. This releasing of the pressure in front of the inlet valve throughout its opening stroke makes it possible to use a closing spring of considerable strength.

In the modified construction shown in Fig. 6, the inlet valve 44 is formed of a single member. In this modification, the check valve 45 is of the flap type, it being mounted on the safety, or pressure release valve 46. This safety valve is here provided with a rib 47, adapted to engage the grooves 48 to prevent the turning of the valve. This embodiment is simple and effective.

The valve 44 acts to control the circulation passage, the same as the structure shown in Fig. 2, except that it being made of a single member, if it is retained in its open position, the circulation passage remains closed. However, by the provision of the seat or packing ring 43, the valve may be loosely fitted so that it is not likely to clog, particularly with the passages arranged to discharge the sediment, as illustrated.

The fuel is delivered to the burners through the pipe 49, which is connected to the discharge 50 of the gas valve casing. The burners are provided with a pilot 51, which is provided with suitable flashing means, but as the details of this flashing means form no part of the present invention, they are not illustrated or described herein.

I have illustrated and described my improvements in detail in the form in which I have embodied the same, which form I find practicable. I desire, however, to remark that I am aware that my improvements are capable of considerable variation in structural details without departing from my invention, and I desire to be understood as claiming the same specifically, as illustrated, as well as broadly within the scope of the appended claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water valve casing having a cylinder-like valve chamber, a cold water inlet and discharge and a hot water inlet and discharge, there being a circulation connection between said hot water inlet and said cold water discharge, said cold water discharge being in the bottom of said valve chamber, there being a transverse groove in the bottom of said valve chamber at its inner end and a discharge passage for said groove; a connection for said heater to said hot water inlet with which said discharge passage is connected; a water inlet valve comprising an inner piston-like member having a port therein and an outer member adapted to seat in the outer end of said inner member, and when seated to close said port in said inner chamber, said valve being adapted when in its open position to cut off said circulation connection of said cold water discharge and hot water inlet; a return spring for said water inlet valve arranged to engage said inner member thereof; and a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position.

2. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water valve casing having a cylinder-like valve chamber, a cold water inlet and discharge and a hot water inlet and discharge, there being a circulation connection between said hot water inlet and said cold water discharge, said cold water discharge being in the bottom of said valve chamber, there being a discharge passage at the inner end of said chamber; a connection for said heater to said hot water inlet with which said discharge passage is connected; a water inlet valve comprising an inner piston-like member having a port therein and an outer member adapted to seat in the outer end of said inner member, and when seated to close said port in said inner chamber, said valve being adapted when in its open position to cut off said circulation connection of said cold water discharge and hot water inlet; a return spring for said water inlet valve arranged to engage said inner member thereof; and a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position.

3. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water valve casing having a cylinder-like valve chamber, a cold water inlet and discharge and a hot water inlet and discharge, there being a circulation connection

between said hot water inlet and said cold water discharge, said cold water discharge being in the bottom of said valve chamber; a water inlet valve comprising an inner piston-like member having a port therein and an outer member adapted to seat in the outer end of said inner member, and when seated to close said port in said inner chamber, said valve being adapted when in its open position to cut off said circulation connection of said cold water discharge and hot water inlet; a return spring for said water inlet valve arranged to engage said inner member thereof; and a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position.

4. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water valve casing having a cold water inlet and discharge and a hot water inlet and discharge, there being a circulation connection between said hot water inlet and said cold water discharge; a water inlet valve comprising an inner piston-like member having a port therein and an outer member adapted to seat in the outer end of said inner member, and when seated to close said port in said inner chamber, said valve being adapted when in its open position to cut off said circulation connection of said cold water discharge and hot water inlet; a return spring for said water inlet valve arranged to engage said inner member thereof; and a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position.

5. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water valve casing having a cold water inlet and discharge and a hot water inlet and discharge, there being a circulation connection between said hot water inlet and said cold water discharge; a water inlet valve comprising an inner piston-like member having a port therein and an outer member adapted to seat in the outer end of said inner member, and when seated to close said port in said inner chamber, said valve being adapted when in its open position to cut off said circulation connection of said cold water discharge and hot water inlet; a return spring for said water inlet valve arranged to engage said inner member thereof; a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position; a return check valve for said cold water inlet; a pressure release valve arranged in said cold water inlet; and a by-pass passage for said water inlet valve.

6. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water valve casing having a cold water inlet and discharge and a hot water inlet and discharge, there being a circulation connection between said hot water inlet and said cold water discharge; a water inlet valve comprising an inner piston-like member having a port therein and an outer member adapted to seat in the outer end of said inner member, and when seated to close said port in said inner chamber, said valve being adapted when in its open position to cut off said circulation connection of said cold water discharge and hot water inlet; a return spring for said water inlet valve arranged to engage said inner member thereof; a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position; a return check valve for said cold water inlet; and a by-pass passage for said water inlet valve.

7. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water valve casing having valve chamber, a water inlet and discharge, said water discharge being in the bottom of said valve chamber, there being a transverse groove in the bottom of said valve chamber at its inner end and a discharge passage for said groove; a water inlet valve comprising an inner member and an outer member adapted to seat in the outer end of said inner member; a return spring for said water inlet valve arranged to engage said inner member thereof; and a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve, whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position.

8. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water valve casing having valve chamber, a water inlet and discharge,

said water discharge being in the bottom of said valve chamber, there being a discharge passage at the inner end of said valve chamber; a water inlet valve comprising an inner member and an outer member adapted to seat in the outer end of said inner member; a return spring for said water inlet valve arranged to engage said inner member thereof; and a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve, whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position.

9. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water valve casing having valve chamber, a water inlet and discharge, said water discharge being in the bottom of said valve chamber; a water inlet valve comprising an inner member and an outer member adapted to seat in the outer end of said inner member; a return spring for said water inlet valve arranged to engage said inner member thereof; and a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve, whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position.

10. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water inlet valve comprising an inner member and an outer member adapted to seat in the outer end of said inner member; a return spring for said water inlet valve arranged to engage said inner member thereof; and a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve, whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position.

11. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water inlet valve comprising an inner member and an outer member adapted to seat in the outer end of said inner member; a return spring for said water inlet valve arranged to engage said inlet member thereof; a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve, whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position; a return check valve for said cold water inlet; and a pressure return valve in said cold water inlet.

12. The combination with a water heater, of a fuel valve; a return spring for said fuel valve; a water inlet valve comprising an inner member and an outer member adapted to seat in the outer end of said inner member; a return spring for said water inlet valve arranged to engage said inner member thereof; a stem for said inlet valve carried by said outer member thereof, said stem being slidably arranged through said inner member to actuate said fuel valve, whereby said fuel valve is opened by the opening of said inlet valve and is permitted to close in the event of said outer member of said inlet valve being retained in its open position; and a return check valve for said cold water inlet.

13. The combination with a water heater, of a fuel valve; a water valve casing having a valve chamber; a cold water inlet and discharge and a hot water inlet and discharge, there being a circulation connection between said hot water inlet and said cold water discharge, said cold water discharge being in the bottom of said valve chamber, there being a transverse groove in the bottom of said valve chamber at its inner end and a discharge passage for said groove; a connection for said heater to said hot water inlet with which said discharge passage is connected; and a water inlet valve adapted to actuate said fuel valve, said inlet valve being adapted, when in its open position, to cut off said circulation connection of said cold water discharge and hot water inlet.

14. The combination with a water heater, of a valve casing having a valve chamber, a cold water inlet and discharge, a hot water inlet and discharge, a circulation port for said hot water inlet and said cold water discharge, and a sediment discharge passage, the sediment discharge passage being at the inner end of said chamber, the cold water discharge being in the bottom of said chamber, a connection for said heater to said hot water inlet with which said sediment discharge passage is connected, and a piston valve arranged in said chamber, said valve being between said cold water inlet and discharge when in its closed position and between said cold water discharge and said circulation port when in its open position.

15. The combination with a water heater, of a fuel valve; a valve casing having a valve chamber therein provided with a cold water inlet at its outer end, a hot water inlet and discharge at its inner end, and a cold water discharge intermediate to said cold water and hot water inlets, the said cold water discharge and hot water inlet being

connected to said heater; and a single piston valve for actuating said fuel valve arranged in said chamber, said piston valve being between said cold water inlet and discharge when in its normal closed position and between said cold water discharge and hot water inlet when in its open position whereby the hot water inlet and cold water discharge are normally in communication, the cold water discharge being in the bottom of said chamber so that said valve moves across the same in its opening and closing movements.

16. The combination with a water heater, of a fuel valve; a valve casing having a valve chamber therein provided with a cold water inlet at its outer end, a hot water inlet and discharge at its inner end, and a cold water discharge intermediate to said cold water and hot water inlets, the said cold water discharge and hot water inlet being connected to said heater; and a single piston valve for actuating said fuel valve arranged in said chamber, said piston valve being between said cold water inlet and discharge when in its normal closed position and between said cold water discharge and hot water inlet when in its open position whereby the hot water inlet and cold water discharge are normally in communication.

17. The combination with a water heater, of a fuel valve; a water valve casing having a cold water inlet and discharge and a hot water inlet and discharge, there being a circulation connection between said hot water inlet and said cold water discharge; a water inlet valve adapted to actuate said fuel valve, said inlet valve being adapted, when in its open position, to cut off said circulation connection of said cold water discharge and hot water inlet; a return check valve for said cold water inlet; and a pressure release valve arranged in said cold water inlet.

18. The combination with a water heater, of a valve casing having a valve chamber, a cold water inlet and discharge, a hot water inlet and discharge, a circulation port for said hot water inlet and said cold water discharge, a piston valve arranged in said chamber, said valve being between said cold water inlet and discharge when in its closed position and between said cold water discharge and said circulation port when in its open position, a fuel valve actuated by said piston valve, a return check valve for said cold water inlet disposed in advance of the inlet valve; and a by-pass for said water inlet valve when said valve is in its open position.

19. The combination with a water heater, of a fuel valve; means for closing said fuel valve; a water valve casing having a cold water inlet and discharge, and a hot water inlet and discharge, there being a circulation connection between said hot water inlet and said cold water discharge; a water inlet valve comprising two members, and a stem, the stem being carried by the outer member and the inner member being slidably mounted on said stem and having a circulation port therein, said stem being adapted to actuate said fuel valve whereby said fuel valve is opened by the opening of the said inlet valve, and is permitted to close in the event of the inner member of said inlet valve being retained in its open position.

20. The combination with a water heater, of a fuel valve, a water inlet valve comprising an inner and an outer member and the stem, the stem being carried by the outer member, the inner member being slidably mounted on said stem, said stem being adapted to actuate said fuel valve, whereby said fuel valve is opened by the opening of said inlet valve, and a return spring for said water inlet valve arranged to engage said inner member thereof, the outer member being returned to its initial position by said fuel valve closing means in the event of the inner member being retained in its open position.

21. The combination with a water heater, of a fuel valve, means for closing said fuel valve, a water inlet valve casing having a valve chamber, a cold water inlet and discharge, and a circulation port; a water inlet valve comprising inner and outer member, the inner member having a circulation port therein, the outer member being adapted to close said port when the parts are in their normal position, the said water discharge and circulation port of said casing being in communication when the valve is in its closed position, and being cut off by said valve when it is in its open position, and a stem for said inlet valve carried by said outer member, arranged to operate said fuel valve, to open said fuel valve upon the opening of said inlet valve, said outer valve member being returned to its open position by said fuel valve closing means in the event of said inner valve member being retained in its open position, in which event the water discharge port and circulation ports of said casing are connected through said circulation port of said valve member.

22. The combination with a water heater, of a fuel valve means for closing said fuel valve, a water inlet valve comprising an inner and an outer member, and a stem for said inlet valve carried by said outer member, said stem being arranged to engage the stem of the fuel valve to open the same upon the opening of said inlet valve, the closing means for said fuel valve being adapted to return said inner inlet valve member to its normal or open position independently of said outer member.

23. The combination with a valve; means for closing said valve; a fluid actuated member formed of separable parts adapted to move together in the normal operation of the member; means for actuating said valve connected to one of the parts, said part being adapted to be returned to its initial position by said valve closing means in the event of the other part remaining in its actuated position, all co-acting for the purpose specified.

24. The combination with a valve, of means for closing said valve, a fluid actuated member, and a second member arranged to be actuated therewith and to act on said valve to open the same on the actuation of said fluid actuated member, said second member being adapted to return to its initial position with said fluid actuated member in its normal operation, said valve closing means being arranged to return the said second member to its initial position independently of said fluid actuated member in the event of said fluid actuated member remaining in its actuated position.

25. The combination with a valve; of a fluid actuated member comprising two parts; a stem carried by one of said parts and slidably associated with the other, said stem being adapted to open said valve on the actuation of said member; and means for closing said valve adapted to return said member by which said stem is carried to its initial position in the event of the other part remaining in its actuated position, all co-acting for the purpose specified.

26. The combination with a water heater, of a fuel valve; means for closing said fuel valve, means for opening said fuel valve, comprising a piston arranged to be actuated by the delivery of water to the heater, and a coacting second member associated with said piston to be actuated therewith and to return therewith to its initial position in the normal operation of the piston, said fuel valve closing means being adapted to return said second member to its initial position independently of said piston in the event of the piston remaining in its actuated position when the delivery of water to the heater ceases.

27. The combination with a water heater of a fuel valve; means for closing said fuel valve; a piston arranged to be actuated by the delivery of water to the heater; and a coacting member adapted to act on said fuel valve associated with said piston to permit its being returned to its initial position by said fuel valve closing means, independently of said piston in the event of the piston remaining in its actuated position.

28. The combination with a water heater of a fuel valve; means for closing said fuel valve; and means for opening said fuel valve comprising a member arranged to be actuated by the delivery of water to the heater, and a member associated therewith to permit its being returned to its initial position by said fuel valve closing means independently of said first named member in the event of said first named member remaining in its actuated position.

29. In a water heater, the combination of a fuel valve, a return spring for said fuel valve, a water inlet valve comprising an inner and an outer member, the outer member being adapted to seat in the outer end of the inner member, and a return spring for said water inlet valve arranged to engage the inner member thereof, the outer member being operatively associated with said fuel valve whereby said fuel valve is opened by the opening of said inlet valve, and is permitted to close in the event of the inner member thereof being retained in its open position.

30. In a water heater, the combination of a fuel valve, a water actuated member arranged to be actuated by a delivery of water to the heater operatively associated to said fuel valve to open the same, said member being formed of parts normally moving together, means for returning said water actuated member to its initial position, disposed to act on one of the parts, the other part being capable of return to its initial position independently thereof, and means for closing said fuel valve adapted to return the said independently returnable part of said water actuated member to its initial position upon the failure of the water actuated member return means to return said member.

31. The combination with the controlled valve, of a fluid actuated member for opening said valve, said member being formed of parts normally moving together, one of the parts being operatively associated with said controlled valve to open the same on the actuation of said member, and means for closing said controlled valve adapted to return said part operatively associated with it to its initial position, independently of the other part in the event of its remaining in its actuated position.

32. The combination with a water heater, of a fuel valve; a water valve casing having a cold water inlet and discharge and a hot water inlet and discharge, there being a circulation connection between said hot water inlet and said cold water discharge; and a water inlet valve adapted to actuate said fuel valve, said inlet valve being adapted, when in its open position to pass between said circulation and said discharge ports and cut off said circulation connection of said cold water discharge and hot water inlet, said inlet valve comprising a plurality of members normally operated together, one of the members being

provided with a circulation port which is open when the members of the valve are separated.

33. The combination with the controlled valve, of a fluid actuated member formed of separable parts normally operating together, means for returning said fluid actuated member to its initial position disposed to act on one of the parts, the other part being operatively associated with said controlled valve to open the same, and means for closing said controlled valve, adapted to return said part operatively associated with it to its initial position when the means for returning said fluid actuated member fails to accomplish its purpose.

34. In a structure of the class described, a water valve casing having a cold water inlet and discharge and a hot water inlet and discharge, there being a circulation connection between said hot water inlet and cold water discharge located in the end of the valve chamber; a water inlet piston valve adapted, when in its open position, to cut off the circulation of said cold water discharge and hot water inlet; and a gasket or seat for said valve when in its open position, disposed about the circulation port.

35. In a structure of the class described, a water valve casing having a cold water inlet and discharge and a hot water inlet and discharge, there being a circulation connection between said hot water inlet and cold water discharge; a water inlet valve adapted, when in its open position, to cut off the circulation of said cold water discharge and hot water inlet; and a gasket or seat for said valve when in its open position.

36. In a water heater, the combination with the fuel valve; a water actuated member adapted to open said fuel valve on the passage of water to the heater; a check valve located in the water supply in advance of said fuel valve actuating member; and a pressure release valve in which said check valve is seated.

37. The combination with a water heater, of a fuel valve, a water inlet valve adapted to open said fuel valve on the passage of water to the heater, a return check valve located in the water supply in advance of the said water inlet valve, a pressure release valve disposed to deliver past said check valve, and a by-pass passage for said water inlet valve.

38. The combination with a water heater, of a fuel valve, a water inlet valve adapted to open said fuel valve on the passage of water to the heater, a return check valve located in the water supply in advance of the said water inlet valve, and a by-pass passage for said water inlet valve.

In witness whereof, I have hereunto set my hand and seal in the presence of two witnesses.

HERBERT S. HUMPHREY. [L. S.]

Witnesses:
F. A. LEMKE,
B. M. SCHERER.