

G. A. SHOOK.
INSTANTANEOUS WATER HEATER.
APPLICATION FILED JAN. 4, 1909.

993,723.

Patented May 30, 1911.

3 SHEETS—SHEET 1.

Fig. 2.

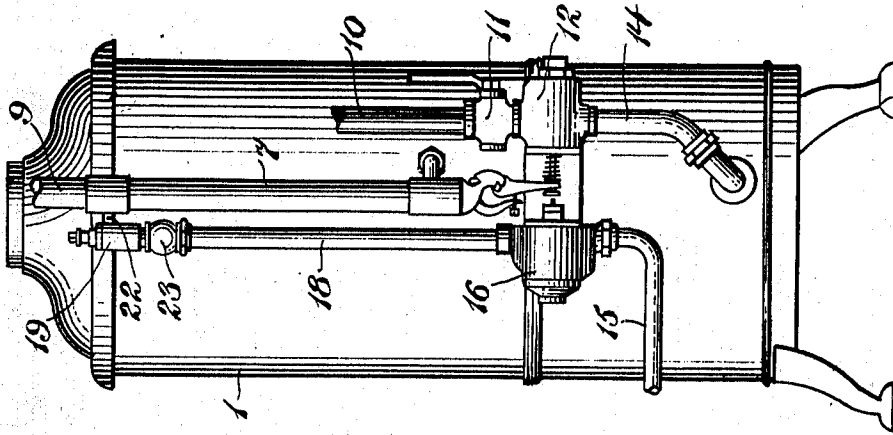
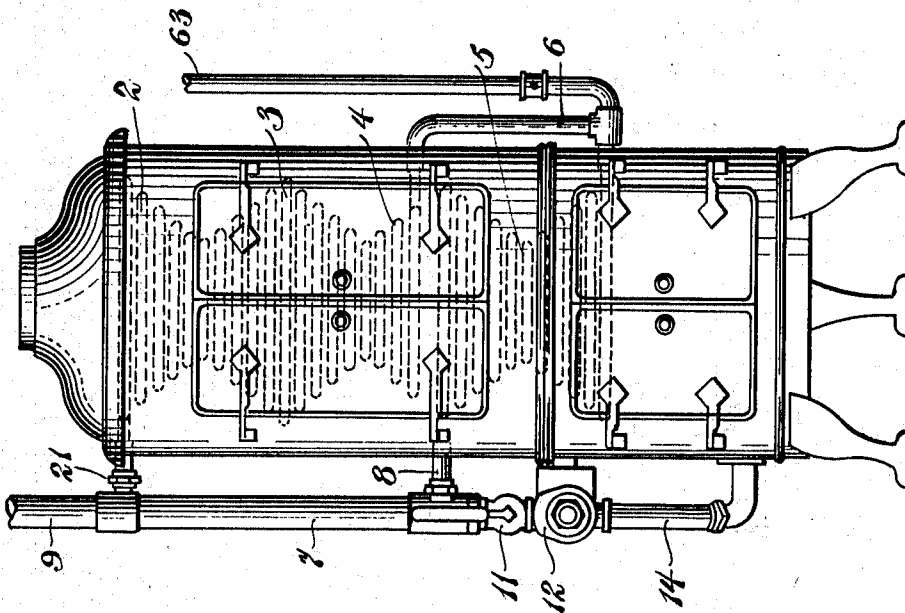


Fig. 1.



WITNESSES

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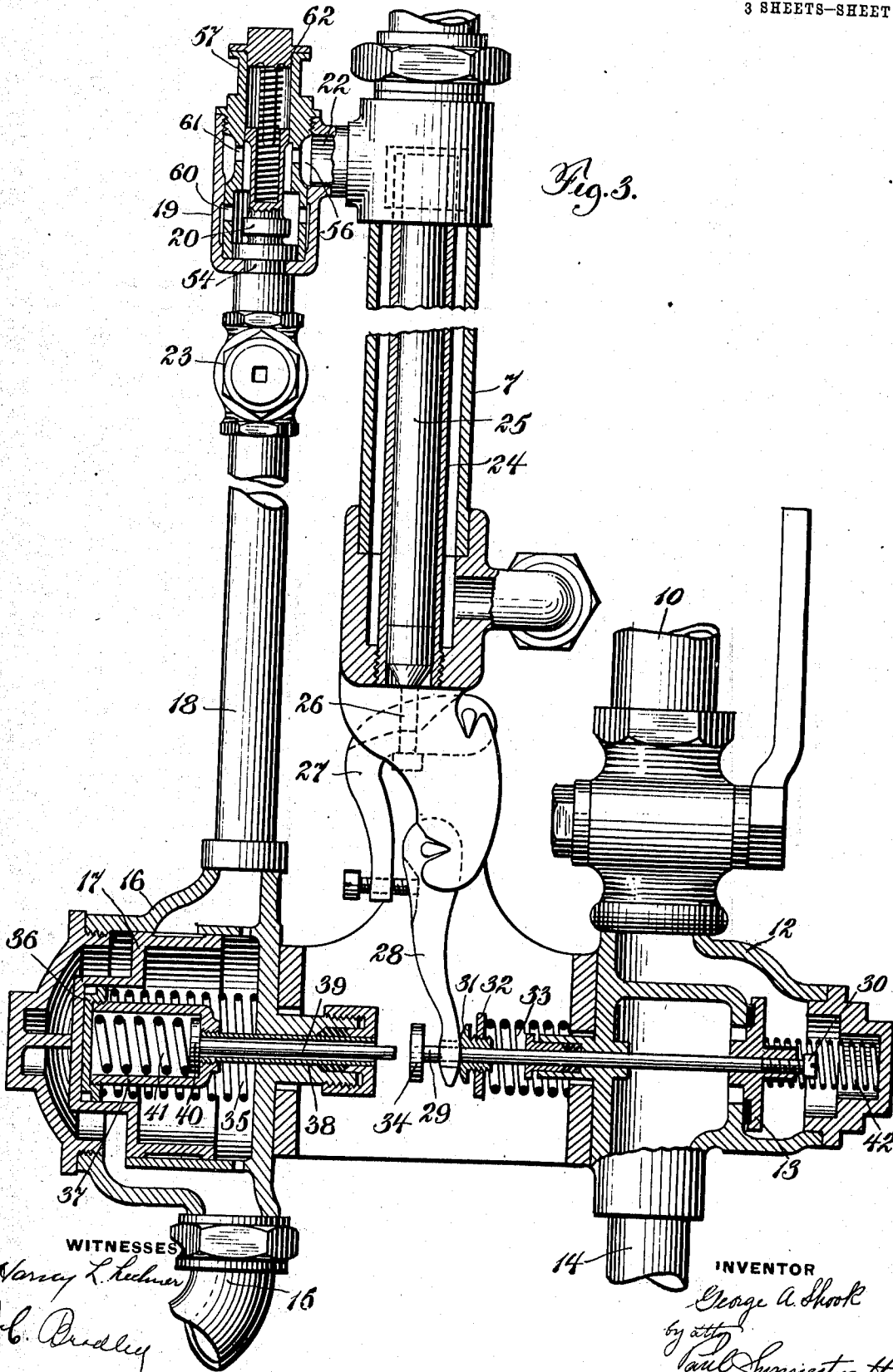
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3 SHEETS-SHEET 2.

Fig. 3.



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3 SHEETS-SHEET 3.

Fig. 4.

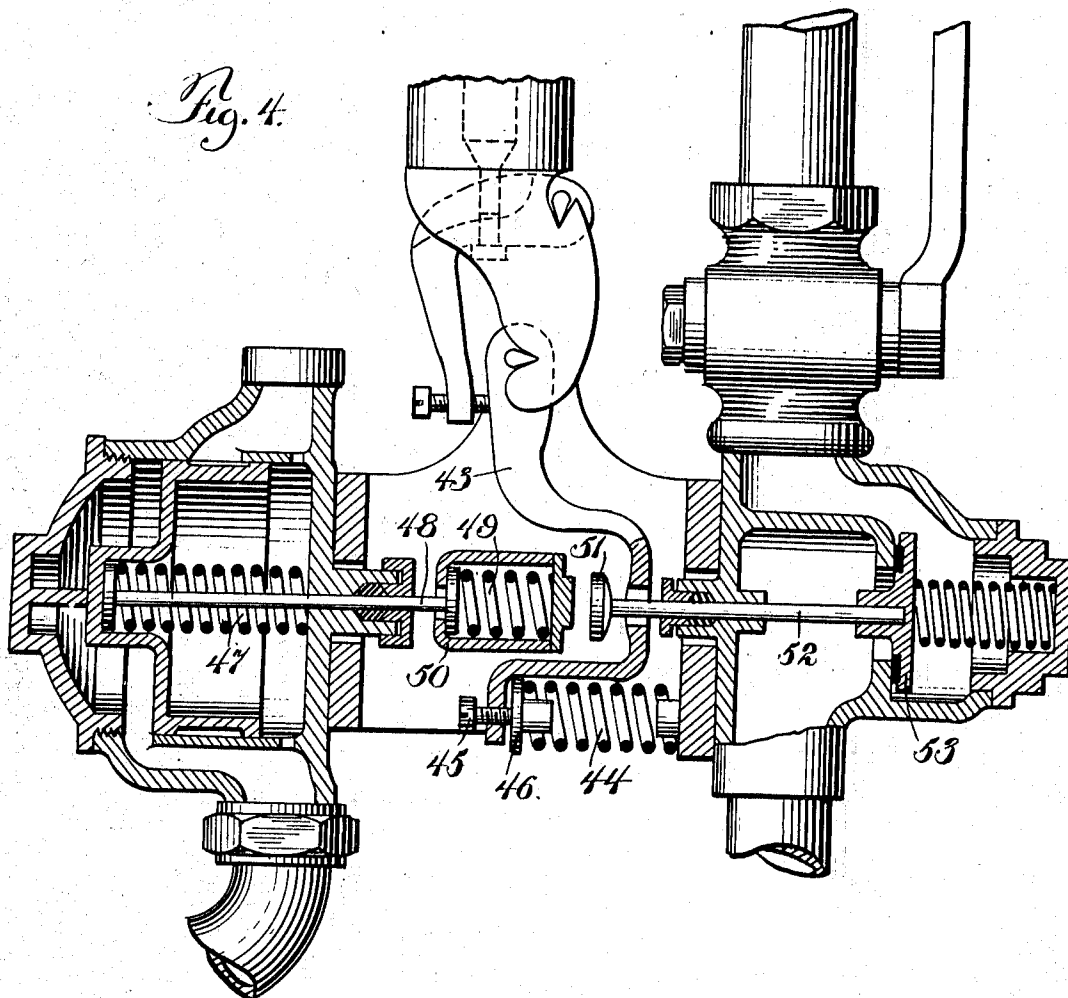
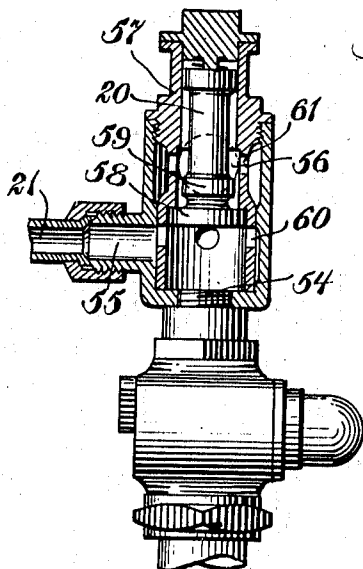


Fig. 5.



WITNESSES

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UNITED STATES PATENT OFFICE.

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INSTANTANEOUS WATER-HEATER.

993,723.

Specification of Letters Patent.

Patented May 30, 1911.

Application filed January 4, 1909. Serial No. 470,679.

To all whom it may concern:

Be it known that I, GEORGE A. SHOOK, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Instantaneous Water-Heaters, of which the following is a specification.

The invention relates to instantaneous water heaters having a dual control of the gas supply and particularly to the mechanism for automatically governing the gas supply. The invention has for its principal objects; the provision of a simplified apparatus of the character specified wherein a single valve for controlling the gas supply replaces the plurality of independent valves heretofore considered necessary for this purpose; the provision of a device of the character specified having a single gas valve wherein the valve may be operated by the thermostatic controlling means independent of the water valve and may be closed thereby in case the water valve is accidentally stuck open; and the provision of an improved controlling device for the gas valve wherein the closure of the gas valve in case of accident to the water valve, is more positive than that of the thermostatically controlled gas valves heretofore employed. One embodiment of the invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a front view of the heater,
Fig. 2 is a side elevation thereof,
Fig. 3 is an enlarged detail partly in section, of the controlling mechanism,
Fig. 4 is an enlarged sectional view illustrating a modified form of controlling mechanism, and

Fig. 5 is an enlarged detail of the valve shown in the upper portion of Figure 3 with its piston in the position occupied when the outlet from the heater is open, the section being taken at right angles to that of Figure 4.

Heretofore it has been customary in instantaneous water heaters to provide two independent gas valves, one of which is controlled from the motor valve, or water valve as it is more commonly termed, and the other valve is controlled by the thermostat, such general construction being illustrated in co-pending application Serial No. 457,383. I

have found that one of these gas valves may be dispensed with, and that the controlling means therefor may be so arranged that all the advantages incident to the two valve construction are retained, and other advantages not present in the two-valve construction secured, in addition to the general simplification and cheapening of the apparatus due to the use of one valve instead of two.

That portion of the apparatus in which the departure of this application particularly resides is illustrated in the lowered portion of Figure 3, but in order that the relation of this structure to the general heater construction may be clear, the entire heater is illustrated and will be described, reference being had to the co-pending application 457,383 heretofore referred to, for a detail description of that portion of the apparatus shown and described but not claimed.

Referring first to the general arrangement of parts as shown in Figures 1, 2 and 3; 1 is the casing of the heater; 2, 3 and 4 are the upper sets of coils of the boiler; 5 is the lower inverted set of coils, the lower coil of which set is connected to the lower coil of the set 3 by means of the pipe 6; 7 is the thermostat casing, which casing communicates with the upper coil of the set 5 by means of the pipe 8, and is provided with an outlet 9 for the hot water which is to be distributed; 10 is the gas inlet pipe provided with the usually manually operated valve 11; 12 is the gas valve casing, the valve 13 of which is automatically controlled from the thermostat and water valve in a manner to be hereinafter described; 14 is the gas pipe leading from the valve casing to the burners; 15 is the water supply pipe leading to the automatic water valve casing 16; 17 is the piston valve in the casing; 18 is a water pipe leading from the valve casing 16 to the casing 19 of the controlling check valve 20; 21 is a pipe leading from the casing 19 to the upper coil of the set 2; 22 is a tube leading from the upper portion of the casing 19 to the upper portion of the thermostat casing 7; and 23 is a pressure regulating valve whose construction may be of any approved type and is immaterial in so far as the invention of this application is concerned. From the foregoing the general operation of the heater will be apparent and

may be briefly stated as follows. A faucet in the outlet 9 being opened, a flow of water occurs through the inlet 15 causing the piston valve 17 to move to the right (Fig. 3) and thence up through the pipe 18 to the check valve 20, moving such valve to the position of Figure 5, so that the water passes through the pipe 21 into the heater. The water then circulates down through the coils 2, 3 and 4, the connection 6, up through the coil 5, the connection 8, the thermostat casing 7, and to the outlet 9. When the faucet in the outlet 9 is closed, the valve 17 moves back to the position indicated in Figure 3, and the check valve 20 moves down and seats itself as indicated in this figure. When the valve 20 is in this lower position, a circulation occurs from the lower coil 5 to the casing 7 and thence through the connection 22, valve casing 19, and connection 21 to the top coil of the boiler.

The construction wherein the invention of this present application particularly resides will now be described in detail, reference being had to Figure 3 of the drawings. The thermostat here shown is of the ordinary type, and comprises the copper or brass tube 24 closed at its upper end, and the porcelain rod 25 fitting the tube and provided at its lower end with the usual metal cap 26 from which the levers 27 and 28 are operated. The lower end of the lever 28 is provided with a hole for the passage of the stem 29 of the gas valve 13, which stem 29 is longitudinally adjustable with respect to the valve 13 by means of the set screw 30. The collar 31 is also secured slidably upon the stem 29, and carries thereon an adjustable collar 32 against which a spring 33 bears. The end of the stem 29 is provided with a cap 34, and the thermostat and its levers are so adjusted that when the temperature of the water in the thermostat casing 7 is below the maximum for which the device is set, say below one hundred and fifty degrees, the lower end of the lever 28 occupies about the position indicated in Figure 3 with a space between the cap 34 and the end of the lever, so that the stem 29 and the gas valve 13 carried thereby may be normally operated from the water valve without interference with the thermostatic controlling means. When the outlet 9 is closed the piston 17 of the water valve is held in the position indicated in Figure 3 by means of the spring 35 which spring bears at its rear end against the screw cap 36 of the casing 37. The spring 35 thus serves the double function of holding the casing 37 in its position and maintaining the piston 17 in its rearmost position. The casing 37 is provided at its front end with the tube 38 which passes through the stuffing box of the valve casing. Mounted in the tube 38 is the rod 39 carrying at its rear end the cap 40

which is held in its forward position in the casing by means of the spring 41. The gas valve 13 is held normally in closed position by means of the spring 42, and the combined strength of this spring and the spring 33 is somewhat greater than that of the spring 41. The strength of the spring 42 alone is less than that of either the springs 41 or 35.

The combined action of the water valve and thermostatic controlling means in connection with the gas valve is as follows. If the outlet from the heater is opened the pressure upon the left hand end of the piston 17 overbalances the pressure on the other side because of the reduction of pressure in the tube 18 and the piston is forced to the right compressing the spring 35 and moving the rod 39 so that its front end engages the cap 34, thus opening the gas valve 13 and permitting a flow of gas to the burners. If now the outlet from the heater is closed and the piston 17 accidentally sticks in its right hand position, the temperature of the water in the boiler and in the thermostatic casing 7 rises to a point above that for which the device is set, and the lever 28 under the influence of the spring 33 moves to the left carrying with it the cap 34, which in turn forces the rod 39 to the left compressing the spring 41 at the other end of such rod. This compression of the spring 41 is assured by reason of the fact that the combined strength of the spring 42 and spring 33 is greater than that of the spring 41 as heretofore pointed out. In this manner the closure of the gas valve is provided for regardless of the closure of the piston valve 17. It will be seen that the actuation of the gas valve by the water valve is not in anywise interfered with by the thermostatic controlling means during the normal operation of the apparatus. In addition to acting as a safety device under the condition above set forth when the water valve sticks open, the thermostatic means also acts as a controlling device when the water valve is acting normally without sticking, and in case the water rises above a predetermined temperature the flow of gas is throttled or entirely cut off without altering the position of the water valve. The use of the tube 38 obviates any danger of sticking which might possibly otherwise occur if no tube were used, and the rod 39 had to be packed in order to prevent leakage. The casing 37 is made water tight so that the rod 39 may fit as loosely as is desired in the tube 38. It will also be seen that under the condition of non-closure of the water valve as above described, a very positive and secure closing of the gas valve is secured by reason of the fact that the pressure of the powerful spring 33 augments that of the weaker spring 42 in closing the gas valve. This very much reduces the danger of imperfect closure of the gas

valve due to foreign matter upon the seat, as the two springs are sufficient to cause a closure in cases where the spring 42 alone would close the valve so imperfectly as to permit the passage of a large amount of gas. It will also be seen by comparison of this apparatus with the two valve constructions as heretofore used, that the structure is very much cheapened and simplified, and this without any loss of effectiveness of operation.

In Figure 4 a slightly modified form of controlling mechanism is illustrated. In this apparatus the lower lever 43 of the thermostatic controlling means is curved in the manner shown, and the spring 44 takes the place of the spring 33 in the other form of device. The adjustment of the spring is accomplished by means of the set screw 45 engaging the collar 46 against which the end of the spring 44 bears. Only a single spring 47 is used inside the water valve casing, which spring corresponds to the spring 35 in the other form of device, and the spring corresponding to the spring 37 is mounted at the end of the rod 48. This spring 49 is inclosed by a casing 50, the front end of which is adapted to engage the head 51 carried by the stem 52 of the gas valve 53. It will be seen that the spring 44 is adapted to move the lever 43 to the left, and that the spring 49 permits the gas valve to be closed without moving the piston of the water valve to the left in case it should become stuck. The other features of construction are substantially similar to those shown in Fig 3, and their functions and operation will be clear without further description.

The construction of the controlling check valve is illustrated most clearly in Figures 3 and 5, and although this structure forms a portion of the subject-matter claimed in the co-pending application heretofore referred to, I will briefly describe the device in order that the description of the apparatus shown may be complete. By reference to the figures referred to, it will be seen that the casing 19 is provided with an inlet passage 54 and a pair of circulation passages 55 and 56, leading respectively to the connection 21 to the upper coil of the boiler, and to the connection 22 leading to the thermostat casing 7. Screw threaded into the end of the casing 19, is a bushing 57, and slidable in this bushing is the piston valve 20 having the two heads 58 and 59. The bushing is also provided with two sets of ports 60 and 61 leading respectively to the passages 55 and 56. The piston valve is held normally in the position shown in Figure 3 with its head covering the feed port 54 by means of the spring 62. The valve parts occupy the position shown in Figure 3, when no water is being drawn through the outlet 9. With the parts in this position water from the invert-

ed or reverse coil 5 may circulate freely to the upper coil 2 through the connection 8, the casing 7, the connection 22, the ports and passages of the valve casing 19 and the connection 21. A return circulation to the boiler is also provided for by means of the pipe 63, and a continuous double circulation may be maintained, a part of the water from the thermostat casing passing up through the outlet 9 and around through the system and back to the return pipe 63, while another portion passes through the connection 22 to the casing 19 and thence back to the upper coil of the boiler. If the outlet through the pipe 9 is opened, the piston valve will assume the position shown in Figure 5 by reason of the unbalanced pressure on the opposite sides of such valve, and the upflow through the inlet pipe 18. When the parts are in this position the water from the pipe 18 will pass through the valve casing 19 and out through the passage 55 and connection 21 to the upper coil of the boiler, and thence through the coils of the boiler, the thermostat casing 7, and the outlet pipe 9.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is the following:—

1. The combination in an instantaneous water heater having water valve and thermostatic controlling means and a gas valve, of spring means between the operating member of the water valve and gas valve, and a connection between the gas valve and thermostatic controlling means adapted to compress the spring means and operate the gas valve when the water valve is open in case the temperature of the water rises above a predetermined point.

2. The combination in an instantaneous water heater having water valve and thermostatic controlling means and a gas valve, of spring means between the operating member of the water valve and gas valve, and a connection between the gas valve and thermostatic controlling means whereby the spring means may be compressed and the gas valve operated when the water valve is open in case the temperature of the water rises above a predetermined point, the connection between the gas valve and thermostatic controlling means having sufficient lost motion to normally permit the water to operate the gas valve independent of the thermostatic controlling means.

3. The combination in an instantaneous water heater having water valve and thermostatic controlling means and a gas valve, yielding means between the operating member of the water valve and gas valve, and a connection between the gas valve and thermostatic controlling means whereby the yielding means may be overcome and the gas valve operated with the water valve open

when the temperature of the water rises above a predetermined point.

4. The combination in a water heater having an inlet and outlet, heating means, and a conduit for supplying gas to the heating means, of a water valve actuated by variations of pressure of the water, a thermostatic controlling means governed by the water of the heater, a valve in the conduit, and means whereby the conduit valve is controlled both from the water valve and from the thermostat.

5. The combination in a water heater having an inlet and outlet, heating means, and a conduit for supplying gas to the heating means, of a water valve actuated by variations of pressure of the water, a thermostatic controlling means governed by the water of the heater, a valve in the conduit, means whereby the conduit valve is operated from the water valve, means whereby the conduit valve is operated from the thermostatic controlling means, and means whereby the thermostatic controlling means may close the conduit valve without moving the water valve.

6. The combination in a water heater having an inlet and outlet, heating means, and a conduit for supplying gas to the heating means, of a water valve actuated by variations of pressure of the water, a thermostatic controlling means governed by the water of the heater, a valve in the conduit, yielding means whereby the conduit valve is operated from the water valve, and means whereby the thermostatic controlling means may operate to overcome the said yielding means and close the conduit valve when the temperature of the water rises above a predetermined point.

7. The combination in a water heater having an inlet and outlet, heating means, and a conduit for supplying gas to the heating means, of a water valve actuated by variations of pressure of the water, a thermostatic controlling means governed by the water of the heater, a valve in the conduit, means whereby the conduit valve is operated from the water valve, means whereby the conduit valve is operated from the thermostatic controlling means, and a yielding lost motion connection whereby the thermostatic controlling means may close the conduit valve without moving the water valve.

8. In combination in a water heater having an inlet and outlet, heating means, and a conduit for supplying gas to the heating means, of a water valve provided with a piston actuated by variations of pressure of the water, a thermostat governed by the water of the heater and having an operating lever, a valve in the conduit yieldingly held closed and provided with an operating stem, a spring maintained under compression by the operating lever for closing the conduit

valve when the temperature of the water rises above a predetermined point, a yielding lost motion connection between the piston and stem, and a lost motion connection between the stem and lever.

9. In combination in a water heater having an inlet and outlet, heating means, and a conduit for supplying gas to the heating means, of a water valve provided with a piston actuated by variations of pressure of the water, a thermostat governed by the water of the heater and having an operating lever, a valve in the conduit spring held closed and provided with an operating stem, a spring maintained under compression by the operating lever for closing the conduit valve when the temperature of the water rises above a predetermined point, a lost motion spring connection between the piston and stem, and a lost motion connection between the stem and lever, the combined strength of the spring for closing the conduit valve and that held under compression by the lever being greater than that of the spring in the connection between the piston and stem.

10. A controlling device for water heaters comprising in combination, a water valve, a gas valve adapted to be opened thereby, means for normally closing the said valves, and a thermostatic controlling means arranged to close the gas valve without operating the water valve.

11. A controlling device for water heaters comprising in combination, a water valve, a gas valve adapted to be opened thereby, means for normally closing the said valves, a thermostatic controlling means arranged to close the gas valve, a yielding connection being provided between the gas valve and water valve whereby the gas valve may be closed by the thermostatic controlling means without operating the water valve.

12. The combination with a water heater; heating means therefor; a means for regulating said heating means comprising a member arranged to be acted upon by water delivered to the heater; and a thermostat connected to the heater, said thermostat and water actuated member having a common connection to the heat regulating means.

13. In combination, in a water heater having an inlet and outlet, heating means, and a conduit for supplying gas thereto, of a water valve provided with a piston actuated by variations of pressure of the water, a thermostat governed by the water of the heater and having an operating lever, a gas valve in said conduit yieldingly held closed and provided with an operating stem, a yielding means interposed between the water valve and the gas valve and adapted to yield when the water valve and the operating lever are actuated whereby the gas valve may be operated by the cooperation

of both the water valve and the thermostat or by either independently of the other.

14. In a water heater, the combination of a conduit for water under pressure, a burner for heating the water in said conduit, a valve controlling the flow of fuel to said burner, means normally holding said valve closed, and devices operated by the flow of water through said conduit and by variations of temperature in said water for controlling said means.

15. The combination of a water heater, a burner therefor, a normally closed fuel valve, a member actuated by the withdrawal of water from the heater, for opening said valve and for holding it open when the temperature of the heated water is below a predetermined limit, and a thermostat causing said valve to close, independently of the operation of said member, when the temperature of the heated water rises above the predetermined limit.

16. The combination of a water heater, a burner therefor, a fuel valve, a water actuated member, a yieldable connection between said valve and said member, said member adapted to open said valve and to hold it open while water is being withdrawn from the heater, when the temperature of the water is below a predetermined limit, and a thermostat causing said valve to close, independently of the operation of said water actuated member when the temperature of the water rises above said limit.

17. The combination of a water heater, a burner therefor, a fuel valve, a water valve, said valves provided with stems so arranged that the opening of the water valve by the withdrawal of water from the heater will open the fuel valve, when the temperature of the water is below a predetermined limit, means for closing said valves when the withdrawal of water ceases, and a thermostat causing the fuel valve to close, independently of the operation of said water valve when the temperature of the water rises above said limit.

18. The combination of a water heater, a burner therefor, a fuel valve, an automatic water inlet valve, said valves provided with stems, so arranged that the opening of the water valve opens the fuel valve when the temperature of the water is below a predetermined limit, a movable member arranged to engage the fuel valve stem, and a thermostat for governing said movable member, thereby causing the fuel valve to close irrespective of the position of the water inlet valve, when the temperature of the water is above said limit.

19. In combination in a water heater hav-

ing an inlet and outlet, heating means, and a conduit for supplying gas to the heating means, of a water valve provided with a piston actuated by variations of pressure of the water, a thermostat governed by the water of the heater and having an operating lever, a valve in the conduit yieldingly held closed and provided with an operating stem, a spring controlled by the operating lever for closing the conduit valve when the temperature of the water rises above a predetermined point, and a yielding lost motion connection between said piston and stem.

20. In a water heater, the combination of a conduit for water under pressure, a burner for heating the water in said conduit, a normally seated valve controlling the flow of fuel to said burner, a compound power mechanism adapted to hold said valve closed, a device operated by the flow of water through said conduit for controlling one part of said power mechanism, and a device operated by variations of temperature in said water for controlling the other part of said mechanism.

21. In a water heater, the combination of a conduit for water under pressure, a burner for heating the water in said conduit, a normally seated valve controlling the flow of fuel to said burner, power mechanism in the form of a plurality of springs adapted to hold said valve closed, a device operated by the flow of water through said conduit for controlling one of said springs, and a device operated by variations in temperature in said water for controlling the other of said springs.

22. In a water heater, the combination of a conduit for water under pressure, a burner for heating the water in said conduit, a normally seated valve for controlling the supply of fuel to said burner, mechanism for operating said valve, a device actuated by the flow of water through said conduit and a device actuated by variations of temperature in said water, said devices governing the operation of said valve through said mechanism, causing said valve to open when a flow of water is established through said conduit and the water is below a predetermined temperature, but causing it to remain seated or when open to move in a closing direction when the water is above a predetermined temperature.

In testimony whereof I have hereunto signed my name in the presence of two subscribed witnesses.

GEORGE A. SHOOK.

Witnesses:

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