No. 886,100. PATENTED APR. 28, 1908.

G. S. WALKER.

AUTOMATIC WATER HEATER.

APPLICATION FILED JULY 22, 1907.

2 SHEETS—SHEET 1.

Fig. 1.

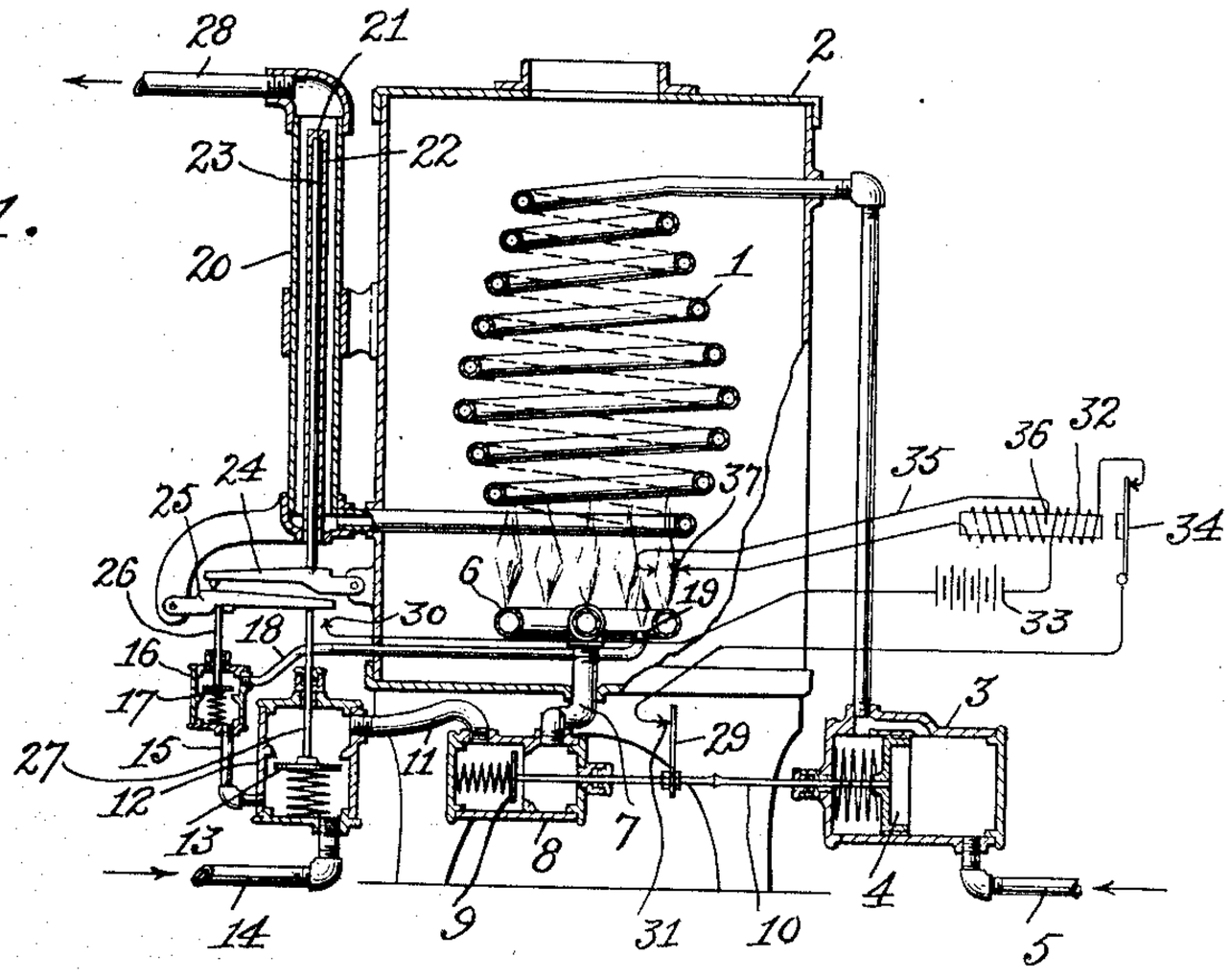
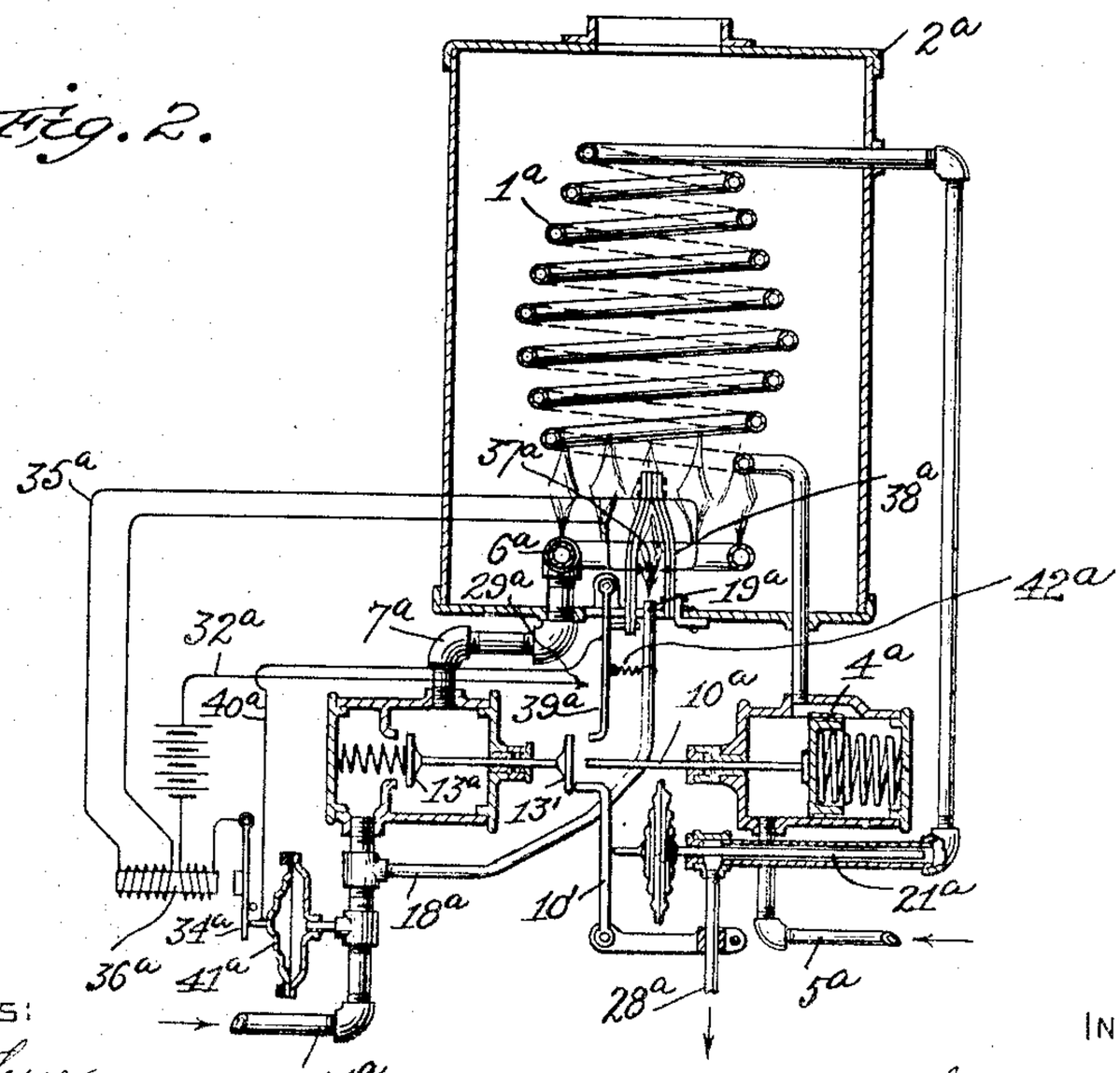


Fig. 2.



WITNESSES:

H. E. Arthur,

Edwin L. Jewett

INVENTOR

Gilbert S. Walker

BY

W. L. Schoonbon

ATTORNEY

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2 SHEETS—SHEET 2.

Fig. 3.

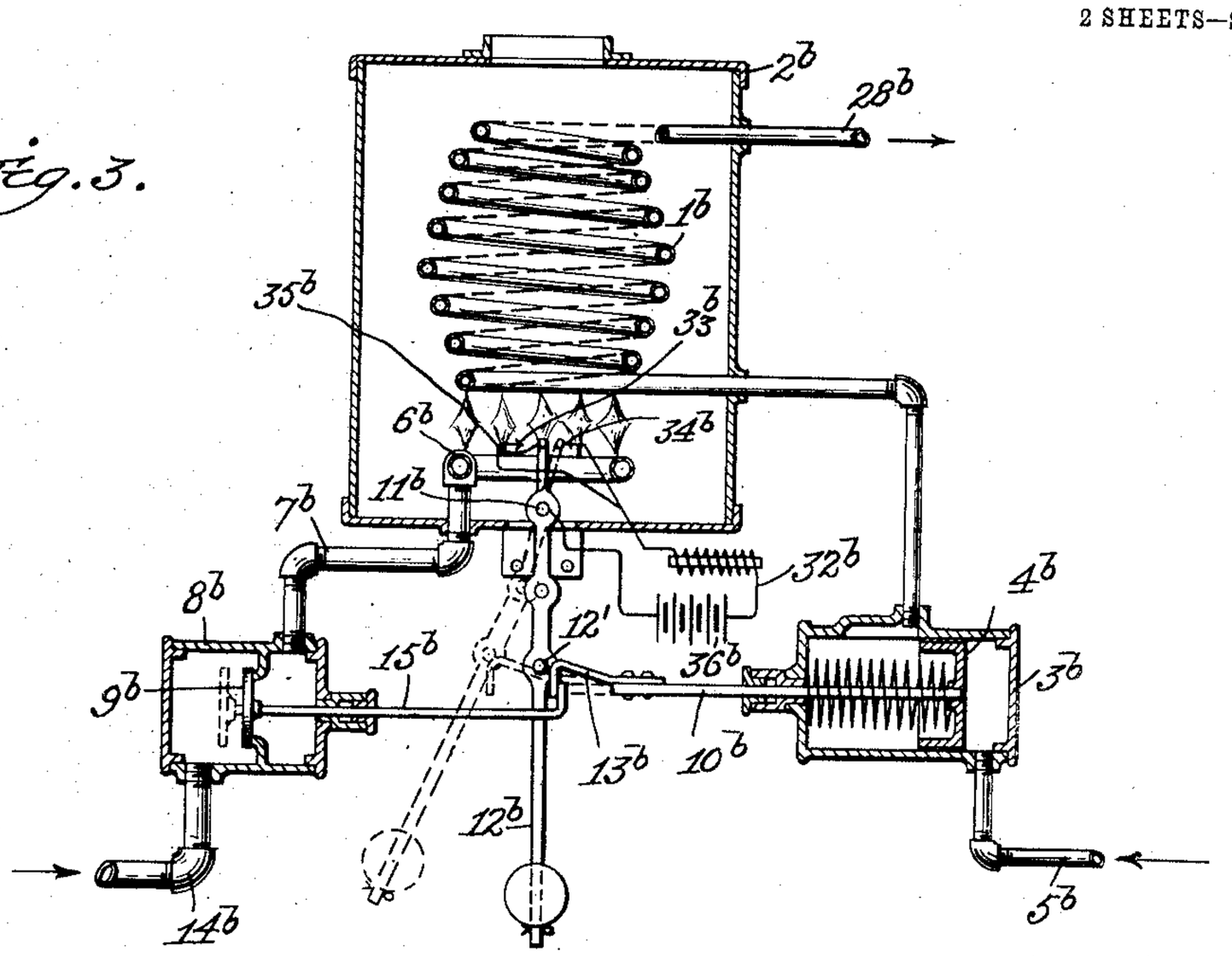


Fig. 4.

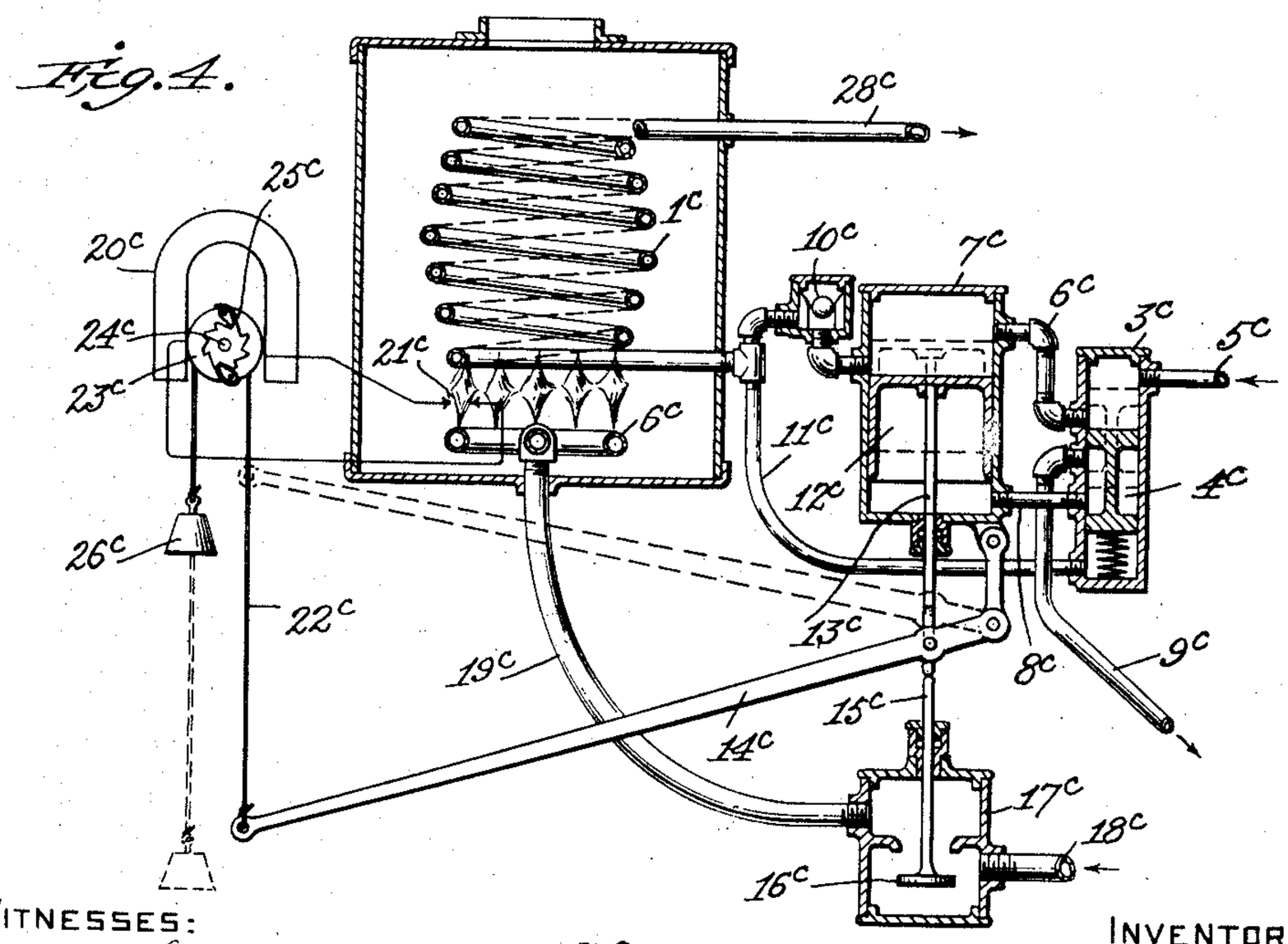
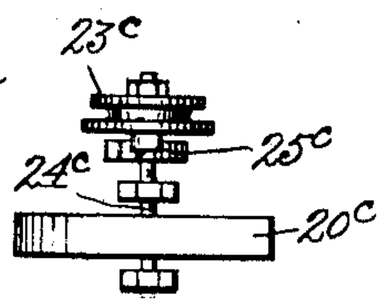


Fig. 4a.



WITNESSES:

H. E. Arthur,

Edwin L. Jewell

INVENTOR

Gilbert S. Walker

BY

M. Schoonborn

ATTORNEY.

UNITED STATES PATENT OFFICE.

GILBERT S. WALKER, OF WHEELING, WEST VIRGINIA.

AUTOMATIC WATER-HEATER.

No. 886,100. Specification of Letters Patent. Patented April 28, 1908.

Application filed July 22, 1907. Serial No. 384,914.

To all whom it may concern:

Be it known that I, GILBERT S. WALKER, a citizen of the United States, residing at Wheeling, in the county of Ohio and State of West Virginia, have invented certain new and useful Improvements in Automatic Water-Heaters, of which the following is a specification.

My invention relates to improvements in automatic water heaters and more particularly to the igniters used in connection therewith.

The object of my invention is to provide means whereby the heating burner used in connection with a water heater will be automatically lighted when the water is turned on or the heating flame is blown out by draft or explosions after the same has been started.

My invention consists of structural features and relative arrangements of elements which will be hereinafter more fully and clearly described and particularly pointed out in the appended claims.

Referring to the two sheets of drawings, in which similar reference characters indicate the same parts in the several views, Figure 1, is a vertical section through a water heater with my improvement applied; Fig. 2, is a similar section of a modified form of the invention; Figs. 3, and 4, are similar sections of modified forms of the same invention; Fig. 4[a], is an enlarged plan view of the magneto machine used in connection with the form shown in Fig. 4.

Referring to Fig. 1, the water heating apparatus to which my invention is herein shown as applied, and which in and of itself is not claimed as of my invention, consists, essentially, of a coil of pipe 1, inclosed within any suitable casing 2. Connected with the cold water inlet of the coil 1 is a chamber 3 in which is situated preferably a spring pressed piston valve 4, against which operates the cold water which is forced through pipe 5 by any suitable pressure.

6 is any suitably constructed heating burner fastened under the coil 1 and adapted to heat the water passing through the same. The gas is supplied to said burner by pipe 7, which is connected with a chamber 8 having a spring pressed valve 9 therein controlling the supply of gas to the burner 6. Said valve 9 is connected by means of a rod 10 to the valve 4 so that said valve 4 controls the supply of gas as readily understood. Connected by means of a pipe 11 to the chamber 8 is a second chamber 12 which is also provided with a spring pressed valve 13 said chamber 12 having a gas inlet pipe 14 as indicated.

Leading from the chamber 12 is a gas pipe 15 which connects with a smaller chamber 16 having a spring controlled valve 17 therein which controls the flow of gas through a pipe 18 one end of which is connected with the chamber 16 and the other end is provided with a pilot burner 19 adjacent to the heating burner 6.

Connected with the outlet of the heating coil 1 is a chamber 20 the interior of which is provided with a thermostat 21 which consists of an outer tube 22 of copper or other material having a high coefficient of expansion containing a rod 23 of porcelain or other material having a low coefficient of expansion. The difference of expansion between the two is multiplied by the levers 24 and 25 suitably pivoted as indicated to the casing or frame work of the heater. Abutting against the underside of the lever 25 and controlled thereby are the rods 26 and 27 which are connected respectively to the spring pressed valves 17 and 13 for purposes to be hereinafter explained.

28 is the pipe for leading off the hot water to the place of consumption.

29 is a conductor spring supported on and controlled by the rod 10 connecting the two valves 4 and 9.

30 is one terminal with which the lever 25 comes in contact and 31 is the other terminal contacting with spring 29 of the primary circuit 32 of an induction coil 36.

33 is the battery, 34 is the vibrator and 35 the secondary circuit of the induction coil which secondary circuit has its spark gap 37 adjacent to a gas outlet of the main burner.

The parts are indicated in the position they assume when hot water is flowing from the outlet pipe 28.

The invention shown in Fig. 1 operates as follows: When cold water is fed into pipe 5 by the opening of any suitable valve (not shown) the pressure acts against the spring pressed valve 4 and opens up communication with the heating coil 1. When the valve 4 has assumed the position in chamber 3 as indicated in the drawing the gas valve 9 is opened and the gas flowing through pipe 14, valve 13, and pipe 11, is permitted to pass

out through valve 9 to the burner 6. The lever 25, owing to the thermostat 21 being still cold is in contact with the terminal 30, and the terminal 31 being in contact with the conductor spring 29 a current is passed through the primary circuit 32 by the intermediate metallic sections consisting of rod 27, casing of chamber 12, pipe 11, casing of chamber 8 and rod 10, which induces a current through the secondary circuit 35 which creates a spark at the gap 37 and lights the gas issuing from the burner as readily understood. After the water passing through the heating coil 1 becomes hot, the copper tube 22 of the thermostat 21 expands and permits the lever 25 to break contact with the terminal 30 and thus the sparking or igniting device will cease to operate and the burner 6 will continue to burn. The pilot burner 19 will be lighted from the main burner 6 and will continue to burn so that should the main burner go out for any reason whatever it will be relighted from said pilot burner. The pilot burner 19 is controlled by the small valve 17 and only burns while the water is hot, since the raised position of the lever 25 permits the valve 17 through rod 26 to remain open. This arrangement is for the purpose of relighting the main burner 6 in case the water supply is closed and reopened before the water in the heating coil has cooled off sufficiently to permit the thermostat to close the electric circuit. It will be seen by the foregoing described arrangement that the supply of gas to the main burner is not only controlled by the water pressure but also by the thermostat through the lever 25 and rod 27 controlling the gas inlet valve 13. The device is so arranged that the differences of pressure between the water pressure on the cold water side and that on the hot water side opens the main gas valve whenever hot water is drawn, and when no water is being drawn the water pressure on the two sides of the water valve 4 equalize and the spring closes the gas valve and returns the water valve to normal position.

The modification shown in Fig. 2 carries out the same invention in which 1^a is the heating coil, 2^a the casing, and 4^a the water valve having a rod 10^a connected therewith. 5^a is the cold water inlet, and 28^a is the hot water outlet. 21^a is a thermostat consisting of a thin inner tube of good heat conducting material interposed in the hot water outlet and connected with a flexible disk and the whole filled with a volatile fluid, the vaporization of which distends the disk and closes the gas valve as will be hereinafter explained.

14^a is the supply pipe for the gas to the main burner 6^a attached to pipe 7^a and is controlled by the valve 13^a. Said valve 13^a is provided with a rod having an enlarged end $13'$ against which may abut the valve rod 10^a and also the upper end of the pivoted arm $10'$ whose position is controlled by the thermostat 21^a.

38^a is an auxiliary thermostat situated over the pilot burner 19^a near the main burner and is constructed of two metals with different coefficients of expansion having one end fixed and the other free to act against the pivoted arm 39^a which arm is held in the position shown by the spring 42^a and is also capable of acting against the enlarged end $13'$ of the gas valve rod and control the supply of gas to the main burner 6^a.

Extending from the main gas supply pipe 41^a is a branch pipe 18^a which feeds the pilot burner 19^a and also connected with this supply pipe 14^a is a flexible pressure diaphragm 14^a to which is connected the wire 40^a of a primary circuit 32^a of an induction coil 36^a, the other end of said wire being permanently connected with the pivoted arm 39^a. 29^a is a terminal of the primary circuit 32^a against which the pivoted arm 39^a contacts when the thermostat is cold and the pilot burner 19^a is not burning.

35^a is the secondary circuit having a spark gap 37^a adjacent to the gas outlet of pilot burner 19^a. 34^a is a vibrator of the induction coil, which rests against the stop and only touches its contactor when the diaphragm 41^a is distended.

The operation of the invention as shown in Fig. 2 is as follows: The illustration shows the position the parts assume when the hot water is passing through the heater. When the hot water outlet is opened and the pressure reduced, the water valve 4^a is moved against the action of its spring by the pressure of the cold water and is made to assume the position as indicated in the drawing. This permits the gas valve to open and supply gas to the main burner 6^a when the pilot light is lighted. The pressure diaphragm 41^a is distended by the gas from pipe 14^a and causes the circuit in the primary 32^a to be completed since the arm 39^a is in contact with the terminal 29^a which as previously described in connection with Fig. 1, causes sparks to be formed at the gap 37^a and lights the pilot burner 19^a. The heat from the pilot light 19^a causes the auxiliary thermostat 38^a to move inward and the gas valve 13^a opens as explained above. The gas then flows to the main burner 6^a and is lighted by the pilot light 19^a. After the thermostat 38^a is heated by the pilot burner, it is made to assume the position shown in Fig. 2, and the pivoted arm 39^a breaks contact with terminal 29^a and stops the sparking operation. It will be seen after the water flowing from the outlet 28^a becomes hot the thermostat 21^a will automatically control the position of the valve 13^a and hence the supply of gas to the burner. Likewise the flow or pres-

sure of water will control the position of the valve 4^a which in turn will also control the position of the valve 13^a and flow of the gas to the burner.

Should the pilot burner for any reason be extinguished, the thermostat 38^a would cause the lower end of the pivoted arm to come in contact with the enlarged end 13′ and push the gas valve 13^a to its seat and close the valve and renew the sparking operation as above explained to relight the pilot burner.

In Fig. 3, 1^b represents the heating coil inclosed in casing 2^b, and 5^b is the cold water inlet and 28^b the hot-water outlet. 6^b is the heating burner connected by pipe 7^b with the interior of casing 8^b, said casing containing the gas controlling vlave 9^b and connected with the gas supply pipe 14^b. 3^b is a casing connected with the supply 5^b and within said casing is provided a spring pressed valve 4^b against which the cold water acts when the pressure is reduced in the hot water outlet. Connected with said valve 4^b is a rod 10^b having a spring extension 13^b which is adapted to engage a jointed pendulum 12^b pivoted at 11^b and having a projecting pin 12′. 15^b is a rod connected with the gas valve 9^b and provided with an upturned end adapted to be engaged by the rod 10^b of valve 4^b. 32^b is an electric sparking device having a divided circuit whose ends 33^b or 34^b are placed on each side of the upper end 35^b of the jointed pendulum 12^b. One pole of the battery 36^b is connected with pivot pin at 11^b.

The operation of the invention as shown in Fig. 3 is as follows: The parts are shown in the position they assume before the water or gas is turned on. When the pressure in the outlet is reduced the cold water acts on the valve 4^b and moves the same to the left causing the rod 10^b to push the pendulum 12^b into the position indicated in dotted lines and at the same time engaging the rod 15^b and opening the gas valve 9^b which permits the gas to flow to the burner 6^b. On further movement of the rod 10^b the spring extension 13^b slips under and frees itself of the pin 12′ and permits the pendulum to vibrate and cause its upper end 35^b to make and break contact with the ends 33^b and 34^b thereby forming sparks to ignite the gas flowing from the burner. After said burner has been lighted the valve 9^b controlling the gas supply is automatically controlled by the amount of water permitted to pass into the heating coil 1^b by valve 4^b, for the reason as will be seen by the construction shown that when the water valve 4^b begins to open the end of rod 10^b engages the upturned end of rod 15^b and opens valve 9^b in the same ratio as the water valve 4^b opens.

Referring to Figs. 4 and 4^a, 1^c is the heating coil having the cold water inlet 5^c and hot water outlet 28^c. 3^c is a valve casing having a spring pressed valve 4^c. Leading from one end of said casing 3^c is a pipe 6^c leading to the upper end of a chamber 7^c, and 8^c is a pipe connecting the chamber 3^c with the lower end of chamber 7^c. 9^c is a pipe connecting the middle of chamber 3^c with the sewer or other overflow without back pressure. 10^c is a ball valve connection with the inlet of the heating coil 1^c which also is connected by a pipe 11^c with the chamber 3^c and under the spring pressed valve 4^c. Within said casing 7^c is a piston 12^c having attached thereto a rod 13^c which is suitably connected with a lever 14^c and a valve rod 15^c, said rod controlling the operation of a gas regulating valve 16^c within a casing 17^c. 18^c is a gas inlet and 19^c is a pipe leading the gas to the burner 6^c. 20^c is a magneto-generator having the terminals of its circuit separated and forming a spark gap 21^c near the gas outlet of burner 6^c. Connected with the free or outer end of the lever 14^c is a cord 22^c having a return weight 26^c and passing over a loose pulley 23^c on a shaft 24^c carrying the armature of the generator. 25^c is a pawl and ratchet connection of the loose pulley with the shaft 24^c (see Fig. 4^a).

The operation of this form of the invention is as follows: The parts shown in full lines indicate the positions they assume when the water and gas are flowing and the burner has been lighted. When the device is to be started the parts assume the position indicated in dotted lines. When the pressure is reduced in the hot water outlet 28^c the spring pressed valve 4^e is forced down and the pressure back of the piston 12^c is suddenly relieved as will be readily understood. The water passing through to the heating coil 1^c causes the piston 12^c to suddenly kick or seek its lowest position carrying with it the rod 13^c, lever 14^c and gas valve 16^c as shown in full lines, which movement causes the magneto machine to pass sparks over the gap 21^c and lights the gas issuing from the burner 6^c. As the water flow varies the valve 12^c controls the position of gas valve 16^c and hence regulates the supply of gas to burner 6^c.

From the foregoing detailed description and modes of operation it will be clearly seen that I have devised several forms of apparatus in which the burner of a water heater is automatically lighted when the water is turned on and the gas supply to the burner is also automatically regulated. Furthermore should at any time the burner be extinguished it will be relighted.

While I have in the foregoing specification described several forms of apparatus adapted to accomplish the results aimed at, yet it will be obvious to those skilled in the art, the specific construction of the heating coil, burner, igniter or the automatic controlling

means may be modified in many ways without changing in any way the operation of the mechanism or varying the broad invention.

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

1. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, means for igniting said burner, and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically controlling the flow of water through the heating coil and gas to the burner and operating the igniting means.

2. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, an igniter for said burner, and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically controlling the flow of water through the heating coil and gas to the burner and operating the igniter.

3. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a main burner, a gas supply for said burner, an igniter for said burner, a pilot burner for said main burner, and means operated by the difference of pressure between the cold water inlet and the hot water outlet for automatically controlling the flow of water through the heating coil and gas to the burner and operating the igniter.

4. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, a thermostat controlling the gas supply, an igniter for said burner, and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically controlling the flow of water through the heating coil and gas to the burner and operating the igniter.

5. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, a thermostat in the hot water outlet controlling the gas supply, an igniter for said burner, and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically controlling the flow of water through the heating coil and gas to the burner and operating the igniter.

6. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, a gas controlling valve, an electric igniter for said burner, and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically operating the electric igniter and gas valve and controlling the flow of water through the heating coil.

7. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a main burner, a gas supply for said burner, a gas controlling valve, an electric igniter for said burner, a pilot burner for said main burner, and means operated by the difference of pressure between the cold water inlet and the hot water outlet for automatically operating the electric igniter and gas valve and controlling the flow of water through the heating coil.

8. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, a gas controlling valve, a thermostat controlling the gas supply, an electric igniter for said burner, and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically operating the electric igniter and gas valve and controlling the flow of water through the heating coil.

9. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, a gas controlling valve, a thermostat in the hot water outlet, controlling the gas supply, an electric igniter for said burner, and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically operating the electric igniter and gas valve and controlling the flow of water through the heating coil.

10. A water heater comprising a heating coil having a cold water inlet and hot water outlet, water controlling means in the path of the water and actuated by the pressure thereof, a gas burner, a gas supply valve, an igniting device for said burner and means operated by the water controlling means for automatically actuating the igniting device.

11. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, an igniter for said burner, a thermostat controlling the gas supply and igniter and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically controlling the flow of water through the heating coil and gas to the burner and operating the igniter.

12. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, means for igniting said burner, and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically controlling the supply of gas to the burner and operating the igniting means.

13. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a main burner, a gas supply for said burner, an igniter for said burner, a pilot burner for said main burner, and means op-

erated by the difference of pressure between the cold water inlet and the hot water outlet for automatically controlling the supply of gas to the burner and operating the igniter.

14. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, a thermostat controlling the gas supply, an igniter for said burner, and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically controlling the supply of gas to the burner and operating the igniter.

15. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, a gas controlling valve, an electric igniter for said burner, and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically operating the electric igniter and gas valve.

16. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a main burner, a gas supply for said burner, a gas controlling valve, an electric igniter for said burner, a pilot burner for said main burner and means operated by the difference of pressure between the cold water inlet and the hot water outlet for automatically operating the electric igniter and gas valve.

17. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, a gas controlling valve, a thermostat controlling the gas supply, an electric igniter for said burner and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically operating the electric igniter and gas valve.

18. A water heater comprising a heating coil having a cold water inlet and a hot water outlet, a burner, a gas supply for said burner, an igniter for said burner, a thermostat controlling the gas supply and igniter, and means operated by the difference of pressure between the cold water inlet and hot water outlet for automatically controlling the supply of gas of the burner and operating the igniter.

In testimony whereof I, affix my signature in presence of two witnesses.

GILBERT S. WALKER.

Witnesses:

C. W. JEFFERS,

WILLIAM PAXTON BURKE