I. J. O'MALLEY.

WATER HEATER.

APPLICATION FILED AUG. 26, 1908.

960,387.

Patented June 7, 1910.

2 SHEETS—SHEET 1.

Fig. 1

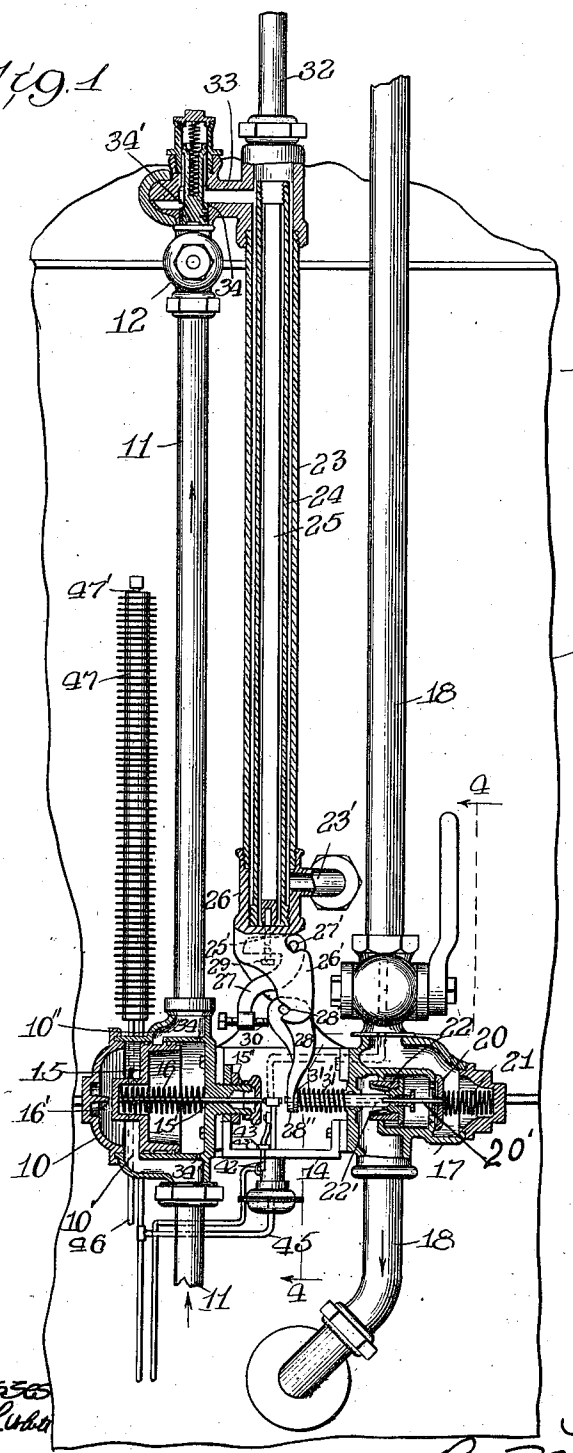


Fig. 2

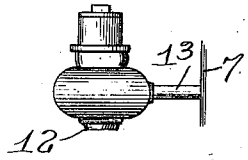
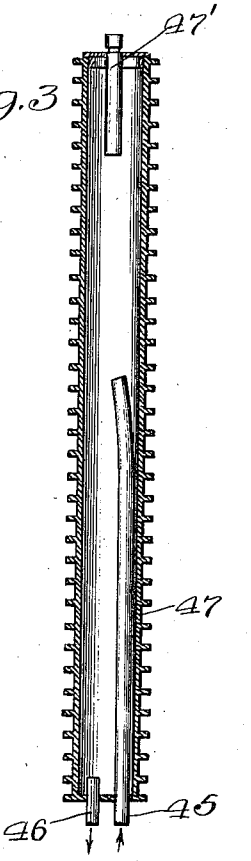


Fig. 3



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2 SHEETS—SHEET 2.

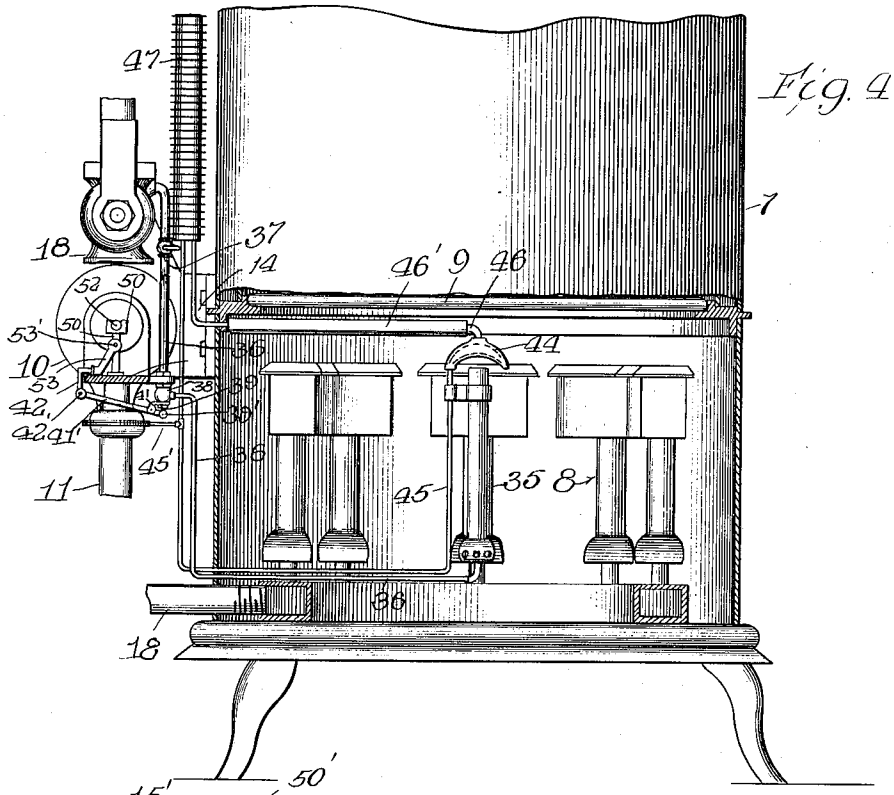

Fig. 4.

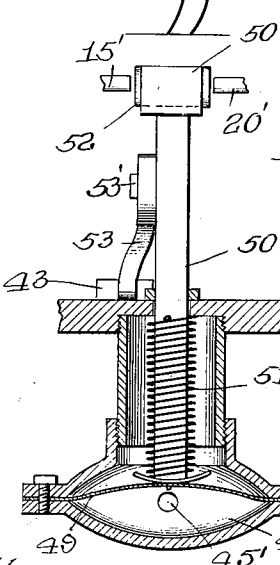

Fig. 5.

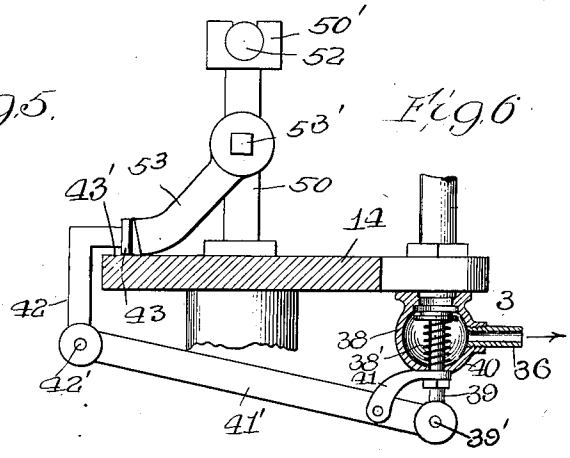

Fig. 6.

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UNITED STATES PATENT OFFICE.

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WATER-HEATER.

960,387. Specification of Letters Patent. Patented June 7, 1910.

Application filed August 26, 1908. Serial No. 450,265.

To all whom it may concern:

Be it known that I, IRA J. O'MALLEY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Water-Heaters, of which the following is a specification.

The primary object of this invention is to automatically shut off the gas supply to the heater whenever the pilot light is accidentally extinguished, and to keep it shut off regardless of the operation of the water valve until the parts are reset by hand.

Another object of the invention is to automatically shut off the supply of gas to the pilot burner whenever the pilot light is accidentally extinguished.

In the accompanying drawings I have illustrated the invention embodied with an automatic valve and thermostat mechanism of known construction and referring thereto—

Figure 1 is a sectional elevation showing, a portion of the jacket. Fig. 2 is an enlarged detail view showing the water regulating valve. Fig. 3 is a detail enlarged sectional view of the radiator. Fig. 4 is a sectional view on the line 4—4 of Fig. 1 and illustrating the lower part of the heater and the devices for closing the pilot light gas valve. Figs. 5 and 6 are detail enlarged sectional views showing the devices for closing the pilot light gas valve.

Referring to the drawings, 7 is the jacket of the heater which incloses a battery of gas burners 8 of any suitable construction and a superposed water coil 9. A water valve 10 is interposed in the cold water pipe 11 which is provided with a regulating valve 12 and connects with the upper end of the coil at 13. The water valve is mounted on a bracket 14 attached to the jacket 7 and it has an inlet port 10′, an outlet port 10″ and a plunger 15. The stem 15′ of the plunger projects through a stuffing box 15″ and a spring 16 is arranged to operate on the plunger to hold it normally against the end stop 16′ and closing the outlet port 10″. A valve casing 17 is arranged in the gas supply pipe 18 and it contains a main gas valve 20 normally held in closed position by the spring 21 and a thermostat gas valve 22 normally open. The stem 20′ of the main gas valve extends through the hollow stem 22′ of the thermostat gas valve and both stems project through the valve casing 17 to a position separated from but in opposition to the stem 15′ of the water valve.

A thermostat comprising an outer tube 23 is connected by branch 23′ to the outlet of the hot water coil and an expansion tube 24 plugged at its upper end is arranged within the tube 23 and screwed into the lower end thereof. A porcelain rod 25 is arranged within the expansion tube and is provided at its lower end with a pin 25′ which extends through the fitting 26 at the lower end of the outer tube 23 and made integral with the bracket 14. This fitting 26 has two parallel downward projections 26′ on which the thermostat levers 27 and 28 are fulcrumed at 27′ and 28′ respectively. The lever 27 has an adjusting screw stop 29 to engage the pin 25′ and another adjusting screw stop 30 to engage the lever 28. The lower end 28″ of the lever 28 engages a collar 31 on the stem 22′ of the thermostat gas valve 22. A spring 31′ is arranged on the stem 22′ between said collar 31 and the gas valve casing 17. The upper end of the thermostat connects with the hot water outlet pipe 32. The cold water pipe 11 is connected by a branch 33 with the upper end of the outer tube 23 of the thermostat and a check valve 34 is arranged in this branch. This check valve will close the branch 33 under the pressure of the cold water flowing through pipe 11 when hot water is being drawn from the outlet pipe 32, to admit cold water to the coil, but if no hot water is being drawn from the outlet pipe 32 the check valve remains in the position illustrated in Fig. 1 to permit a circulation through the thermostat, branch 33 and the water coil. This arrangement provides for a circulation of the water in the event of the burners remaining lighted when no water is being drawn, and such circulation carries the hot water from the lower end of the coil into the outer tube of the thermostat, thereby heating the thermostat and causing the latter to shut off the gas. The check valve and the water valve plunger may be provided with ports 34′ so that the cold water supply to the coil will not be entirely shut off when these valves are closed, and this also provides for an expansion of the water in the coil, allowing it to back up in the cold water supply pipe.

The pilot burner 35 is supplied with gas through a pipe 36 which connects with the gas pipe 18 and is provided with a hand operated shut off cock 37 and an automatic shut off valve 38. A spring 38′ tends to force the valve 38 normally against its seat and this valve is carried by a stem 39 which projects outward through the valve casing 40 and is pivotally connected at 39′ to one end of a lever 41′ which is fulcrumed on an arm 41 supported on the valve casing 40 (Fig. 6). A trigger 42 is pivotally connected at 42′ to the other end of the lever 41′ and its head 43 is arranged to engage a shoulder 43′ on the bracket 14. When the trigger is engaged with the shoulder the valve 38 will be held open as shown in Fig. 6. A fluid chamber 44 is arranged above the pilot burner 35 and is provided with an inlet pipe 45 and an outlet pipe 46, the latter being preferably provided with a covering 46′ of non-heat conducting material. The pipe 45 connects with the bottom of a radiator 47 (Fig. 3) and the pipe 46 projects upward in the radiator to discharge therein at some suitable point above its bottom. By thus arranging the discharge end of the pipe 46 above the bottom of the radiator I avoid discharging the hot fluid therein into the cooler fluid at the bottom of the radiator which circulates through the pipe 45 to the chamber 44. This chamber 44 may be made in any suitable manner but I prefer to make it cup-shape as shown in Fig. 4. A relief valve 47′ is preferably provided at the top of the radiator. The pipe 45 has a branch 45′ which connects with a pressure chamber 48 in which a diaphragm 49 or other pressure operated device is suitably secured. A stem 50 is connected to the diaphragm and a spring 51 is arranged on the stem and acts on the diaphragm in opposition to the pressure in the chamber 48. Instead of the diaphragm I may use any other means adapted to actuate the stem 50 in a similar manner and for the same purpose. The upper end of the stem is provided with a horizontal sleeve 50′ which holds a movable shuttle 52 arranged between the opposing ends of the water valve stem 15′ and the main gas valve stem 20′ (Fig. 5). A push bar 53 is pivoted at 53′ on the stem 50 and is arranged to engage the trigger 42 to disengage the latter from the shoulder 43′.

Let it be assumed that the heater is in condition for use with the radiator and the coil supplied with water and the pilot light burning. If water is drawn at a faucet from the hot water pipe 32 the pressure within the coil will be relieved accordingly and the pressure of the cold water will force back the plunger 15 and close the check valve 34, thus closing the connection between the thermostat and the cold water inlet to the coil. When the plunger 15 is moved by the pressure of the cold water to the right in Fig. 1 the stem 15′ will move the shuttle 52 against the stem 20′ of the main gas valve and open the latter to admit gas to the main burners which will immediately ignite from the pilot and heat the water in the coil. When the drawing off of hot water is stopped the plunger 15 moves to the left in Fig. 1 closing the outlet port 10″ and permitting the main gas valve to close, thereby shutting off gas to the main burners. At the same time the check valve 34 opens. If the hot water is drawn off slowly or if for any reason the water in the coil reaches a temperature exceeding the predetermined degree the thermostat will operate to permit the lower end of the lever 28 to be forced to the left in Fig. 1 by the spring 31′ to close the valve 22 which shuts off the supply of gas to the main burners. The thermostat operates in a well known manner and it need only be said that the valve 22 is normally open, as shown in Fig. 1, and is automatically closed, as before stated, when the water is heated to the predetermined degree.

It sometimes happens that the pilot light is extinguished accidentally by a draft or by a reduction of gas pressure. My invention automatically shuts off the supply of gas to the burners whenever the pilot light is extinguished accidentally so as to avoid the escape of gas which may accumulate and produce an explosion when an attempt is made to relight the pilot burner or the main burners or to investigate the source of trouble. This I have accomplished by the devices hereinbefore described and comprising the shuttle which is normally arranged between the stem of the water valve plunger and the stem of the main gas valve to communicate the movement of the former to the latter as heretofore described. The shuttle is supported in this position by the pressure in chamber 48, which is maintained by heat from the pilot light. When the pilot light is extinguished and the pressure in chamber 48 diminishes the spring 51 pushes the stem 50 down until the shuttle is moved away from its position between stems 15′ and 20′ to permit the main gas valve to be closed by spring 21. At the same time the push bar disengages trigger 42 from the shoulder 43′ to close the pilot gas valve 38. The gas supply will remain shut off from the burners until the trigger is again engaged with the shoulder 43′ to open the pilot light gas valve. When the trigger is thus engaged the push bar is lifted and allowed to rest upon the trigger. The pilot burner is lighted and the heat therefrom causes the water in the circulating system through chamber 44 to expand and produce sufficient pressure in chamber 48 to raise the stem 50 until the shuttle is again located in operative position between stems 15′ and 20′. As the stem 50

rises the push bar is dragged across the head of the trigger and drops into position behind the trigger.

My invention comprises an automatic device of simple character which can be readily applied to hot water heaters of different kinds, and it may be used in connection with a thermostat as herein described or without the thermostat. It insures the shutting off of the gas supply to the burners whenever the pilot light is extinguished accidentally and in this way it eliminates a source of objection and trouble to water heaters of this class because of the apparent impossibility of avoiding the accidental extinguishment of the pilot light, when the heater is not under observation, by drafts or decrease of gas pressure, or otherwise. Even if the water valve is opened after the gas has thus been automatically shut off the gas will not then be turned on because the stem 15′ of the water valve plunger cannot operate the stem 20′. The trigger must first be engaged with its shoulder to open the pilot burner gas valve, the pilot burner lighted, and then sufficient pressure produced in the chamber 48 to raise the shuttle into operative position so that the movement of the water valve plunger may be communicated to the main gas valve.

My invention makes the water heater safe against the escape of gas from the burners and avoids the danger of explosions from the accumulation of such escaping gas.

What I claim and desire to secure by Letters Patent is:

1. In a water heater, the combination of a pilot burner, a gas supply pipe leading thereto, and positively circulating fluid pressure controlled means outside of the pilot burner for automatically shutting off the gas supply from the pilot burner when the pilot light is extinguished.

2. In a water heater, the combination of a pilot burner, a gas supply pipe leading thereto, a circulating fluid pressure controlled means heated by the pilot light for automatically shutting off the gas supply from the pilot burner when the pilot light is extinguished, and means for cooling said pressure fluid.

3. In a water heater, the combination of an intermittently and automatically operated main burner, and a relatively continuously lighted pilot burner, gas supply pipes for said burners, a positively circulating fluid system heated by the pilot light, and means operated by said system for shutting off the gas supply to the burners when the pilot light is extinguished.

4. In a water heater, the combination of an intermittently and automatically operated main burner and a relatively continuously lighted pilot burner, gas supply pipes for the burners, a positively circulating fluid system heated by the pilot light and comprising an expansion chamber, pressure means in said chamber, and means operated by said pressure means for shutting off the gas supply when the pilot light is extinguished.

5. In a water heater, the combination of a pilot burner, a gas supply pipe leading thereto, a valve in said pipe, means for holding said valve open, a positive circulating fluid system heated by the pilot light, and means operated by said system for releasing said holding means when the pilot light is extinguished to permit said valve to close and shut off the gas supply to the pilot burner.

6. In a water heater, the combination of an intermittently and automatically operated main burner and a relatively continuously lighted pilot burner, a gas supply pipe to the main burners, a gas supply pipe to the pilot burner, a valve in each of said pipes, means for holding the pilot burner gas valve open, means for opening the main burner valve, a circulating fluid system heated by the pilot light, and means operated by said system when the pilot light is extinguished to close said pilot burner valve and prevent the main burner valve from opening.

7. In a water heater, the combination of a pilot burner, a gas supply pipe leading thereto, a valve in said pipe, a shoulder, a trigger connected to said valve and adapted to be engaged with said shoulder to hold the valve open, a circulating fluid system heated by the pilot light, and a push bar adapted to be operated by said fluid system when the pilot light is extinguished to release the trigger from the shoulder and permit the valve to close and shut off the gas supply to the pilot burner.

8. In a water heater, the combination of a pilot burner, a gas supply pipe leading thereto, a spring actuated valve in said pipe, a shoulder, a trigger connected to said valve and adapted to be engaged with said shoulder to hold the valve open, a push bar, a circulating fluid system heated by the pilot light and adapted by expansion of the fluid under influence of heat from the pilot light to hold said push bar out of operative engagement with the trigger and to operate said push bar by contraction of the fluid when the pilot light is extinguished to release the trigger from engagement with the shoulder and permit the valve to close and shut off the gas supply to the pilot burner.

9. In a water heater, the combination of a pilot burner, a gas supply pipe leading thereto, a circulating fluid system heated by the pilot light and comprising a pressure chamber, a diaphragm in said chamber, a stem connected to said diaphragm, a spring on said stem acting on the diaphragm against the pressure in said chamber, and

means operated by said stem to shut off the gas supply to the pilot burner when the pilot light is extinguished.

10. In a water heater, the combination of the main burners, a gas supply pipe leading thereto, a gas valve in said pipe, means for operating said gas valve comprising a movable shuttle, and means for withdrawing the shuttle to prevent the main burner gas valve from being opened.

11. In a water heater, the combination of the main burner, a gas supply pipe leading thereto, a valve in said pipe, means for operating said valve comprising a water valve, a stem for the gas valve, and a movable shuttle, means for holding the shuttle in operative position between the water valve and the stem, and pressure operated means for withdrawing said shuttle out of operative position.

12. In a water heater, the combination of the main burner, a gas supply pipe leading thereto, a valve in said pipe, means for operating said valve comprising a shuttle, a stem carrying said shuttle, a pressure chamber, a diaphragm in said chamber for operating the stem, and means for supplying pressure to said chamber.

13. In a water heater, the combination of the main burner, a gas supply pipe leading thereto, a gas valve in said pipe, a cold water supply pipe, a valve in said water pipe, stems for said gas and water valves arranged in opposition to each other, a shuttle normally arranged in position between said stems for communicating the movement of the water valve stem to the gas valve stem, and means for withdrawing the shuttle from position between the stems.

14. In a water heater, the combination of the main burner and the pilot burner, gas supply pipes to said burners, a gas valve in each pipe, a trigger connected to the pilot burner valve and adapted to hold said valve open, means for opening the main burner valve comprising a shuttle, and means automatically operated when the pilot light is extinguished for releasing said trigger to close the pilot burner valve and withdrawing said shuttle to prevent the main burner valve from opening.

15. In a water heater, the combination of a main burner and a pilot burner, gas supply pipes to said burners, a valve in each pipe, a trigger engaged with said pilot burner valve and adapted to hold the same open, means for operating the main burner valve comprising a shuttle, a stem carrying said shuttle, a push bar on said stem to engage the trigger, and pressure operated means for moving the stem to withdraw the shuttle from operative position and for causing the push bar to release the trigger.

16. In a water heater, the combination of a main burner and a pilot burner, gas supply pipes for the burners, manually operated valve mechanism for turning on the gas to the pilot burner independently of the main burner, automatic means operated by heat from the pilot light for turning on the gas to the main burner, and positively circulating fluid pressure controlled means for automatically and simultaneously shutting off the gas supply from the pilot burner and preventing the gas from being turned on to the main burner when the pilot light is extinguished.

17. In a water heater, the combination of a main burner and a pilot burner, gas supply pipes for the burners, automatic mechanism for turning on gas to the main burner when water is drawn from the heater, positively circulating fluid pressure controlled means for automatically and simultaneously shutting off the gas supply from the pilot burner and preventing the gas from being turned on to the main burner when the pilot light is extinguished, manually operated means for turning on gas to the pilot burner independently of the main burner, and means dependent upon the heat from the pilot light for automatically restoring said automatic valve mechanism to operative position when the pilot burner is re-lighted.

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