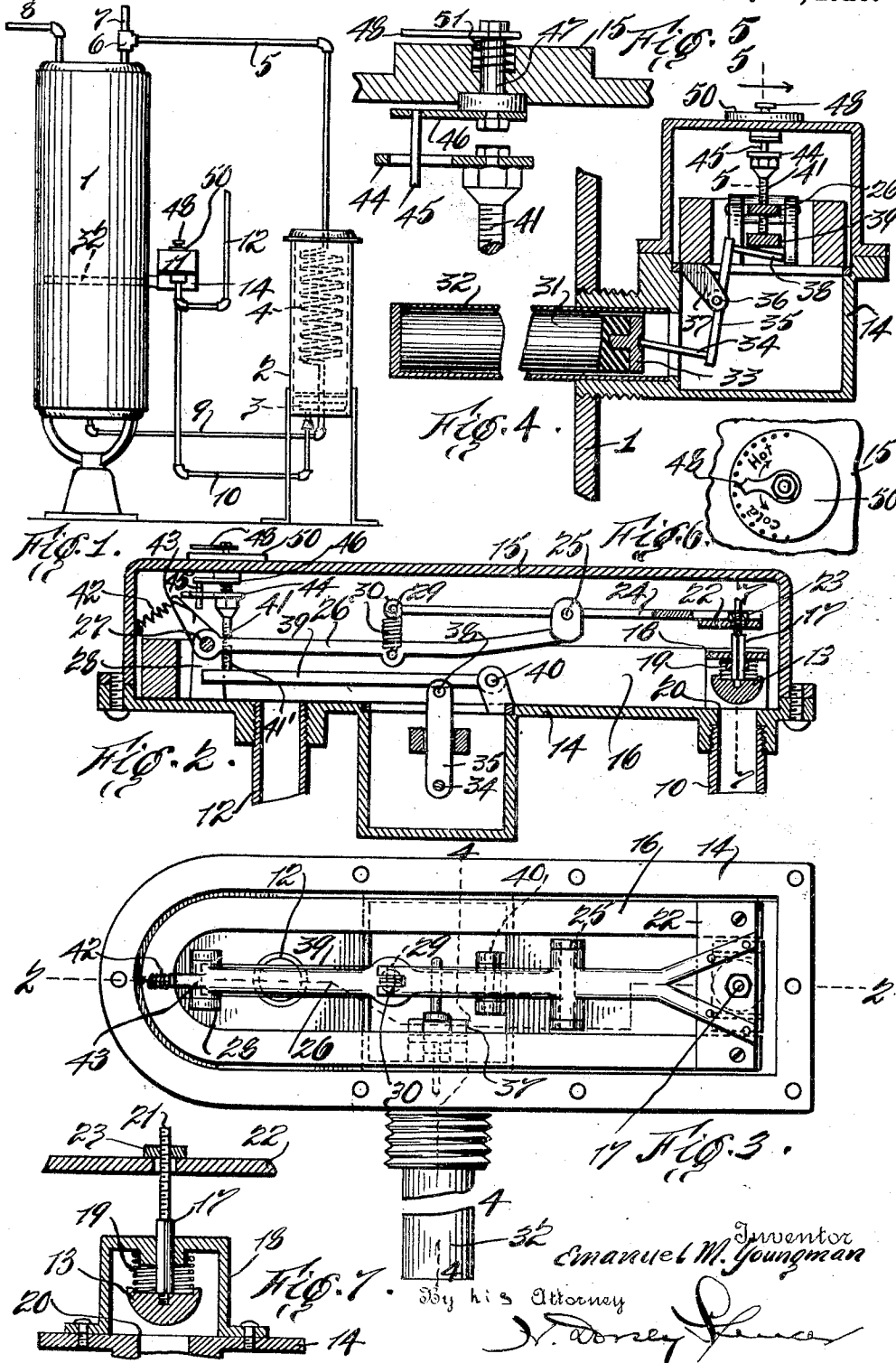


E. M. YOUNGMAN.
THERMOSTAT CONTROLLER FOR HOT WATER GAS HEATERS.
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UNITED STATES PATENT OFFICE.

EMANUEL M. YOUNGMAN, OF CONEY ISLAND, NEW YORK.

THERMOSTAT-CONTROLLER FOR HOT-WATER GAS-HEATERS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EMANUEL M. YOUNGMAN, a citizen of the United States, residing at 13th St. & Surf avenue, Coney Island, New York, have invented certain new and useful Improvements in Thermostat-Controllers for Hot-Water Gas-Heaters, of which the following is a clear, full, and exact description.

This invention relates to a thermostatic control for hot water gas heaters, and has for its object the provision of means to maintain a supply of hot water within the ordinary storage tank, said means comprising an ordinary gas heater for the water which is automatically turned on to heat the water when the temperature of the same falls to a predetermined low point, and which is automatically shut off so as not to overheat the water when the temperature of the same has reached a predetermined high point.

The invention relates more particularly to that class of devices having a gas heater and which completely shuts off the gas supply to the heater, leaving perhaps a pilot light burning for the ready ignition of the gas when again turned on, as distinguished from those devices which merely check or throttle the supply of gas to the heater without completely closing off the same, commonly known as slow-down devices. In devices of the character first named, that is which completely shut off the supply of gas to the heater, the principal difficulty to be overcome for successful operation has been to effect a sufficiently wide and quick opening of the gas supply valve when it is to be opened at all, and also to effect the quick snap-closing of the valve when it is to be closed. The ordinary gas heater most commonly used at the present time is of the Bunsen burner type, which requires a proper ratio of gas to air in the mixing chamber for proper combustion and to prevent back firing. Therefore in these gas control devices it is necessary to open and shut the valves to and from the minimum gas supply adjustment with a quick snap-like movement.

A further object of the present invention is to provide a device which will operate with equal effectiveness for different adjustments either for maintaining the water in the storage chamber at a comparatively high temperature, or for maintaining it at a com-

paratively low temperature, and also a device that can be adjusted for efficient operation in places of different climatic temperatures.

In the preferred embodiment of my apparatus shown in the accompanying drawings—

Figure 1 is an elevation of the device shown installed with a water storage chamber and a gas water heater;

Fig. 2 is an enlarged longitudinal section along line 2—2 of Fig. 3;

Fig. 3 is a plan view of the device with the cover of the casing removed;

Fig. 4 is a transverse section through the device along line 4—4 of Fig. 3;

Fig. 5 is a detail section along line 5—5 of Fig. 4 of the adjusting arm;

Fig. 6 is a detail of the top of the casing showing the adjusting pointer; and

Fig. 7 is a detail section through the valve along line 7—7 of Fig. 2.

Referring more particularly to the drawings, 1 indicates the ordinary water storage tank; 2 indicates the gas hot water heater having a burner at 3 and the water heating coils 4 mounted therein. The upper end of the coil 4 is connected with the hot water inlet pipe 5, which enters the top of the storage tank 1 through T-branch 6. Pipe 7 runs to the hot water taps for withdrawing the hot water as desired from tank 1. The cold water inlet pipe for the tank is shown at 8, and it is understood that this extends within the tank to a point adjacent the bottom thereon. The pipe 9 carries the cold water from the bottom of the tank 1 to the heating coils 4 of the heater. The gas burner 3 of the usual Bunsen burner type is supplied with gas from pipe 10 leading from the valve casing 11, which forms part of the thermostatic control mechanism. Pipe 12 leads from any suitable gas supply also into the casing 11.

As shown in enlarged section, Fig. 2, the gas outlet pipe 10 from the casing 11 is adapted to have its communication with said casing shut off by a gas valve 13 mounted within the casing and adapted to fit against valve seat 20. The casing 11 comprises a suitable base portion 14 and detachable cover 15 secured to the base portion in a gas-tight manner. Upon the base portion 14 is fixed a permanent magnet 16, preferably of horse-shoe form as shown in Fig. 3. Between the poles of the magnet 16 the gas

valve 13 is preferably mounted by having a stem 17 slidably guided in a U-shaped bracket or keeper 18 and normally pressed into closed position by a spring 19 between
 5 said keeper and the head of the valve. The keeper 18 limits the upward movement of the valve and the stem 17 of the valve is preferably squared so as to prevent the valve turning and thus insure its seating upon its
 10 seat 20 in the same position upon every operation. The upper end of said stem 17 is screw-threaded as at 21, and passes loosely through an armature 22 with a nut 23 secured thereto above said armature 22. As
 15 shown in Fig. 2, the armature 22 is carried upon the end of an arm 24 and is arranged above the poles of the magnet 16, so that its downward movement will permit the valve 13 to be closed by its spring 19 and the up-
 20 ward movement of the armature will engage the nut 21 and lift the valve. The armature-carrying arm 24 forms part of a break joint lever, and for this purpose is pivotally carried at 25 upon an armature-lifting member
 25 or lever 26, said lever being pivoted at 27 upon a fixed standard 28 of the base 14. The armature-carrying arm 24, as before stated, carries at one end the armature 22 and is connected at its other end, as at 29,
 30 by a spring 30 to the lifting member 26. This spring 30 tends to keep the carrying arm 24 and lifting member 26 in definite relation so as to move as a single lever construction, but when the armature 22 is at-
 35 tracted to the magnet 16, the spring 30 will permit said lever construction to break joint around pivot 25.

The lifting member 26 is operated by a suitable train of multiplying levers from the
 40 thermostat 31, shown more clearly in Fig. 5. In the preferred form illustrated, a thermostat comprises a closed tube 32, such as of copper, which has a large coefficient of expansion, and a stem 31, as of carbon, with
 45 a very small coefficient of expansion, said stem being mounted in the tube as shown, so as to move back and forth with the contraction and expansion of said tube 32. The carbon stem 31 preferably has a metallic
 50 wear cap 33 engaging with the end 34 of a lever 35 pivoted at 36 upon a bracket 37 forming a part of the base 14, and the other end of said lever 35 has a projecting arm 38 extending beneath a lever 39 pivoted at
 55 40, also upon a part of the base 14. The lifting member 26 carries near to its pivot 27 an adjustable stud 41, the lower end of which engages the outer end of lever 39. Movement of the stem 31 to the right (look-
 60 ing at Fig. 4) due to the contraction of the tube 32, will operate through the train of multiplying levers 35, 39 and 26 to lift the armature 22. When the copper tube 32 expands, the weight of the multiplying
 65 levers, just named, will thrust the stem 31

toward the left in said tube 32, but if said weight is not sufficient or if the device is to be used in some other position so that the weight of the levers is not effective for this
 70 purpose, a suitable spring, such as 42, engaging a tail piece 43 of said lever 26, may be employed. It will be noted that the tube 32 communicates at its open end with the interior of the valve casing 11 and is mounted
 75 to extend horizontally directly into the water storage chamber 1 whereby it is readily responsive to changes of temperature in said water storage tank.

The adjustable stud 41 screw-threaded into lever 26 has fixed to its upper end a
 80 laterally projecting arm 44 with a slotted opening, into which plays the pin 45 of a crank arm 46. The crank arm 46 is fixed to shaft 47 extending through the upper wall 15 and which is provided at its upper end
 85 with an indicating pointer 48. As shown in Fig. 6, a suitable graduated dial 50 is placed beneath said indicating pointer 48. A spring 51 beneath the head of said pointer and received within a counter-sunk portion
 90 of the cover 15 tends to keep said shaft 14 tight within its bearing and prevent the escape of gas. From this it will be seen that the turning of the pointer 48 will effect the turning of the threaded adjusting screw
 95 41 to raise or lower the same within the lifting member 26, and the exact effect of this adjustment will be later described.

The operation of the apparatus will be readily understood from the description
 100 heretofore given, but may be briefly summarized as follows. Assuming the parts to be in the position shown in Fig. 2, the valve 13 is open and under these conditions gas is entering pipe 12, filling the interior of
 105 the valve chamber 11 and passing out through pipe 10 to the burner 3, thus heating the water within the coils 4. The hot water passes upwardly through pipe 5 into the tank 1, and gradually more and more
 110 water within said tank 1 becomes heated until the level of hot water descends as far as the thermostat tube 32. As soon as the tube 32 expands, the weight of the multiplying levers 39, 30 and 26, acting through
 115 lever 25, pushes said rod 31 to the left slowly during the gradual expansion of the tube 32. If the valve 13 were brought to its seat 20 as slowly as said tube 32 expands, the gas would be cut off too gradu-
 120 ally and a point would be reached wherein the gas supply would not be sufficient to effect the good mixture for the Bunsen burner, and the result would be a back fire in the burner, causing it to lose efficiency.
 125 Therefore it is desirable to close the valve quickly when it comes to within a predetermined distance of its seat 20, and this distance should be at least enough to in-
 130 sure the minimum amount of gas for effect-

ing a proper mixture within the Bunsen burner. In the present construction, when the armature 22 is slowly approaching the magnet 16 comes sufficiently far into the magnetic field of the magnet, it is suddenly and abruptly attracted to the magnet, whereupon the valve 13 is impelled by its spring 19 into a quick snap-closing position upon its seat. The movement of the armature 22 toward its magnet causes a rocking of the armature-carrying member 24 and creates a tension on the spring 30. The valve 13 thus having been closed, the burner 3 goes out and the water within the tank 1 gradually cools off. The thermostatic tube 32 will be contracted by the cooling of the water and will thrust the stem 31 to the right (Fig. 4), and through the train of levers heretofore described, elevate the lifting member 26 slowly. The member 26 through its pivotal connection 25 will tend to elevate the arm 24, but the armature end of said arm 22 is in contact with the magnet, and therefore only the spring end 29 of said arm will be elevated, creating an increased tension upon the spring 30. When this tension is sufficient to break the armature 22 away from the magnet 16, the armature end of the arm 24 will be thrown up abruptly to effect a quick opening of the valve 13, the spring 30 contracting for this purpose.

When it is desired to adjust the apparatus for a higher temperature of water within the tank 1, it is of course obvious that the tube 32 should be allowed to expand to a greater degree and thus permit stem 31 to move farther to the left (Fig. 4) before allowing the valve 13 to close. In other words, the armature lifting arm 26 must be initially placed in a higher position so that it will travel down a farther distance than before for permitting the valve 13 to close. For this purpose, therefore, the screw stud 41 should be turned in the lever 26 to lengthen its lower end and elevate the adjustment of arm 26 with respect to the lever 39. Conversely, when it is desired to maintain the water in tank 1 at comparatively colder temperature, the gas should be shut off with less expansion of the tube 32, and consequently the adjusting screw 41 should be turned in such direction as to shorten its lower end 41' and to permit the lever 26 to stand initially into a lower position with respect to the lever 39. It will be noted that the spring 30, since it is carried with the lever 26 and arm 24 in the various up and down adjustments thereof, has its tension only negligibly affected by said adjustments.

It is obvious that various changes and modifications of the parts and arrangements here shown may be made within the scope of my invention, and therefore the

claims should be given an interpretation to include all such immaterial variations.

What I claim as new is—

1. In a thermostatic control for hot water gas heaters in combination, a gas valve and magnet, an armature coacting with said magnet for controlling the quick opening and closing of said valve, an armature lifting member, connections between said lifting member and said armature, comprising a spring carried bodily with said lifting member, and a thermostat for actuating said lifting member.

2. In a thermostatic control for hot water gas heaters in combination, a gas valve and magnet, an armature coacting with said magnet for controlling the quick opening and closing of said valve, an armature lifting member, an armature carrying arm pivoted on said lifting member, a spring connection between said armature-carrying arm and said lifting member, and a thermostat for actuating said armature-lifting member.

3. In a thermostatic control for hot water gas heaters in combination, a gas valve and magnet, an armature coacting with said magnet for controlling the quick opening and closing of said valve, an armature lifting member, an arm pivoted between its ends on said lifting member and carrying the armature at one end thereof, a spring connecting the other end of said arm with said lifting member, and a thermostat for actuating said armature lifting member.

4. In a thermostatic control for hot water gas heaters in combination, a gas valve with a spring tending to close it, a keeper for limiting the upward movement of said valve, a magnet, an armature coacting with said magnet having a loose play connection with said valve for controlling the quick opening and closing of said valve, an armature lifting member, connections between said lifting member and said armature comprising a spring for permitting a limited movement of said lifting member against the tension of said spring without lifting the armature, and a thermostat for actuating said armature-lifting member.

5. In a thermostatic control for hot water gas heaters in combination, a gas valve, a keeper for limiting the upward movement of said valve, a spring between said keeper and valve tending to close the valve, a magnet, an armature coacting with said magnet having a loose play connection with said valve for controlling the quick opening and closing of said valve, an armature lifting member, connections between said lifting member and said armature comprising a spring for permitting a limited movement of said lifting member against the tension of said spring without lifting the armature, and a thermostat for actuating said armature-lifting member.

6. In a thermostatic control for hot water gas heaters, in combination, a gas valve and magnet, an armature coacting with said magnet for controlling the quick opening
5 and closing of said valve, an armature lifting member, an armature lever pivoted on said lifting member, a spring between said lever and member, a thermostat, connections
10 stat, and means for adjusting said connections without varying the tension of said spring.

7. In a thermostatic control for hot water gas heaters, in combination, a gas valve and
15 magnet, an armature coacting with said magnet for controlling the quick opening and closing of said valve, an armature lifting member, an armature lever pivoted on said member, a thermostat, connections be-
20 tween said thermostat and said lifting member, means for adjusting said connections,

and a tension spring between said lifting member and armature lever bodily movable when said adjusting means is moved, whereby the tension of said spring remains sub- 25
stantially constant.

8. In a thermostatic control for hot water gas heaters, in combination, a thermostat, a lifting member operated thereby, an armature lever supported intermediate its length 30
on said lifting member, a gas valve, and an armature carried on said lever, a magnet for said armature, and a tension spring arranged between the end of said lever and
said lifting member, said spring adapted to 35
be stretched upon the raising of the lifting member to effect an increased tension against the pull of the magnet upon the armature.

Signed at New York city, N. Y., this 5th 40
day of February, 1918.

EMANUEL M. YOUNGMAN.