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THERMOSTATIC VALVE

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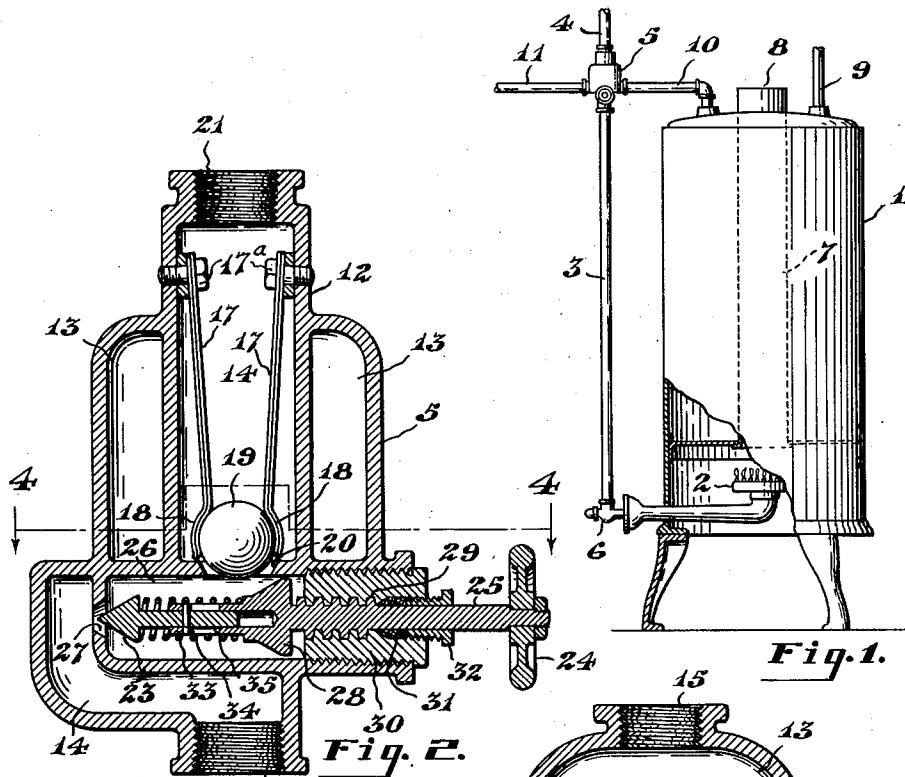


Fig. 1.

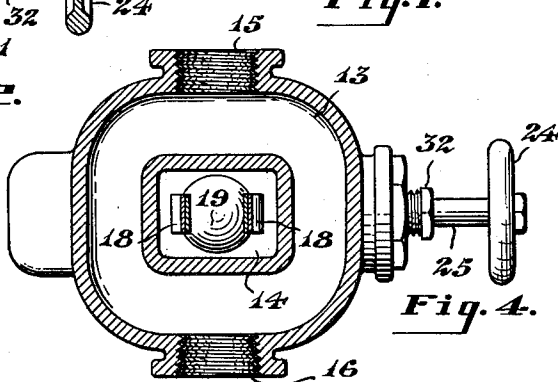


Fig. 4.

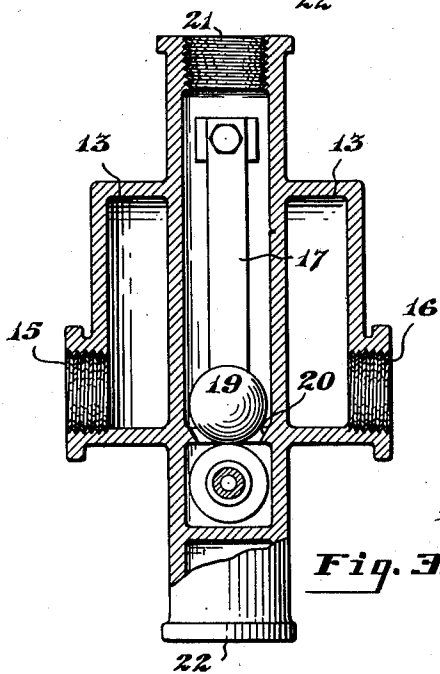


Fig. 3.

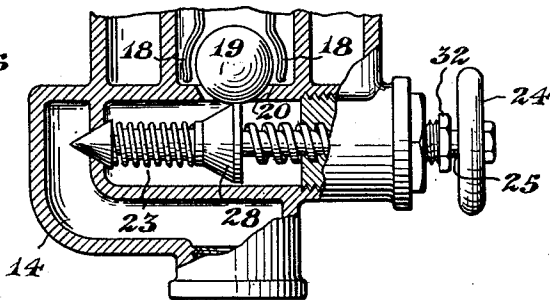


Fig. 5.

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THERMOSTATIC VALVE

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7 Claims. (Cl. 137—161)

This invention relates to safety devices for heating appliances which use a fluid fuel and is particularly directed to a fuel cut-off device responsive to hazardous temperature conditions which are apt to be encountered in the operation of the appliance.

It is the object of this invention to provide a combined manually operable and temperature responsive cut-off valve having a minimum number of parts which may be readily and inexpensively manufactured; the device being of simple construction so as to insure the proper operation of the device over long periods of time.

Stated in general terms, my improved valve comprises in a unitary structure, a manually operable portion and a thermostatically operable portion, the latter of which is under control of a thermostat responsive to temperature conditions of the substance being heated. The manually operable valve and the thermostatically operable valve are operatively associated with each other so that the closing of the hand operated valve effects the opening of the thermostatically controlled valve, the closing of which is solely under control of a thermostat associated therewith.

With these and other objects in view, the invention consists in the novel construction, arrangement and combination of parts, hereinafter described, illustrated in some of its embodiments in the accompanying drawing and particularly pointed out in the appended claims.

Referring to the drawing, Figure 1 is a side elevational view of a water heater illustrating one mode of practicing my invention; Figure 2 is an enlarged central sectional view illustrating the details of my improved valve with the valve parts shown in open position; Figure 3 is a central sectional view corresponding to Figure 2 with the parts rotated 90°; Figure 4 is a sectional view taken on line 4—4, Figure 2; and Figure 5 is a sectional view corresponding to Figure 2, with the manually operable valve shown in closed position.

In Figure 1, I have shown a conventional water heater merely for purposes of illustrating one use to which my improved control device may be put. The heater illustrated comprises a storage tank 1, the liquid contents of which are heated by a gas burner 2, supplied with fuel by way of the conduits 3 and 4, between which I have interposed my improved fuel control device 5.

Adjacent to the burner, there is provided a regulating valve 6 of suitable design for regulating the flow of gas to the burner 2 as is custom-

ary in devices of the type illustrated. The heated products of combination from the burner 2 are conducted from the appliance by means of an internal flue 7, which terminates in a collar 8 which is provided for connection with a suitable vent pipe or flue.

The water heater is connected to a water supply line by means of a cold water inlet pipe 9 which is provided to supply cold water to the tank. A hot water outlet pipe 10 communicates with the interior of the tank and with one side of the casing of the valve 5, the opposite side of which is in communication with the pipe 11 of the hot water system.

The valve 5 includes an integrally formed casing 12 having a water chamber or passageway 13 and a gas passageway 14, separate from the water passageway. The water passageway 13 is in communication with the threaded inlet and outlet openings 15 and 16 which are arranged for connection with the hot water conduits 10 and 11 respectively whereby the valve parts are maintained at substantially the same temperature as that of the water in the tank 1, the purpose of which will be described in detail presently.

The upper portion of the gas passageway 14 is jacketed or surrounded by the hot water chamber 13. Within this portion of the gas passageway, I have positioned a pair of bimetallic thermostatic bars 17, secured at their upper ends to the casing 12 by any suitable means such as the bolts 17a. The lower free ends of the thermostatic bars are circularly curved at 18 so as to provide a holding device for the spherical valve member 19. Immediately below the valve sphere, 35 is a valve port 20, providing a seat for the sphere 19.

This portion of the device operates in response to the temperature of the water to provide a fuel cut-off device when the water temperature exceeds a predetermined temperature at which time the lower ends of the thermostatic bars 17 move away from each other allowing the sphere 19 to drop onto its seat 20 thus cutting off the flow of gas between the inlet 21 and the outlet 22 of the valve, which are connected to the conduits 4 and 3 respectively.

After the stated operation takes place, the device is then in a closed and inoperative position. The sphere 19 is raised to uncover its port 20 through the operation of a manually operable valve member 23, under control of a hand wheel 24 which is rigid with a valve stem 25. The valve member 23 is of conical shape and it cooperates with a ported valve seat 27, formed in the cham-

ber 26 which is in communication with the port 20.

A conical portion 28 is formed on the valve stem 25 intermediate the ends thereof. The valve stem 25 has a threaded portion 29, which engages with the threads formed in a plug 30, threadably received by the casing 12. The plug 30 is further provided with a recess for the reception of packing material 31, held in place by means of the packing gland 32, provided to prevent the escape of gas from around the stem 25 of the manually operable valve.

After the sphere 19 has been released and has dropped into engagement with the seat 20, gas can be again supplied to the burner 2 by turning the hand wheel 24, bringing the portion 23 of the needle valve into engagement with the seat 27, whereupon the valve assumes the position shown in Figure 5 in which the cone 28 engages the sphere 19, raising it to the position shown in this figure. After the water in the tank 1 has cooled sufficiently, the lower ends 18 of the thermostatic bars will shift towards each other and engage the sphere 19 holding it in the position shown in Figure 2, whereupon the manually operable valve 23 may be shifted to its open position and the burner may be re-ignited, and the device will function to supply gas to the burner 2 until the water again exceeds the predetermined temperature for which the thermostatic bars 17 are set.

From the preceding, it is apparent that I have provided a relatively simple and inexpensive control device which automatically serves to cut off the gas supply to the burner of the appliance in the event dangerously high temperatures are reached by the medium being heated and the device further functions as a manually operable shut-off valve which may be operated in the ordinary manner of such valves to control the operation of the appliance. The automatic thermostatic control need be given no consideration by the operator as it automatically functions to protect against overheating of the water in the tank. The arrangement of the valve whereby it is necessary to manually cut-off the fuel supply for a period of time before the thermostatic device is in condition to supply gas to the burner is an important safety feature of my improved valve as it prevents the turning on of the fuel either intentionally or accidentally when the tank is in an overheated condition.

Furthermore, it is to be understood that the particular forms of apparatus shown and described, and the particular procedure set forth, are presented for purposes of explanation and illustration and that various modifications of said apparatus and procedure can be made without departing from my invention as defined in the appended claims.

Having thus described my invention, what I claim is:

1. A valve device to control the flow of one fluid by temperature conditions of a second fluid, including a first passageway for conducting said first fluid, two valve elements in said passageway normally open and adapted to close the same, one of said valves when moved to closed position adapted to move the other to open position, means responsive to temperature changes for controlling the closing of one of the valves when the other valve is in open position, and a second passageway for conducting the second fluid adjacent said responsive means.

2. A valve for controlling the flow of one fluid

by the temperature conditions of a second fluid, comprising a casing having inlet and outlet openings and communicating passageways therebetween with a pair of valve seats surrounded by said passageways, a pair of valve members associated with said valve seats and normally held in one position, and means responsive to the temperature of said second fluid to cause the movement of one of said valve members to another of its positions, and means for operating the other of said valve members to another of its positions and for moving said first named valve member to its normal position.

3. A valve for use with heated fluid, comprising a casing, a passageway therein, a movable member therein normally held open and adapted to close the passageway, a second movable member adapted to move the first member to open position and to close the passageway, a heat responsive device adapted to control the closing of the first member when the second movable member is in its open position, and means in the casing for conducting the heated fluid adjacent the heat responsive device.

4. Automatic cut-off and manually adjustable valve comprising a casing, a fluid conducting passageway extending through said casing, a pair of valve seat portions disposed in series relation in said passageway, a valve member disposed adjacent one of said valve seats for fluid flow obstructing engagement therewith, automatically operable means for controlling the obstructing position of said member, a reciprocable valve member disposed adjacent the second of said valve seats for fluid flow obstructing engagement therewith, manually actuable means for reciprocably moving said reciprocable member toward or away from said second valve seat, and means associated with said manually actuable means for engaging said first mentioned member and moving it to its unobstructing position by the continued movement of said manually actuable means with said second member in flow obstructing position.

5. An automatic cut-off and manually adjustable valve comprising a casing, a fluid conducting passageway extending through said casing, a pair of valve seat portions disposed in series relation in said passageway, a valve member disposed adjacent one of said valve seats for fluid flow obstructing engagement therewith, automatically operable means for controlling the obstructing position of said member, a reciprocable valve member disposed adjacent the second of said valve seats for fluid flow obstructing engagement therewith, manually actuable means for reciprocably moving said reciprocable member toward or away from said second valve seat, a slack motion connection between said manually actuable means and said reciprocable valve member comprising a spring and a slidable support for said valve member, and means associated with said manually actuable means for engaging said first mentioned member and moving it to its unobstructing position by the continued movement of said manually actuable means with said second member in flow obstructing position.

6. An automatic cut-off and manually adjustable valve comprising a valve casing, a fluid conducting passageway extending through said casing, an automatically controlled valve for obstructing fluid flow in said passageway, a second valve for obstructing fluid flow in said passageway, manually movable means for adjusting the position of said second valve, means connecting

said means with said second valve to permit relative movement therebetween after the valve has been moved to its flow obstructing position, and resetting means associated with said manually
5 movable means for resetting said automatically controlled valve to its open position after said second valve has been moved to its flow obstructing position.

10 7. An automatic cut-off and manually adjustable valve comprising a casing, a fluid conducting passageway extending through said casing, a pair of valve seat portions disposed in series relation in said passageway, a first one of said valve seats adapted to be disposed in a substantially horizon-

tal plane, a substantially spherical member adapted to engage said first valve seat in flow obstructing relation, a thermostatic bar having a portion adapted to engage said spherical member for normally holding it spaced above said first
5 valve seat, a member adapted to engage the second one of said valve seats in flow obstructing relation, and manually adjustable actuating means therefor comprising means for moving
10 said spherical member to its spaced unobstructing position when said second valve seat flow obstructing member is moved to its flow obstructing position.

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