Sept. 13, 1938. R. W. JOHNSON 2,129,937

OIL CONTROL DEVICE

Filed May 13, 1935 2 Sheets-Sheet 1

Fig. 1.

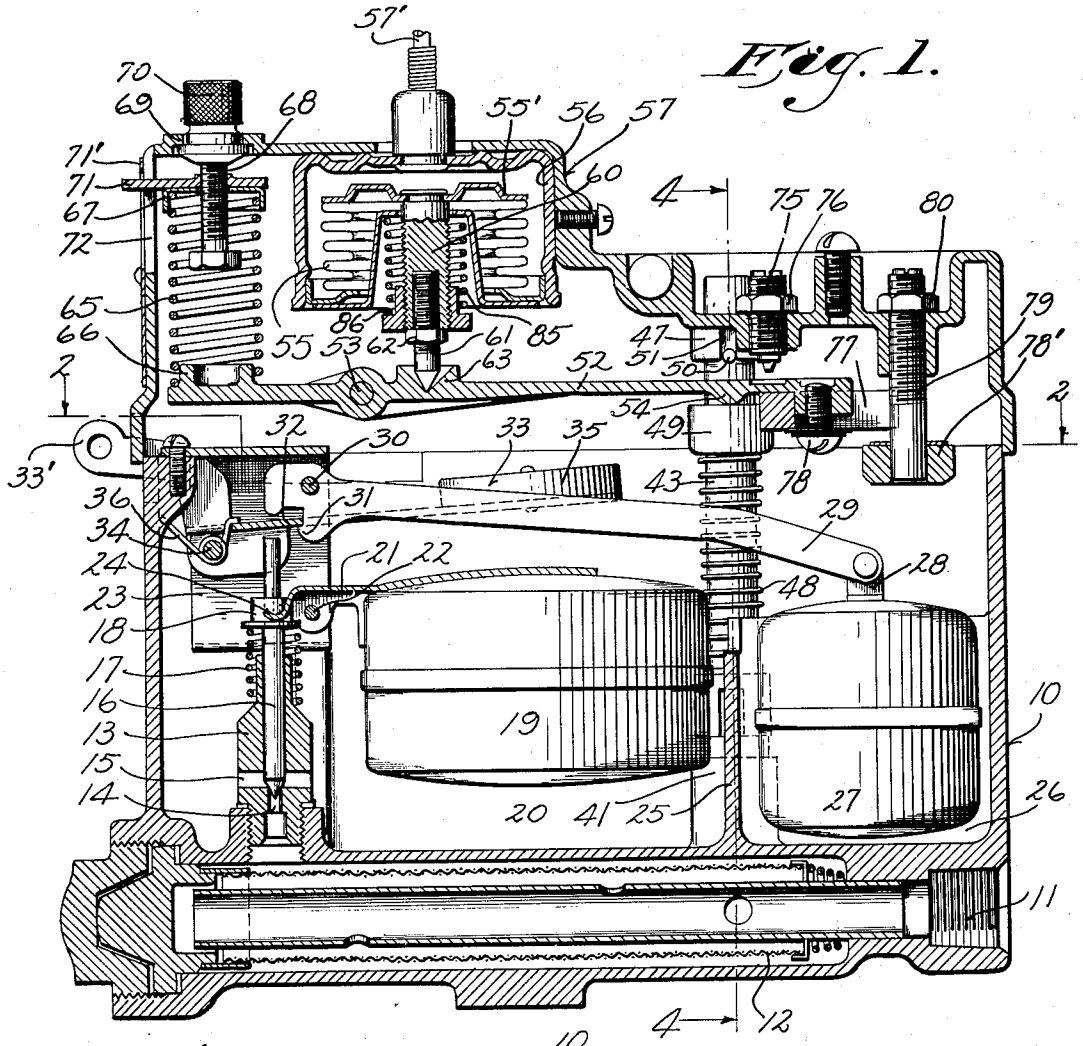

Fig. 2.

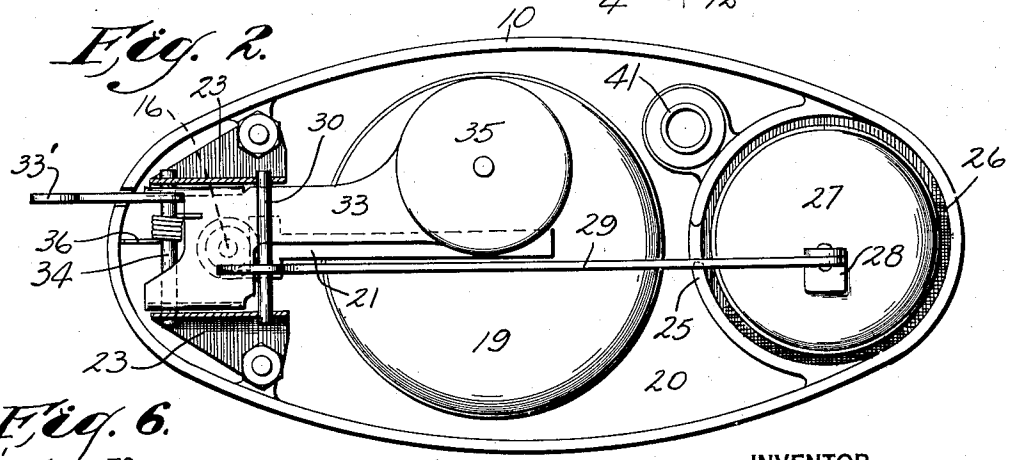

Fig. 6.

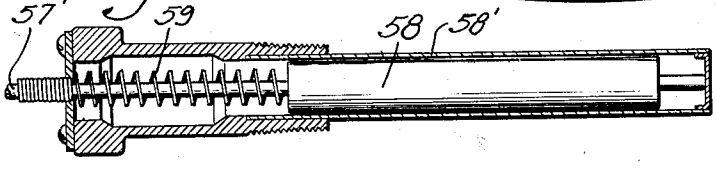

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Fig. 3.

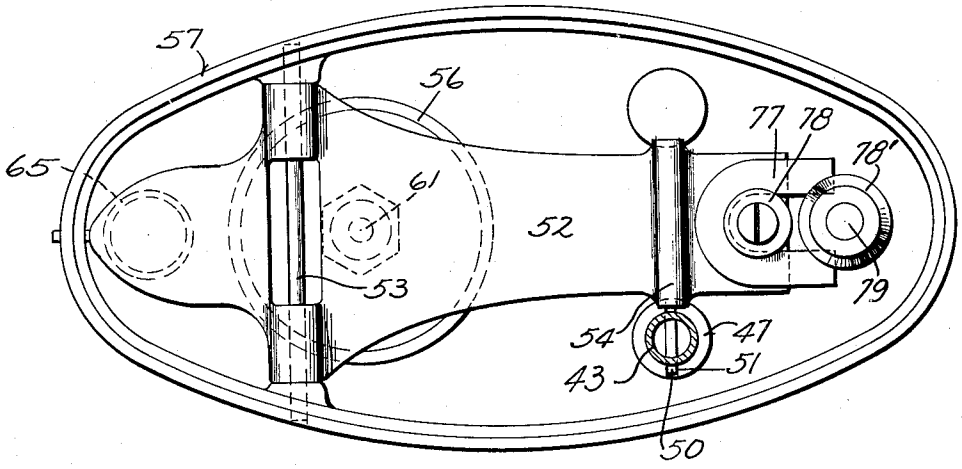


Fig. 4.

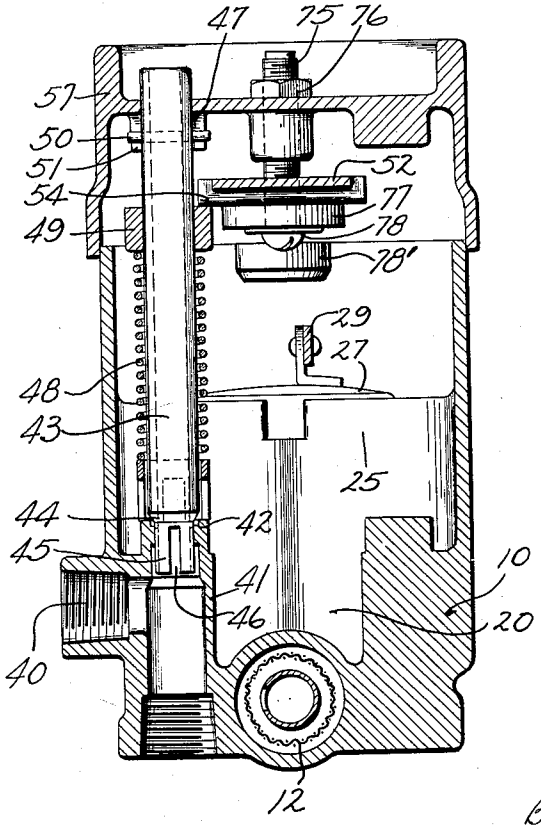
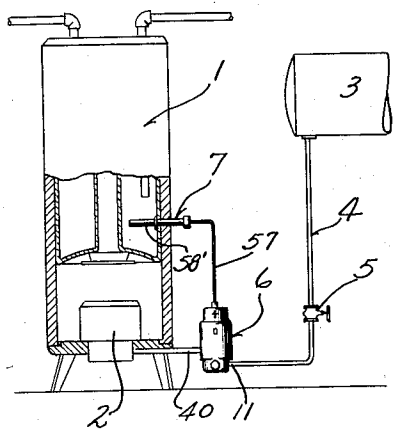


Fig. 5.



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OIL CONTROL DEVICE

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3 Claims. (Cl. 236—99)

This invention relates in general to an oil control device designated to regulate the flow of oil from a reservoir or tank to a burner especially where the oil is fed by gravity.

One object of the invention is to provide a device of this character which may be advantageously used with gravity feed oil fired water heaters or the like, the device being adapted to respond to temperature conditions so that oil is supplied to the burner when the temperature of the water drops below a certain value and is automatically shut off when the temperature rises to a predetermined point.

Another object of the invention is to provide a device of this character and which is simple and compact in construction, reliable and effective in operation and easily and comparatively inexpensive to manufacture and install.

The device is so constituted that while it is readily reponsive to the limits of any selected temperature range it operates with certainty and effectiveness and especially so in connection with the shutting off of the oil supply, the latter operation being performed with a snap action.

Along with these advantages the device is adjustable and readily so to maintain a high or low fire.

Another object of the invention is to introduce into the mechanism a large factor of safety whereby in the event of failure of the means which responds to the temperature the flow of oil will be automatically shut off.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings, forming a part of this specification, and in which:

Figure 1 is a view in longitudinal vertical cross section showing an oil control device embodying the present invention, parts being shown in elevation for the sake of illustration;

Figure 2 is a view in horizontal cross section taken on line 2—2 of Figure 1 and looking in the direction of the arrows;

Figure 3 is a similar view taken on line 3—3 of Figure 1, and looking in the direction of the arrows;

Figure 4 is a view in transverse vertical cross section taken on line 4—4 of Figure 1;

Figure 5 is a diagrammatic view partly in elevation and partly in section illustrating one way in which the oil control device may be installed or practically applied; and

Figure 6 is a detail view partly in elevation and partly in cross section and showing the expansion tube, immersion well and associated parts.

Referring to the drawings, and more especially to Figure 5, it will be seen that the device may be employed in connection with a domestic hot water heater designated generally at 1 and of the type wherein the water is heated by means of an oil burner 2. From a tank or reservoir 3, which contains the supply of oil, a feed line 4 extends to the oil burner 2. In the feed line a shut-off valve 5 may be provided. An oil control device embodying the present invention is designated generally at 6 and is incorporated in the feed line. The action of the oil control device is regulated by a thermo-responsive element designated generally at 7.

The oil control device 6 comprises a casing designated generally at 10. The lower portion of the casing is provided with an inlet 11 equipped with a suitable strainer and screen device designated at 12. The oil, after passing through the strainer, flows up through the body of an inlet valve 13, this valve body 13 having an axial port 14 and transverse ports 15. A needle valve 16 is slidably interfitted with the valve body and controls the flow of oil through the ports 14 and 15. A spring 17 encircles the reduced upper end of the valve body and has its lower end abutting against the valve body and its upper end abutting a flanged collar 18 secured to the needle valve 16. The spring biases the valve to open position. A float 19 is provided within the casing and is located in a liquid supply chamber 20. A lever 21 is attached to the float and is fulcrumed as at 22 on a mounting bracket 23. The lever 21 has a curved end 24 which bears against the flange of the collar 18 so that as the level of liquid in the supply chamber 20 rises the float will be elevated and its lever 21 rocked about the fulcrum 22 to cause the end 24 thereof to press down on the flange of the collar 18 and close the valve. As the level in the chamber 20 drops the action is reversed and the spring 17 functions to open the valve. In this way a selected or predetermined level is maintained in the chamber 20.

In the event grit or sediment tends to prevent seating of the valve 16 upon rise of liquid in the chamber 20 above the predetermined level, the liquid will flow over a partition or dam 25 and into an auxiliary chamber 26. This will result in the elevation of an auxiliary float 27 which has a lug 28 pivotally connected to one end of

a latching lever 29. The latching lever 29 is fulcrumed as at 30 on the bracket 23 and has a latching hook 31 engageable with the shoulder 32 of an auxiliary valve operator designated generally at 33. This operator 33 is pivotally mounter as at 34 on the bracket 23 and is biased by means of a weight 35 and a spring 36 to swing sharply downwardly. Normally, it is prevented from such swinging movement by the latch 31, but when the latch is disengaged by elevation of the float 27, the weight 35 and spring 36 are allowed to operate and the operator 33 swings quickly down and punches the valve 16 closed. The operator 33 has an arm 33' projecting exteriorly of the casing and providing a means whereby it may be reset. When reset the latch 31 automatically snaps into operative position and the float 27 displaces the fuel in chamber 26 back into chamber 20 so that the device is again ready for operation.

The casing 10 is provided with an outlet 40 and adjacent this outlet 40 the casing has an integral vertical sleeve 41 formed with a valve seat 42. A tubular outlet valve 43 is provided and has a beveled portion 44 designed to engage the seat 42 and also has a reduced extension 45 provided with a metering slot 46. The tubular valve 43 is not only guided in the sleeve 41 but also in a guide structure 47 provided in the horizontal web integral with the upper part of the casing. A spring 48 encircles the valve 43 and has a lower end engaged against the upper end of the sleeve 41 and its upper end engaged under a collar 49 suitably fixed to the valve so that the tendency of the spring 48 is to open the valve. The valve is constrained to vertical movement by means of a guide pin 50 extending diametrically therethrough and having its ends projecting therefrom and working in slots 51 of the guide structure 47. An operating lever 52 is provided for the valve and is fulcrumed on a cross pin 53 supported by the casing. One portion of this lever has a laterally extending boss or projection 54 which bears against the collar 49 so that when the lever is swung in one direction it will be effective to close the valve.

The lever 52 is controlled as to its position by means of a bellows 55 contained within a cup-like carrier 56 suitably fastened to the top 57 of the casing. This bellows is filled with a suitable volatile liquid and is filled under vacuum. The liquid not only fills the bellows but also a connecting tube 57' and an expansion tube 58 held at the inner end or bottom of an immersion well 58' by means of a spring 59. The well 58' is tapped into the side of the water heater as illustrated diagrammatically in Figure 5. As the temperature of the water in the heater rises the expansion tube increases the pressure in the bellows 55, and this pushes the bellows downwardly. This motion of the bellows is transmitted to the lever 52 by means of a stud 60 connected with the upper end plate of the bellows and having a bolt 61 threaded thereinto and secured in position by a lock nut 62. The lower end of the bolt 61 is tapered and engages in a similarly formed socket 63 provided on the lever.

The bellows works against a spring 65 which has one end engaged over a boss 66 of the lever and its other end bearing against an abutment 67 threadedly interconnected with an adjusting bolt 68. The bolt 68 has a swivel-like mounting 69 on the casing top and its upper end projects above the casing and is enlarged and knurled as indicated at 70 so that it may be turned with facility. A portion 71 of the abutment projects through and is guided by a slot 72 in the side wall of the casing so that as the bolt is turned the abutment moves up or down but does not rotate. In this way the tension of the spring may be varied as desired. The projecting portion 71 may also be used as an indicator or pointer and in such capacity coacts with suitable indicia such as "Warm", "Medium", "Hot", or suitable numerals provided on an indicator plate 71' fastened to the casing adjacent the slot 72.

The movement of the lever 52 is limited in one direction by means of a stop screw 75 threaded through the top of the casing and held in position by a lock nut 76. When the lever 52 swings up against the stop screw 75 it allows the valve 43 to open under the influence of its spring 48 whereas when it swings down to its other position its projection 54 coacts with the valve collar 49 to close the valve. In order that the valve may be closed with a snap action, a U-shaped permanent magnet 77 is secured in any suitable manner as by means of a screw and washer 78 to one end of the lever and is designed to coact with a magnetic pole or stop 78' adjustably supported on the casing by means of a stud 79 threaded to the casing and secured in position by a lock nut 80.

With a device of this character, as the temperature of the water reaches a predetermined value the volatile filling within the bellows is expanded and the bellows plate 55' moved downwardly with the result that the lever 52 is rocked in a clockwise direction as viewed in Figure 1, thereby moving the valve toward its closed position against the action of its spring 48. As the valve approaches its closed position the magnetic field of the magnet 77 traverses the magnetic body 78 and when the body 78 is threaded by sufficient flux, these parts 77 and 78' coact to close the valve with a snap action. As the water cools off or as it is replaced by cold water the volatile filling of the bellows contracts and the spring 65 rocks the lever 52 in a counter-clockwise direction, as viewed in Figure 1, permitting the valve 43 to open under the influence of its spring 48. The extent of opening of the valve may be varied by varying the adjustment of the screw 75.

In the event the bellows or the elements connected thereto should leak, atmospheric pressure will be established within the bellows and this will allow the safety spring 85 interposed between the shoulder 86 and the bellows casing (and now no longer working against atmospheric pressure) to automatically swing the lever 52 downwardly and close the outlet valve. Normally, however, the valve is closed under the controlling action of the bellows, although in the final phases of the closing movement the magnet 77 comes into action and insures closing of the valve with a snap action, as above described.

The rate to which the fuel is supplied to the burner when the valve 43 is fully open is determined by the adjustment of the screw 75 which may be set to limit the extent of opening of the valve 43 as desired. Where it is desired to maintain a low fire flame the body 75 which functions not only as a magnet pole but also as a stop may be set by adjustment of its stud 79 to regulate the low fire flame.

While I have shown and described one construction in which the invention may be embodied, it is to be understood that this construction has been selected merely for the purposes of example or illustration and that various changes

in the size, shape and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the subjoined claims.

The invention claimed is:

1. A control device of the character described comprising a casing having a liquid supply chamber therein and provided with an outlet, a valve in the casing cooperable with the outlet to regulate flow therethrough, spring means biasing the valve to open position, a single lever fulcrumed within the casing and cooperable with the valve to force it to closed position when swung in one direction, said casing having a top overlying said lever, a bellows interposed between the top and lever and having a member bearing down on the arm of the lever engaged with the valve, said bellows having a volatile filling therein and being effective to cause the lever to close the valve when the bellows is expanded under the influence of rising temperature on said volatile filling, spring means interposed between the top of the casing and the lever and engaged with the lever on the side thereof opposite to that engaged by said member and opposing the action of the bellows and means operable from the exterior of the casing for adjusting said spring means to regulate the temperature at which the valve is closed.

2. A control device of the character described comprising a casing having a liquid supply chamber therein and provided with an outlet, a valve in the casing cooperable with the outlet to regulate flow therethrough, spring means biasing the valve to open position, a single lever fulcrumed within the casing and cooperable with the valve to force it to closed position when swung in one direction, said casing having a top overlying said lever, a bellows interposed between the top and lever and having a member bearing down on the arm of the lever engaged with the valve, said bellows having a volatile filling therein and being effective to cause the lever to close the valve when the bellows is expanded under the influence of rising temperature on said volatile filling, spring means interposed between the top of the casing and the lever and engaged with the lever on the side thereof opposite to that engaged by said member and opposing the action of the bellows, means operable from the exterior of the casing for adjusting said spring means to regulate the temperature at which the valve is closed, a permanent magnet secured to the end of the arm of the lever engaged with the valve and a stationary magnetic member carried by the casing and cooperable with said permanent magnet to effect closing of said valve with a snap action.

3. A control device of the character described comprising a casing having a liquid supply chamber therein and provided with an outlet, a valve in the casing cooperable with the outlet to regulate flow therethrough, spring means biasing the valve to open position, a single lever fulcrumed within the casing and cooperable with the valve to force it to closed position when swung in one direction, said casing having a top overlying said lever, a bellows interposed between the top of the casing and the lever, said bellows being hermetically sealed and having a pressure therein below atmospheric, a shouldered member connected to the bellows, projecting exteriorly thereof and bearing down on the arm of the lever engaged with the valve whereby the bellows is effective to cause the lever to close the valve when the bellows is expanded, spring means interposed between the top of the casing and the arm of the lever on the opposite side of its fulcrum from that engaged with the valve and opposing the action of the bellows, means operable from the exterior of the casing for adjusting said spring means, a safety spring having one end engaged with the shoulder of said member, and a fixed abutment for the opposite end of said spring, said safety spring being normally ineffective but functioning, should the bellows leak, to close said valve.

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