

April 3, 1951

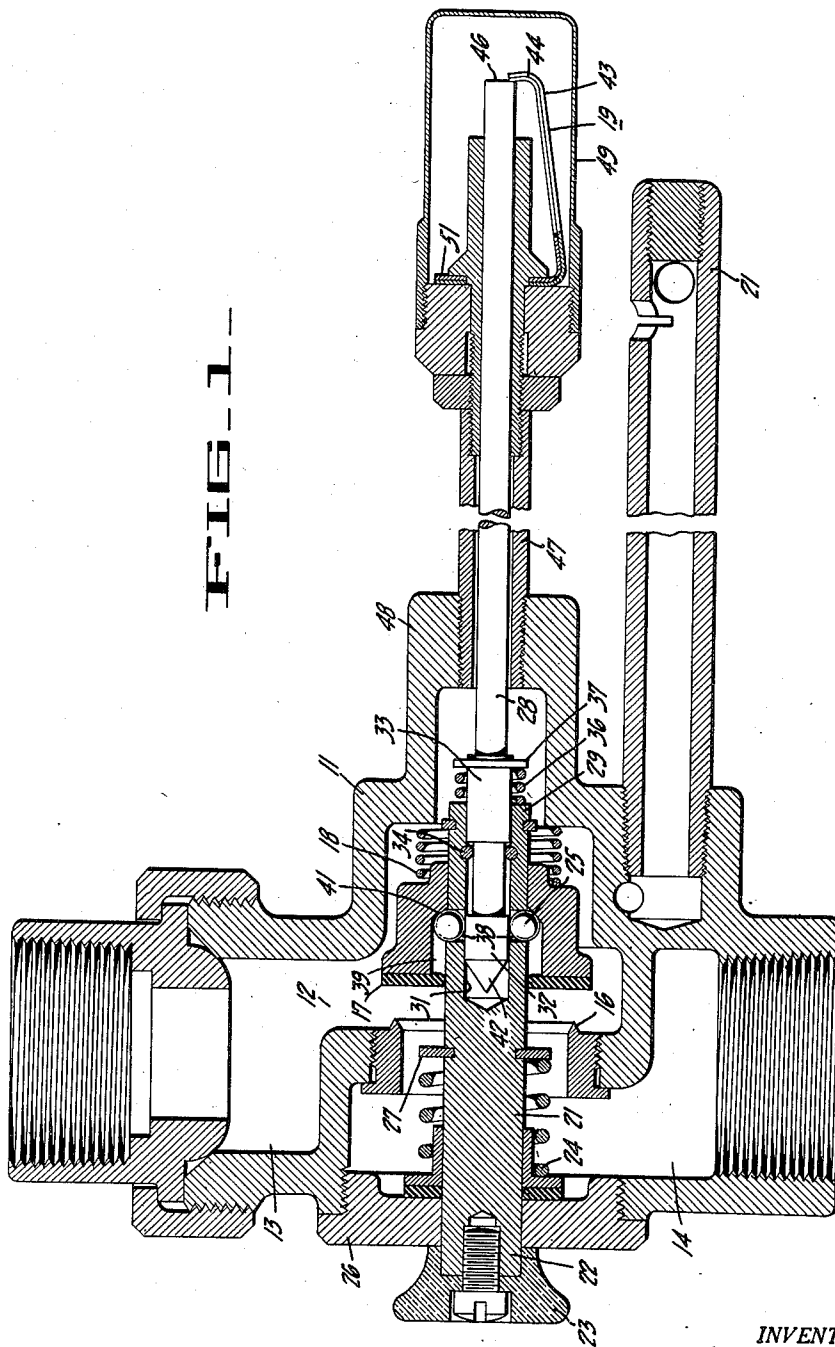
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2,547,853

RESET MECHANISM FOR PILOT SAFETY VALVES

Filed May 21, 1948

3 Sheets-Sheet 1



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RESET MECHANISM FOR PILOT SAFETY VALVES

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3 Sheets-Sheet 2

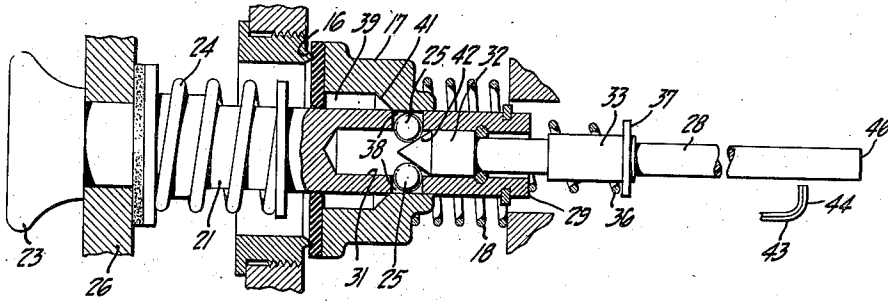


FIG. 2.

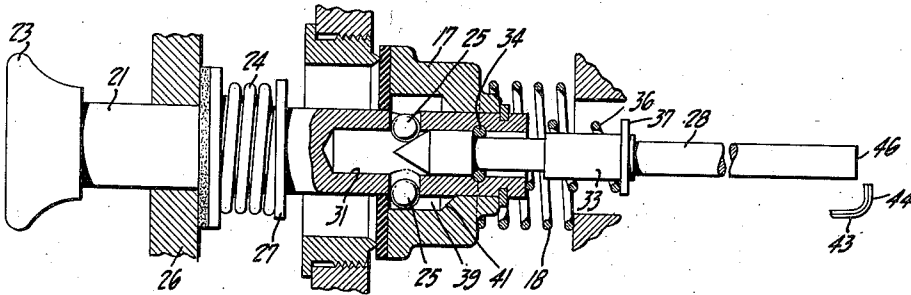


FIG 3

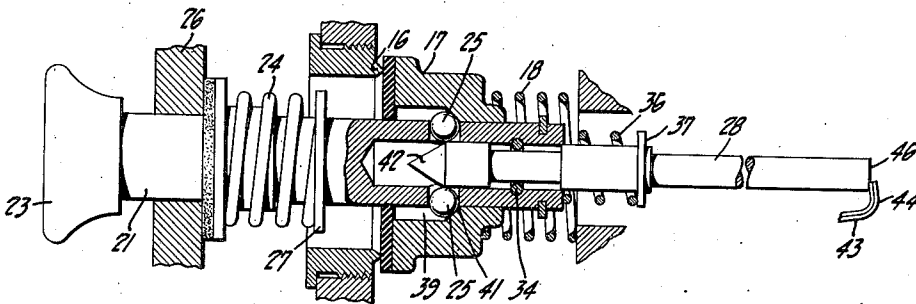


FIG. 4.

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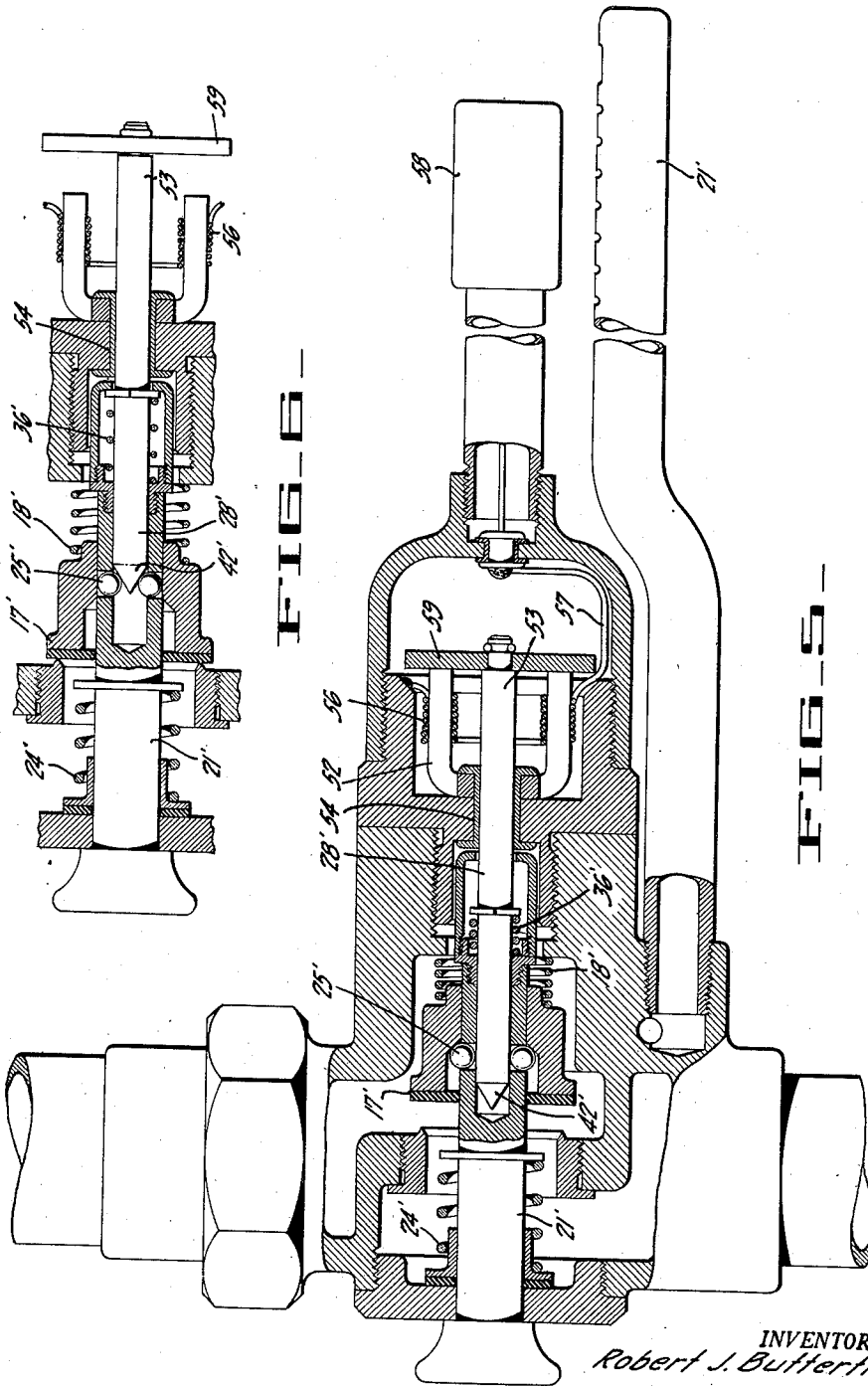
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RESET MECHANISM FOR PILOT SAFETY VALVES

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3 Sheets-Sheet 3



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RESET MECHANISM FOR PILOT SAFETY VALVES

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4 Claims. (Cl. 137-139)

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The invention relates to pilot burner operated safety valves of the type controlling the fuel flow to the main burner of a heat appliance and functioning to shut off such flow upon extinguishing of the pilot flame, and relates more particularly to what is known as the reset mechanism for such safety valves.

An object of the present invention is to provide a reset mechanism for pilot operated safety valves of the character described, providing for what is commonly referred to as safe lighting, that is the positive prevention of fuel flow to the main burner of the heat appliance until after the pilot burner is ignited and properly put in operation.

Another object of the present invention is to provide a reset mechanism of the character above in which there has been eliminated all auxiliary valves and locking devices upon which the provision of safe lighting has heretofore depended, whereby the device of the present invention is rendered more positive and foolproof in its operation.

A further object of the invention is to provide a reset mechanism of the character above which is adaptable for use with all existing forms of pilot safety valves and more particularly to existing forms of thermostatically operated catches and releases including such types as electromagnetic, bimetal, deflecting tube, etc.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

With reference to said drawings:

Figure 1 is a cross sectional view of a pilot operated safety valve constructed in accordance with the present invention.

Figure 2 is a fragmentary view of the reset mechanism in the shut-off position of the valve.

Figure 3 is a fragmentary cross sectional view of the reset mechanism in another position of the parts.

Figure 4 is a fragmentary cross sectional view of the reset mechanism in still another position of the parts.

Figure 5 is a cross sectional view of a modified form of the safety valve.

Figure 6 is a fragmentary cross sectional view

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of the reset mechanism illustrated in Figure 5 but in a different position of its several parts.

The safety valve illustrated in the accompanying drawings includes a valve body 11, formed with an internal gas passage 12 extending between inlet and outlet openings 13 and 14 adapted for connection to conduits in the fuel line to the main burner of a heat appliance. Provided in the passage 12 is an annular valve seat 16 and a valve 17 movable to and from the seat to close or open fluid flow through the passage. The valve 17 is constantly urged to a closed position by a helical spring 18 but is held in an open position during normal operation by a thermostatic catch means 19 energized by a pilot burner 21 which in an appropriate installation is mounted in proximity to the main burner of the appliance and is in constant operation so as to provide periodic ignition of the main burner as fuel is supplied thereto. Upon extinction of the pilot flame, the thermostatic catch means 19 is operated to release the valve 17 for movement to its closed position under the urge of spring 18 so as to thereafter prevent the flow of fuel to the main burner of the appliance. After closing of the valve 17 as above described, means is provided for opening the valve and resetting the thermostatic catch means 19 after the pilot burner is again ignited and put in proper operation. During this resetting operation it is important that the valve 17 remains closed until after it is certain that the pilot is in proper operation. This provision in pilot safety valves is commonly referred to as safe lighting and is particularly important where gas is used as the fuel so as to prevent the flow of gas to the main burner until after the pilot burner has been ignited and put into operation.

With reference to the drawings the reset mechanism includes a member 21 which is mounted in the body 11 for reciprocation and having one end 22 extending from the body and fitted with a button 23 for manual engagement and displacement, in conjunction with means 25 providing a detachable connection between the valve 17 and the member 21 for displacing the valve to open position and the operation of which means is controlled by the thermostatic catch means 19 so as to make and break such connection in the caught and uncaught positions respectively of the means 19. Preferably the member 21 is mounted axially through the valve seat 16 and extends centrally through and provides a sliding support for the valve 17 so as to properly guide the valve in its movement to and from the seat 16.

A helical spring 24 is positioned around the member 21 and compressed between a closure part 26 for the body and a washer 27 mounted on the member 21 so as to constantly urge the member 21 to a position inwardly of the body, that is with the button 23 on the outer end of the member drawn up against the closure part 26. Of importance in this construction is the fact that spring 24 is somewhat stronger than spring 18, so that in the attached position of member 21 and the valve 17, spring 24 will overcome the resilience of spring 18 and provide for the opening of valve 17.

Means for controlling the operation of the detachable connection 25 here includes a longitudinal extension 28 slidably carried for relative longitudinal movement by the inner end 29 of member 21. As will be seen from Figure 1 the inner end 29 of member 21 is provided with an axial bore 31 which slidably receives spaced enlarged end portions 32 and 33 on the member 28. A ring key 34 fixed in the bore 31 between the enlarged end portions 32 and 33 limits the amount of relative longitudinal movement between members 21 and 28. A helical spring 36 compressed between the end 29 of the member 21 and a washer 37 on the member 28 normally urges the member 28 to a distended position relative to member 21, that is with the enlarged part 32 on member 28 positioned in abutment with the key 34 as illustrated in Figures 2 and 3 of the drawing.

The detachable connection 25 here consists of a plurality of balls mounted in peripheral openings 38 in the member 21 extending from the bore 31 to the exterior periphery of the member. Surrounding the balls 25, the valve 17 is provided with an enlarged chamber 39 defined at its base by an inclined shoulder 41'. In the position of the parts illustrated in Figure 1 of the drawing, the balls 25 are forced outwardly in the openings 38 by the enlarged part 32 on member 28 so as to hold the balls between the walls of the openings 38 and the inclined shoulder 41 on the valve to thereby establish a connection between member 21 and the valve. The end surface 42 of part 32 is reduced to a conical point so that on relative outward movement of part 28 with respect to member 21 as illustrated in Figures 2 and 3 of the drawing, the pointed end 42 of member 28 is positioned opposite to the balls 25 and the balls are thereby permitted to move inwardly through openings 38 and into the bore 31 so as to permit the valve 17 to slide freely longitudinally on the member 21. It will be noted that this latter inward movement of the balls 25 is caused in part by the tapered shape of the shoulder 41 which is inclined to the longitudinal axis of the member.

The thermostatic catch means 19 may be of any one of several types available. The type depicted in Figure 1 of the drawing includes a bimetal element 43 mounted in proximity to the pilot burner 21 so as to be heated thereby, and being so constructed and mounted that when heated, the outer end 44 will move laterally across and engage the end face 46 of the member 28. This general form of thermostatic latch means is more fully illustrated and described in Jenkins Patent No. 2,322,520, issued June 22, 1943. The element 43 is supported at the outer end of a tube 47, threaded into a boss 48 provided on the rear side of the body 11 and extends away from the body in axially alignment with member 21 and its associated part above described, and in sur-

rounding relation to the extension member 28. Preferably the element 43 is enclosed in a capsule 49 so as to shield the element from direct contact with the pilot flame. As here illustrated the base 51 of the element is anchored, leaving the opposite free end 44 capable of swinging to and from the axis of member 28 in response to the heat received from the pilot burner. The arrangement of the bimetal element is such that upon extinguishing of the pilot burner 21 and cooling of the element, end 44 of the element will swing away from the axis member 28 as illustrated in Figures 2 and 3 of the drawing so as to prevent relative longitudinal movement of member 28, that is to its distended position as above described. Conversely upon ignition of the pilot burner and heating of element 43, the free end of 44 thereof will swing towards the axis of member 28 so that when the member is moved with the reset member 21 to the positions illustrated in Figures 1 and 4 of the drawing, the end 44 of the element will swing across the end face of 46 of member 28 and prevent its return outward movement.

As will be understood by those skilled in the art, there are a variety of thermostatic latch means which may be used in connection with the present invention, such as the deflecting tube type illustrated in Drow application, Serial Number 783,284, filed October 31, 1947, now Patent No. 2,530,942, dated November 21, 1950, for Temperature Responsive Safety Valve, or a thermomagnetic type of latch such as illustrated in Figures 5 and 6 of the drawing.

Summarizing the foregoing description of the several parts, the operation of the device is as follows. The several parts are shown in their normal operating position in Figure 1 of the drawing wherein the valve 17 is held in open position permitting fluid flow to the main burner. Balls 25 are held outwardly by part 32 so as to lock the valve 17 to the reset member 21 and the valve and member 21 are held inwardly with respect to the body by means of spring 24. At the same time the outer end 46 of member 28 is stopped by the hooked end 44 of the bimetal element 43 so that member 28 is held in relatively telescoped position with respect to member 21 thus compressing spring 36. Upon extinguishing of the pilot burner 21, bimetal element 43 cools and retracts from the outer end of element 28 as illustrated in Figure 2 of the drawing, thereby causing member 28 to spring outwardly with respect to member 21 under the action of spring 36. This relative movement of member 28 withdraws the enlarged end 32 of member 28 from the base of the openings 38 thereby permitting the balls 25 to move inwardly on to the pointed forward end of 42 and thus release the valve 17 for movement longitudinally on member 21 to a closed position of the valve against seat 16 under the action of the valve closing spring 18. Valve 17 thus moved to its closed position prevents further passage of fuel to the main burner until after resetting of the device has been accomplished. When the pilot burner 21 has been reignited and put into proper operation, the first step in the resetting procedure takes place as illustrated in Figure 3 of the drawing. The operator engages the knob 23 at the front end of member 21, and pulls member 21 outwardly with respect to the body and against the resistance of spring 24. The inter-connection between members 21 and 28 afforded by the ring key 34 causes member 28 to move with member 21 to again

position the outer end 46 of member 28 opposite to the intumed end 44 of the thermostatic element 43. In this movement of parts 21 and 28, it will be noted that valve 17 remains in a seated position, although it will be noted that the balls 25 have been drawn forwardly into the valve chamber 39. If the pilot burner has been put into proper operation and sufficient time permitted to elapse so as to heat the thermostatic element 43, the end of 44 of the element 43 will have been moved laterally across the end face 46 of member 28 so as to prevent the return outward movement of member 28. On the other hand if the pilot burner has not been put into proper operation, the bimetal element will not have moved to stop the return movement of member 28 and a release of member 21 from its outwardly drawn position as illustrated in Figure 3 will merely return the parts to an inoperative position as illustrated in Figure 2 without effecting an opening of valve 17. On the other hand if pilot burner operation has been properly instituted and the bimetal element 43 heated and displaced as above explained, then the end 44 of the element will prevent the return movement of member 28 as illustrated in Figure 4 of the drawing. As the knob end 23 of member 21 is permitted to return from its outwardly drawn position as illustrated in Figure 3, the relative movement between members 21 and 28 will force the balls 25 over the pointed end 42 and into engagement with the base 41 of the valve chamber 39. This position of the parts is illustrated in Figure 4 of the drawing. Further and full return of member 21 will then displace the valve 17 away from its seat 16 to a position of the parts as illustrated in Figure 1. In this last named return movement of member 21 it will be noted that both the valve spring 18 as well as the spring 36 separating members 21 and 28, are compressed by reason of the greater compressive force of spring 24. In accordance with the foregoing it will be clear that it is impossible in the operation of the reset means 21 to open valve 17 and thereby permit passage of fuel to the main burner until after the pilot burner 21 has been properly ignited and put in operation.

A modified form of the invention has been illustrated in Figures 5 and 6 of the drawing wherein a thermo-couple electro-magnet type of latch is shown instead of the bimetal type in the above described embodiment. As here shown a horseshoe magnet 52 is mounted centrally with respect to the outer end 53 of member 28', the latter being mounted for reciprocal movement in a slide bearing 54 provided through the base of the magnet 52. The magnet is energized by a field winding 56 provided on the legs of the magnet and which are connected by conductor 57 to a thermo-couple 58 mounted in proximity to the pilot burner 21'. Thus during normal and proper operation of the pilot burner, thermo-couple 58 is heated and thereby generates an electrical potential in turn energizing the field coil 53 and the magnet core 52. An armature or keeper 59 is secured to the outer end 53 of member 28' and which upon engagement with the pole faces of magnet 52, as illustrated in Figure 5, will be firmly held fast thereon when the magnet is energized as described.

Upon extinguishing of the pilot flame, in the form of the invention illustrated in Figures 5 and 6, the thermo-couple 58 will cool and thereby collapse the magnetic field at magnet 52 and release the armature 59 for relative outward move-

ment of part 28'. This relative outward movement of part 28', as described in connection with the first embodiment, permits an inward movement of balls 25' across the pointed end 42' so as to thereby release the valve 17' for closing under the operation of its closing spring 18', it being noted that the initial outward movement of element 28' is caused as above described by the spring 36' constantly urging the separation of members 21' and 28'. The released, shut-off position of the several parts is illustrated in Figure 6. The resetting operation of this modified form of the invention is identical with that described in connection with the first embodiment illustrated in Figures 1 to 4 of the drawing. To better adapt the device to thermo-magnetic operation, it may be noted that a slight change has been made in the specific arrangement for effecting the sliding and interconnecting attachment of members 21' and 28', but such change is merely structural without changing the relative functioning of the parts.

I claim:

1. A pilot operated safety valve comprising, a valve body having a fuel passage and an annular valve set therein, a member mounted for reciprocation in said body and extending through said seat coaxially thereof and having an end extending from said body for manual engagement and displacement outwardly of said body, a spring normally urging said member to an opposite reciprocal position inwardly of said body, a valve slidably carried on said member for movement to and from said seat, a second spring normally urging said valve to said seat, a second member slidably carried by said first member and extending longitudinally therefrom the direction opposite to said first end, a third spring mounted between said first and second members and normally urging said members to a relatively distended position, a thermostatic element mounted adjacent to the axis of movement of said second member and functioning when heated to intercept and hold said second member upon movement of the latter upon manual displacement of said first member whereby upon return movement of said first member under the action of said first spring a relative movement between said first and second members will be effected against the resistance of said third spring and detent means carried by said first member and extendable therefrom for engagement with said valve and being connected to said second member and operated thereby upon the aforesaid relative movement between said first and second members whereby upon said return movement of said first member said detent means will engage and displace said valve to open position against the resistance of said second spring.

2. A pilot operated safety valve comprising, a valve body having a fuel passage and an annular valve set therein, a member mounted for reciprocation in said body and extending through said seat coaxially thereof and having an end extending from said body for manual engagement and displacement outwardly of said body, a spring normally urging said member to an opposite reciprocal position inwardly of said body, a valve slidably carried on said member for movement to and from said seat, a second spring normally urging said valve to said seat, a second member slidably carried by said first member and extending longitudinally therefrom the direction opposite to said first end, a third spring mounted between said first and second members and nor-

manually urging said members to a relatively distended position, an armature mounted on said second member, an electromagnet positioned for engagement with said armature upon manual displacement of said first and second members as aforesaid and arranged when energized to hold said second member thereby to cause a relative movement between said first and second members against the action of said third spring upon return movement of said first member by said first spring, and detent means carried by said first member and extendable therefrom for engagement with said valve and being connected with said second member and operated thereby upon the aforesaid relative movement of said first and second members whereby upon said return movement of said first member said detent means will engage and displace said valve to open position against the resistance of said second spring.

3. A safety valve comprising, a valve body having a fuel passage and an annular valve seat therein, a member mounted for reciprocation in said body and extending through said seat coaxially thereof and having an end extending from said body for manual engagement and displacement outwardly of said body, a spring normally urging said member to an opposite reciprocal position inwardly of said body, a valve slidably carried on said member for movement to and from said seat, a second spring normally urging said valve to said seat, a second member slidably carried by said first member and extending longitudinally therefrom in the direction opposite to said first end, a third spring mounted between said first and second members and normally urging said members to a relatively distended position, thermostatically operated catch means functioning when energized to engage and hold said second member upon movement of the latter upon manual displacement of said first member whereby upon return movement of said first member under the action of said first spring a relative movement by the said first and second members will be effected against the resistance of said third spring, and detent means carried by said first member and extendable therefrom for engagement with said valve and being positioned for actuation by said second member upon the aforesaid relative movement by the said first and second members whereby upon said return movement of said first member said detent means will

engage and displace said valve to open position against the resistance of said second spring.

4. A safety valve comprising, a valve body having a fuel passage and an annular valve seat therein, an elongated member composed of telescopically mounted inner and outer sections supported for reciprocation in said body and extending through said seat coaxially thereof, the outer of said sections having an end extending from said body for manual engagement and displacement outwardly of said body, a spring normally urging said outer section to an opposite reciprocal position inwardly of said body, a valve slidably carried on said outer section for movement to and from said seat, a second spring normally urging said valve to said seat, said inner section being slidably carried by said outer section and extended longitudinally therefrom in a direction opposite to said first end, a third spring normally urging a relative distension of said sections, means limiting said distension, thermostatically operated catch means functioning when energized to hold said inner section upon movement of the latter by manual displacement of said outer section whereby upon return movement of said outer section under the action of said first spring a relative movement by the said sections will be effected against the resistance of said third spring, said outer section having a chamber and registering opening to the outer periphery thereof, a ball mounted in said chamber, the inner end of said inner section entering said chamber and being pointed for engagement with and displacement of said ball whereby upon relative contraction of said sections said ball will be displaced outwardly of said chamber through said opening and into engagement with said valve and upon relative distension of said sections said ball will be released for movement into said chamber to disengage said valve.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
1,480,873	Wagner	Jan. 15, 1924
2,427,935	Van Denberg	Sept. 23, 1947