

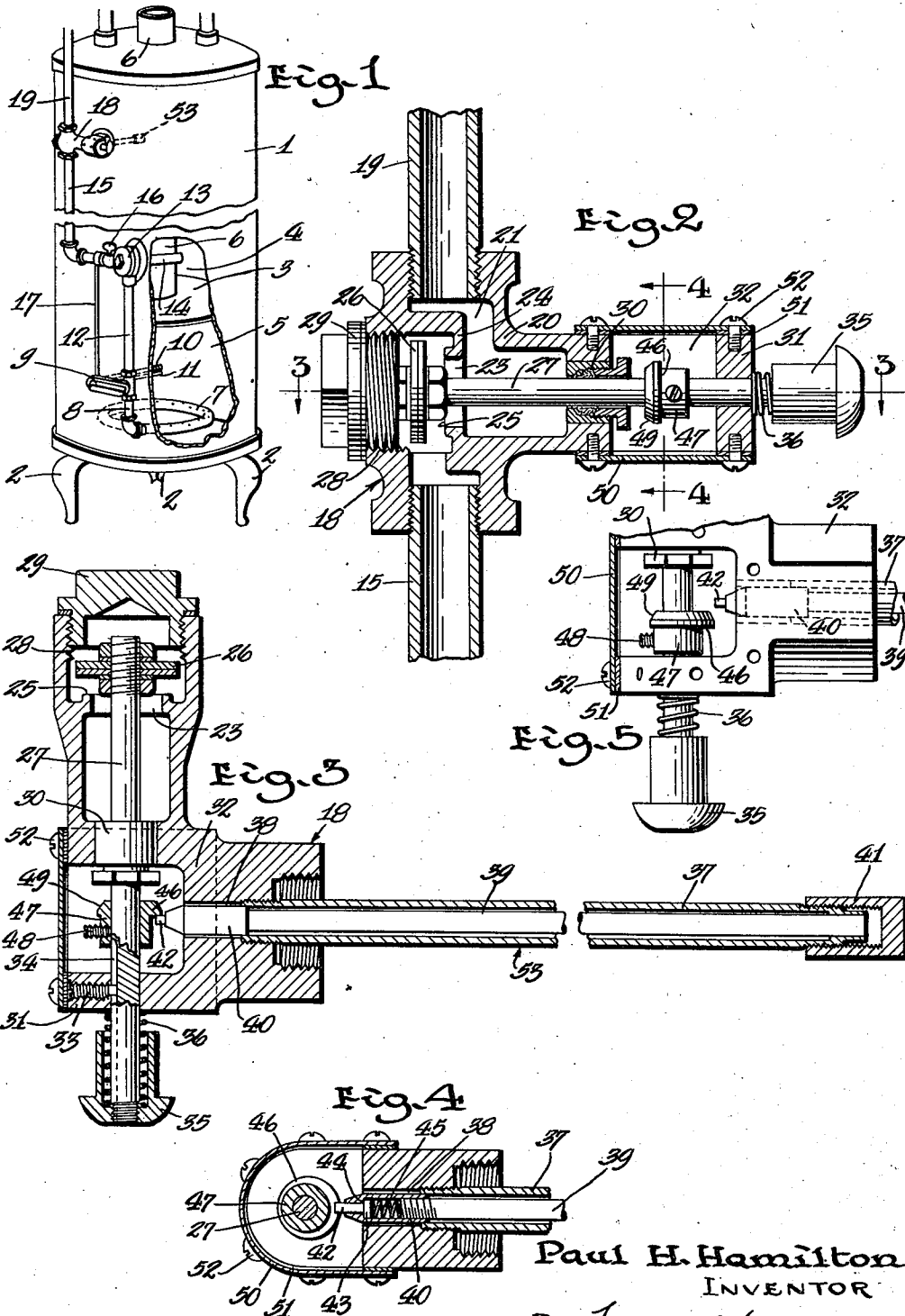
Sept. 10, 1935.

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2,013,713

SAFETY VALVE DEVICE

Filed May 16, 1932



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UNITED STATES PATENT OFFICE

2,013,713

SAFETY VALVE DEVICE

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Application May 16, 1932, Serial No. 611,583

9 Claims. (Cl. 236—21)

This invention relates to safety valve devices, and particularly to safety valve devices for controlling the supply of fuel to a gas burner, and the principal object of my invention is to provide a new and improved device of this type.

In the drawing accompanying this specification and forming a part of this application, I have shown, for the purpose of illustration, one form which my invention may assume, and in the drawing:

Figure 1 is a perspective view, with parts broken away, of a heater embodying my invention,

Figure 2 is a vertical sectional view of a safety valve mechanism for controlling the supply of fuel to the burner of the heater,

Figure 3 is a horizontal sectional view taken on line 3—3 of Figure 2,

Figure 4 is a vertical sectional view taken on line 4—4 of Figure 2, while

Figure 5 is a fragmentary elevational view of the latch mechanism illustrated in Figure 3.

Referring to the drawing, and in particular to Figure 1 thereof, my invention is shown as being embodied in a hot-water heater comprising a cylindrical casing 1, supported by legs 2 and divided by means of a partition 3, into an upper water chamber 4 and a lower combustion chamber 5. A substantially tubular centrally disposed pipe or flue 6 communicates with the combustion chamber 5 and extends vertically through the water chamber 4, for permitting the products of combustion, generated in the combustion chamber 5, to escape to the outer atmosphere.

A substantially annular burner 7 is provided in the combustion chamber 5 and is supplied with fuel, such as gas, through a vertically extending pipe 8, which communicates at its upper end with a valve device 9. The valve device 9 is substantially similar to that disclosed in my co-pending application for Letters Patent Serial Number 600,592, and is controlled by a thermostat 10 which is responsive to the heat generated by the main burner 7, and also by a pilot burner 11 associated therewith. A pipe 12 establishes communication between the valve 9 and the lower end of a valve 13 which is controlled by a thermally responsive device 14 extending into the water chamber 4. This valve is normally maintained in an open position and is only closed when the temperature of the water in the chamber 4 reaches a predetermined maximum degree. A vertically extending pipe 15 communicates at its lower end with the pipe 12, through the valve 13 and the passage of fuel through the pipe 12 is also controlled by a manually operable valve 16.

A by-pass pipe 17 communicates at its upper end with the pipe 15 on the fuel supply side of the valve 16, and at its lower end with the pilot burner 11. The upper end of the pipe 15 communicates with the lower end of a normally open safety valve device 18, which in turn communicates with the lower end of a pipe 19, leading to a source of fuel supply, and which is controlled by a thermally responsive device 53 projecting into the upper portion of the chamber 4.

The safety valve device 18 preferably comprises a casting 20 provided with a fuel inlet chamber 21, which communicates with the pipe 19 and with a fuel outlet chamber 22 which communicates with the pipe 15. Communication between the chambers 21 and 22 is at times established through a passageway 23, provided in a vertically extending wall 24, and which is surrounded by an annular valve seat 25 for cooperation with a valve member 26 carried by a valve stem 27. Access to the chamber 22, and to the valve member 26 disposed therein, may readily be obtained through an opening 28 which is normally closed by a movable screw plug 29. The valve stem 27 extends through the inlet chamber 21 and through a suitable packing gland 30 carried by the casting 20, and through a bearing portion 31 which is integrally connected to the casting 20 in spaced relation thereto, by a boss 32, and is prevented from rotating by a screw 33 which is threaded into the bearing 31 for sliding engagement with a key-way 34 formed in the valve stem 27. The outer end of the valve stem 27 is provided with a knob or handle 35, by means of which the valve stem 27 may be shifted inwardly in order to open the valve member 26, as will hereinafter be described. A coil spring 36 is interposed between a bearing 31 and the knob 35, for urging the valve member 26 into seating engagement with its cooperating valve seat 25.

The valve member 26, of the safety valve device 18, normally occupies an open position so as not to interrupt the supply of fuel to the remainder of the apparatus, but is under the control of the thermally responsive device 53, whereby the flow of fuel to the burner may be interrupted in the event of abnormal operation. This thermally responsive device 53 preferably comprises a tube 37 formed of a metal, such as copper, having a relatively high coefficient of expansion when subjected to heat, one end of which is threaded into a bore 38 provided in the boss 32, and which extends into the upper portion of the chamber 4. Extending entirely through the tube 37 is a rod 39, formed of material having a

relatively low coefficient of thermal expansion, such as invar or the like, the inner end of which is suitably secured to the inner end of the tube 37, and the outer end of which is threaded into a shell 40 disposed within the bore 38 for telescopic engagement with the end of the tube 37. A cap 41 is threaded onto the inner end of the tube 37 so as to prevent leakage of water into the tube at this point.

Slidably mounted in the shell 40 is a detent or pin 42 which is provided with a head 43 for engagement with a shoulder 44, to prevent the displacement thereof, and which is yieldably urged outwardly by a coil spring 45 interposed between the head 43 and the adjacent end of the rod 39.

Under normal operating conditions, the pin 42 engages behind an annular shoulder 46 formed eccentrically on the collar 47, which is carried by the valve stem 27 and which is maintained in adjusted position thereon by a set-screw 48. However, if the temperature of the water in the chamber 4 should reach a predetermined maximum, the expansion, and consequent elongation, of the tube 37 will draw the rod 39 inwardly, to the right, as viewed in Figure 3, thus disengaging the pin 42 from the shoulder 46 and permitting the valve member 26 to close under the action of the spring 36.

As soon as the abnormal conditions which caused the operation of the safety valve device have been corrected, and the tube cooled and contracted to its normal length, the valve member 26 may be opened so as to reestablish communication between the burner and its directly associated parts and the source of fuel supply, by manually shifting the valve stem 27 inwardly against the action of the spring 36. This movement of the valve stem 27 carries a bevelled portion 49 of the shoulder 46 into engagement with the pin 42, depressing the same against the action of the spring 45 until the shoulder 46 passes beyond the pin, at which point the pin 42 will snap outwardly to a position back of the shoulder, under the action of the spring 45 so as to lock the valve member 26 in an open position.

The space between the casting 20 and bearing 31 is enclosed by means of a substantially U-shaped casing member 50 and an intermediate packing member 51, which is secured in position by means of screws 52 and which excludes foreign matter from the detent 42 and associated mechanism.

The thermally responsive device 14 is initially adjusted so as to close the valve 13 and interrupt the supply of fuel to the burner 7 when the temperature of the water reaches a predetermined degree, 200° F., for example. The thermally responsive device 53, however, of the safety valve device 18 is initially adjusted to close the valve 26 when the temperature of the water reaches a predetermined higher maximum degree, 212° F., for example. Under normal operation, the thermostat 14 will control the supply of fuel to the burner 7, and the temperature of the water in the chamber 4, but if this valve through any reason should fail to function, and the temperature of the water in the chamber 4 continues to rise, the thermostat 53 will function so as to discontinue the supply of fuel to the entire apparatus. Thus, it will be apparent that the valve device 18 functions as a safety measure in the event that the valve 13 and associated thermally responsive device 14 should fail, through any cause, to function as intended. The tem-

perature as which the thermally responsive device 53 will release the valve 26 may be regulated by means of the eccentric shoulder 46. This is accomplished by screwing the set-screw 48 and rotating the collar 47 on the valve stem 27, so as to increase or decrease the degree of overlap between the shoulder 46 and the detent 42. If the collar 47 is rotated so that the detent 42 overlaps the shoulder 46 a relatively small amount, a release will be effected by a relatively small amount of expansion of the tube 37. On the other hand, if the collar 47 is adjusted so as to provide a relatively large amount of overlap between the shoulder 46 and the detent 42, the tube 37 must expand a correspondingly greater amount in order to effect the release of the valve 26. The mechanism is initially adjusted to function at the desired temperature, which adjustment is determined by the coefficient of expansion of the tube 37. After such an adjustment is effected, the U-shaped casing member 50 is permanently secured in position so as to prevent such adjustment from being disturbed.

From the foregoing, it will be apparent that there is provided a secondary control for the fuel supply to the burner which only functions in the event that the main fuel control functions improperly, or not at all, thus materially reducing the possibility of danger resulting from an excessive rise of temperature, or undue steam pressure developed within the water chamber 4.

It will be obvious to those skilled in the art, that the embodiments of my invention herein shown and described may be variously changed, used, or modified, all without departing from the spirit of my invention or sacrificing the advantages thereof, and it therefore will be understood that the disclosures herein are illustrative only, that my invention embodies advantages and uses other than those particularly pointed out or suggested herein, and that my invention is not limited thereto.

I claim:

1. A device of the character described, comprising: a burner and a conduit leading to said burner; a first valve interposed in said conduit and responsive to the temperature of a locality heated by said burner for controlling the supply of fuel to said burner; a second valve interposed in said conduit and having means responsive to the temperature of said locality for automatically interrupting the supply of fuel through said conduit and to said first valve, when said temperature reaches a predetermined maximum, said second valve when in fuel interrupting position being non-cooperative with respect to said responsive means; and manually operable means for actuating said second valve to reestablish the supply of fuel through said conduit and to said first valve.

2. A device of the character described, comprising: a main burner and a conduit leading to said burner; a pilot burner associated with said main burner; a first valve interposed in said conduit and responsive to the temperature of a locality heated by said main burner for controlling the supply of fuel to said main burner only; and a second valve interposed in said conduit and having means responsive to the temperature of the same locality for interrupting the supply of fuel both to said main burner and to said pilot burner at a predetermined temperature, and said second valve when in fuel interrupting position being non-cooperative with respect to said responsive means.

3. A device of the character described, comprising: a main burner and a conduit leading to said burner; a pilot burner associated with said main burner; a first valve interposed in said conduit and responsive to the temperature of a locality heated by said main burner for automatically interrupting the supply of fuel to said main burner only, when said temperature reaches a predetermined maximum degree, and for automatically establishing the supply of fuel to said burner when said temperature is below said maximum degree; a second valve interposed in said conduit and having means responsive to the temperature of said locality for automatically interrupting the supply of fuel both to said main burner and to said pilot burner when said temperature reaches a predetermined maximum degree, said second valve and said responsive means being non-cooperative when said second valve is in fuel interrupting position; and manually operable means for actuating said second valve to reestablish the supply of fuel to said main burner and said pilot burner.

4. A device of the character described, comprising: a burner; a valve for controlling the supply of fuel to said burner; a spring means for yieldably urging said valve toward a closed position; a shouldered member movable with said valve; a detent engageable by said member for holding said valve open against the action of said spring; means responsive to the temperature of a locality heated by said burner for actuating said detent to release said shouldered member and to effect the closing of said valve; and manually operable means for opening said valve against the action of said spring and for simultaneously moving said member into operable engagement with said detent.

5. A device of the character described, comprising: a burner; a valve for controlling the supply of fuel to said burner; a spring means for yieldably urging said valve toward a closed position; a shouldered member movable with said valve; a detent engageable by said member for holding said valve open against the action of said spring; means responsive to the temperature of a locality heated by said burner for actuating said detent to release said shouldered member and to effect the closing of said valve; means for adjusting said shoulder relative to said detent to effect such release at different temperatures; and manually operable means for opening said valve against the action of said spring and for simultaneously moving said member into operable engagement with said detent.

6. A device of the character described, comprising: a burner; a valve for controlling the supply of fuel to said burner; a spring for yieldably urging said valve toward a closed position; a member movable with said valve and provided with an eccentric shoulder; a detent engageable by said shoulder for holding said valve open

against the action of said spring; means responsive to the temperature of a locality heated by said burner for actuating said detent to release said valve; said shoulder being rotatable to effect adjustment with respect to said detent to cause said valve to respond at a selected temperature.

7. A device of the character described, comprising: a burner, a valve for controlling the supply of fuel to said burner, a spring for yieldably urging said valve toward a closed position; a shouldered member movable with said valve; means responsive to the temperature of a locality heated by said burner carrying a yieldable detent for operable engagement with said shouldered member, said yieldable detent engaging said shouldered member and holding said valve open, and releasing said shouldered member at a predetermined temperature to effect closing of said valve; and means for opening said valve against the action of said spring and for simultaneously moving said shouldered member into operable engagement with said detent.

8. A device of the character described, comprising: a burner; a valve for controlling the supply of fuel to said burner; a spring for yieldably urging said valve toward a closed position; a shouldered member movable with said valve and provided with a chamfered surface; a yieldable detent engageable by said member for holding said valve open against the action of said spring; means responsive to the temperature of a locality heated by said burner for actuating said detent to release said valve; and manually operable means for opening said valve against the action of said spring and for simultaneously moving said chamfered surface past said yieldable detent and causing said shouldered member to engage said detent.

9. A valve, comprising: a valve casing provided with a wall dividing said valve casing into a valve chamber and a valve actuating chamber; a valve stem passing through said wall in fluid tight relation and having one portion disposed within said valve chamber and another portion passing through said valve actuating chamber and extending outwardly of said valve casing; a valve affixed to the portion of said valve stem which lies in said valve chamber and adapted to cooperate with a valve seat formed therein; a spring affixed to the portion of said valve stem which extends outwardly of said valve casing to urge said valve to a closed position; a shouldered member affixed to the portion of said valve stem lying within said valve actuating chamber; and thermal means engaging said shouldered member to hold said valve open against the action of said spring, and affected by a change in temperature to release said shouldered member and thereby cause said valve to close.

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