April 6, 1943. J. H. G. HORSTMANN 2,315,959

SAFETY SHUT-OFF DEVICE FOR GAS VALVES

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Fig.1.

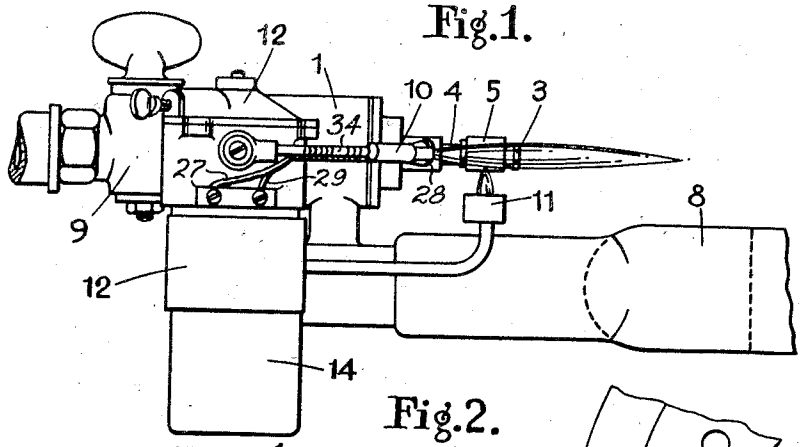


Fig.2.

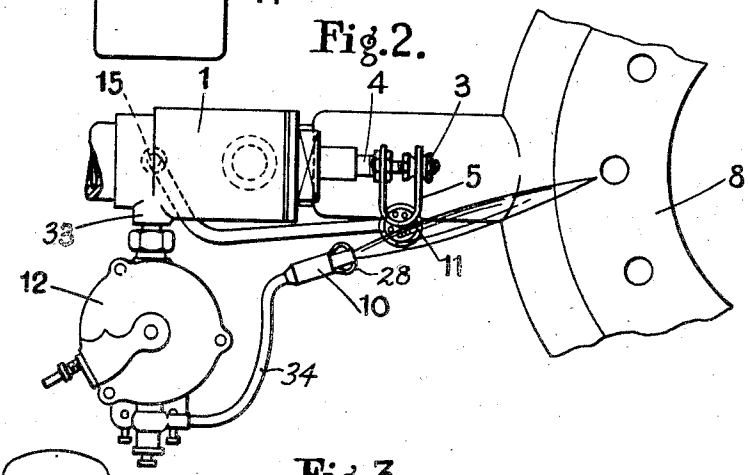
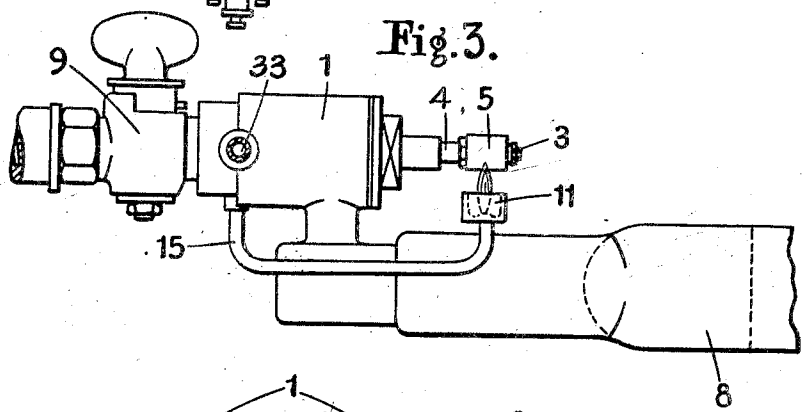


Fig.3.



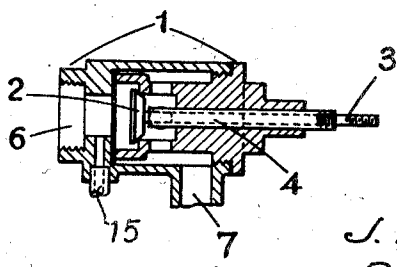


Fig.4.

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SAFETY SHUT-OFF DEVICE FOR GAS VALVES

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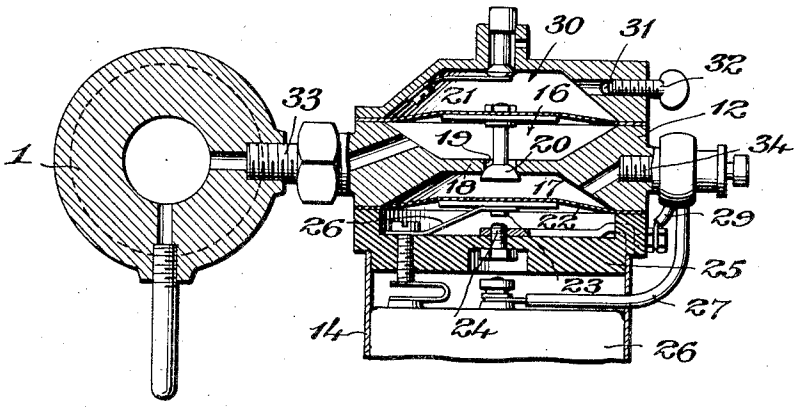
Fig. 5.



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2,315,959

SAFETY SHUTOFF DEVICE FOR GAS VALVES

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Application September 11, 1941, Serial No. 410,472
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2 Claims. (Cl. 158—117.1)

This invention relates to safety shut-off devices for gas valves feeding a main burner or burners of the kind incorporating a cut-off valve operable by a thermo-sensitive element, such as a bi-metal bow which, when cold, tends to maintain said valve in its closed position and wherein there is provided a by-pass or subsidiary burner, the flame of which is adapted to heat the said thermo-sensitive element, with a view to opening the cut-off valve and thereby permitting the passage of gas to the main burner of the appliance. An arrangement of this kind is generally preceded by a main tap operable manually or by time-controlled or other automatic mechanism.

Safety shut-off devices of the foregoing kind are intended to prevent unignited gas from escaping should the gas flame of the main burner become accidentally extinguished or should any ignition device which may be attached to the apparatus fail to operate upon the gas being turned on.

According to the present invention there is associated with the thermo-sensitive element a subsidiary burner having for its sole function the application of initial heat to the element for a predetermined time period sufficient to bring about the opening of the safety valve, said subsidiary burner being associated with automatic means adapted to extinguish its flame when this function has been fulfilled. The continuance of heat for maintaining the thermo-sensitive element in its valve-opening condition is provided for either by the contiguity of the flame from the main burner or by a separate continuously burning by-pass burner or by both, and the method of igniting the first-mentioned subsidiary burner may be automatic (e. g. by means of an electro-catalytic filament), by a permanently burning igniting flame fed by a suitable by-pass, or by an applied match flame or the like.

An advantage of a safety shut-off device according to the invention is that the said subsidiary burner may have a comparatively intense flame and thus whilst the controlled valve would be opened thereby very speedily, the said flame is not sustained to the detriment of the thermo-sensitive element. Once the valve is opened the element may be kept in its valve-opening condition by a less intense heat from the source or sources mentioned. The converse is also the case, i. e. as the intense flame useful for opening the valve quickly has been automatically extinguished after completing this function, and a less degree of heat is employed for maintaining the valve-open position, cooling-off of the parts on cessation of heat and consequent shutting of the valve is also a comparatively quick process.

One way of carrying out the invention is shown, by way of example, in the accompanying drawings wherein:

Figure 1 is an elevation;

Figure 2 is a plan;

Figure 3 is a view similar to Figure 1, but with the subsidiary non-continuously burning burner omitted for clearness.

Figure 4 is a longitudinal sectional view of the safety valve.

Figure 5 is an enlarged sectional view through the control means for the momentarily acting subsidiary burner.

Referring to the drawings, the numeral 1 designates generally a safety valve controlled by the devices according to the invention. This safety valve 1 has a valve member 2 (Figure 4), the valve spindle 3 of which passes through a tube 4 fixedly mounted in the body of the valve 1. A bi-metal bow 5 constitutes the thermo-sensitive element, and its legs are secured respectively to the valve spindle 3 and fixed tube 4. When the bow 5 is heated it opens the valve member 2, in this case by pushing the valve spindle 3 into the tube 4 and lifting the valve member 2 off its seating, to permit gas to pass from the inlet side 6 to the outlet side 7 and thence to the main burner 8.

Associated with the safety valve 1 is a main control tap 9, and in the embodiment illustrated (being provided with automatic ignition) it is merely necessary to open and close the main tap 9 to light and extinguish the main burner 8.

Referring now more particularly to the safety control of the valve member 2, there are employed in combination two auxiliary burners, one being the subsidiary non-continuously burning burner 10, and the other the continuously burning burner 11. The former, 10 is adjusted to give a comparatively intense flame for speedily heating up the bow 5 and opening the valve member 2, and the latter 11 is adjusted to give a less intense flame which may be just sufficient to maintain the bow 5 at a requisite temperature for maintaining the valve member 2 in its open condition.

The subsidiary burner 10 for providing the non-continuous initiating flame may be served by a pressure-operated igniter appliance such as described for example in prior U. S. Patent No. 2,065,972. The effect of such an igniter appliance is that when the main tap 9 is opened the gas passing through the igniter will automatically cause the by-pass flame at 10 to be ignited, the thermo-sensitive device to be operated and the main burner 8 to be lighted, whereupon the by-pass flame at 10 becomes extinguished. In this case the arrangement is such that the cut-off valve member 2 controlled by the thermo-sensitive device remains open under the action of the heat of the additional by-pass burner 11, said burner 11 being fed either from a point 15 between the main tap 9 and the cut-off valve member 2 as shown, or, if desired from a point between the valve member 2 and the outlet 7.

The operation of the embodiment described is

as follows: The main tap 9 is turned on whereupon gas flows to both burners 10 and 11 and the pressure serves to ignite the burner 10 automatically (as fully explained in the aforesaid prior specification) and at the same time shuts off the burner 10 after a predetermined time interval. The burner 10 has meanwhile ignited the burner 11, heated the bow 5, opened the valve member 2, and ignited the main burner 8. The valve member 2 will remain open so long as the burner 11 continues alight. Should the main burner 8 become extinguished accidentally it will re-light from the burner 11, but should the latter become extinguished the bow 5 will cool and the valve member 2 close.

Figure 5 of the drawings illustrates an igniter appliance of the type disclosed in prior Patent No. 2,035,972, for controlling the subsidiary burner 10. This appliance comprises a casing 12 having primary and secondary gas chambers, designated as 16 and 17, respectively, separated by a partition 18 in which is a port 19 controlled by a valve 20. Defining the outer sides of the chambers 16 and 17 are flexible diaphragms 21 and 22, respectively, to the former of which the valve 20 is attached, said valve being normally open and being movable to a position closing the port 19 by outward flexure of the diaphragm 21 under the influence of gas under pressure admitted to the chamber 16.

The diaphragm 22 is provided at its outer side with a contact stud 23 for cooperation with a second contact stud 24 mounted on an insulating support 25 fixed to the casing 12. A leaf spring 26 tends constantly to flex the diaphragm 22 inwardly and thus tends constantly to separate the contact stud 23 from the contact stud 24. When, however, gas under pressure is admitted to the chamber 17 the diaphragm 17 is flexed outwardly and the contact stud 23 thereby is moved into engagement with the contact stud 24. A dry cell 26 is contained in a casing 14 depending from the support 25 and has one terminal thereof suitably connected with the contact stud 23 and its other terminal connected by a conductor 27 with one side of a suitable electrical ignition device, designated generally as 28, disposed with respect to the burner 10 so as to be operable, when energized, to ignite gas supplied to said burner. A conductor 29 connects the other side of the ignition device 28 with the contact stud 24. The contact studs 23, 24 thus constitute a switch in the circuit between the dry cell 26 and the ignition device 28 for controlling said circuit.

Outwardly of the diaphragm 21 is an enclosed space 30 which is in communication with the atmosphere through a vent orifice 31 the effective area of which may be regulated by a manually adjustable valve 32. Thereby the rate of outward flexure of the diaphragm 21 under the influence of gas under pressure admitted to the chamber 16 may be predetermined to the end of predetermining the time period required for closing of the valve 20 when gas under pressure is admitted to said chamber 16.

A pipe 33 connects the chamber 16 with the valve 1 at a point between the main tap 9 and the valve member 2 and a pipe 34 connects the chamber 17 with the burner 10.

The diaphragms 21 and 22 being normally in inwardly flexed positions and the valve 20 thereby being normally open and the contact stud 23 thereby being normally spaced from the contact stud 24, opening of the main tap 9 with consequent supply of gas under pressure to the chamber 16 results in gas being supplied through the port 19 and the chamber 17 to the burner 10 and in reasonably quick outward flexure of the diaphragm 22 with consequent closing of the switch comprised by the contact studs 23 and 24. The circuit of the ignition device 28 thereby is closed and the gas issuing from the burner 10 is ignited, with consequent quick heating of the thermal element 5 and opening of the valve member 2. At the same time, the flame from the burner 10 ignites the burner 11. The burner 10 continues to burn until the valve 20 is closed by delayed outward flexure of the diaphragm 21, whereupon the gas supply to said burner is cut off and remains cut off until the gas pressure in the chamber 16 is relieved by closing of the main tap 9. However, the burner 11 continues to burn and to act upon the thermal element 5 to maintain the valve member 2 open, but if said burner 11 then is extinguished the thermal element 5 cools and closes said valve member 2.

I claim:

1. In a gas burning appliance, a main burner, a gas supply line for said burner, a main valve in said gas supply line for controlling flow of gas to said burner, a thermally operable valve in said gas supply line between said main valve and said main burner for controlling flow of gas to said main burner, a thermosensitive element operatively connected to said thermally operable valve and operable when heated to open said thermally operable valve and when cool to close said thermally operable valve, an auxiliary burner mounted adjacent to said thermo-sensitive element in a position to direct its flame when lighted to apply intense heat to said thermo-sensitive element to quickly heat the same and thereby cause the same quickly to open said thermally operable valve, a gas supply tube for said auxiliary burner connected with said gas supply line between said main valve and said thermally operable valve, control means for said auxiliary burner interposed in said gas supply tube and including means whereby it is operable by the supply of gas thereto to ignite said auxiliary burner and then to cut off the supply of gas thereto and thereby extinguish the same after the elapse of a brief predetermined period of time, and a second auxiliary burner separate from said first mentioned auxiliary burner and having a gas supply connection with said gas supply line between said main valve and said thermally operable valve, said second mentioned auxiliary burner being intended to burn constantly and being mounted in a position relative to said thermo-sensitive element to apply a small non-damaging amount of heat to said thermo-sensitive element sufficient to cause the latter to maintain said thermally operable valve open, said thermo-sensitive element thereby being operable to close said thermally operable valve to cut off the supply of gas to said main burner upon extinguishment of said second mentioned auxiliary burner and consequent cooling of said thermo-sensitive element.

2. A gas burning appliance as set forth in claim 1 in which the first mentioned auxiliary burner is mounted in a position relative to said second mentioned auxiliary burner to direct its flame when lighted to effect lighting of said second mentioned auxiliary burner should the latter be extinguished.

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