Oct. 2, 1934. E. L. FONSECA 1,975,142

THERMOSTATICALLY CONTROLLED FUEL CONTROL APPARATUS

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Fig. 1.

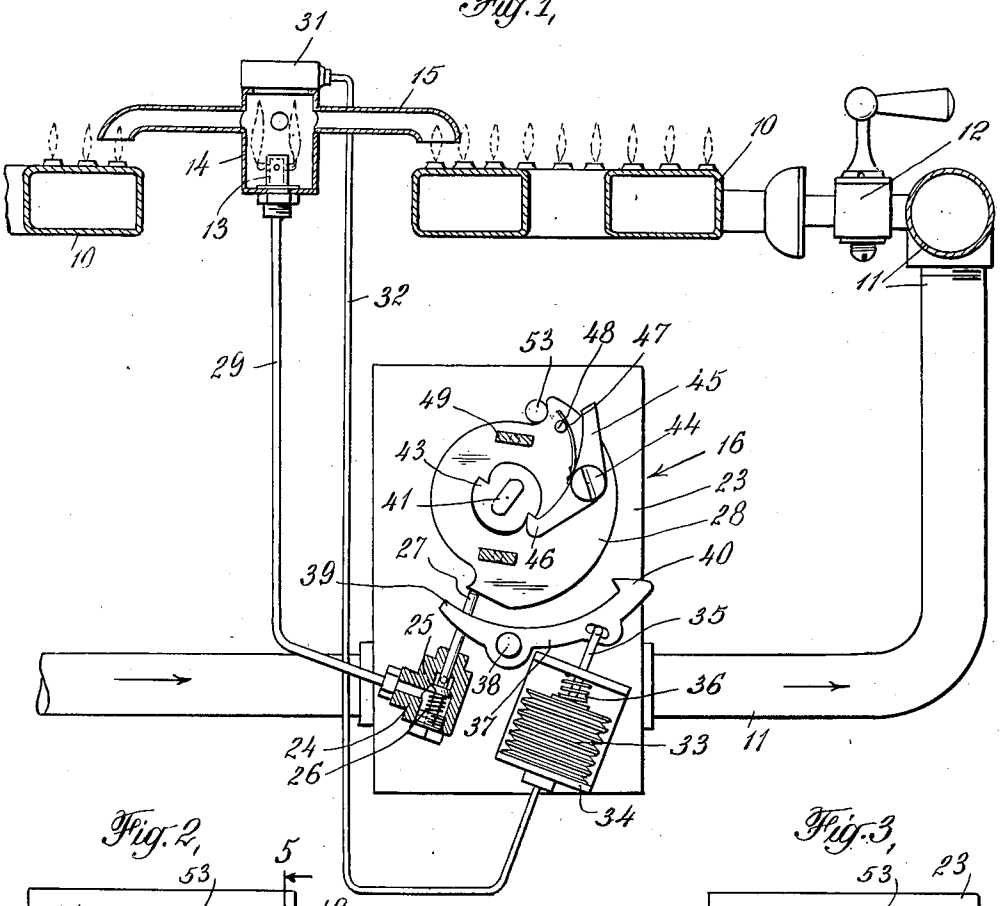


Fig. 2.

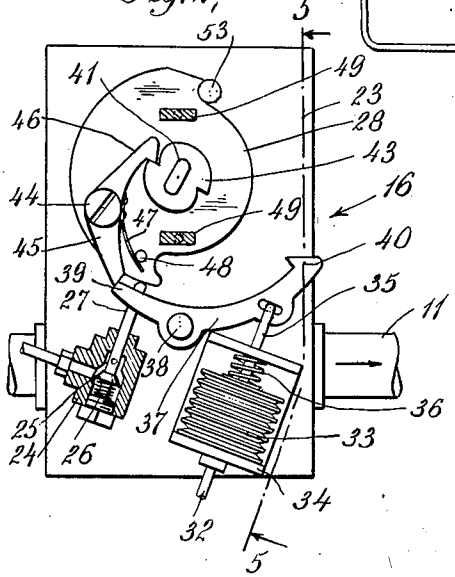
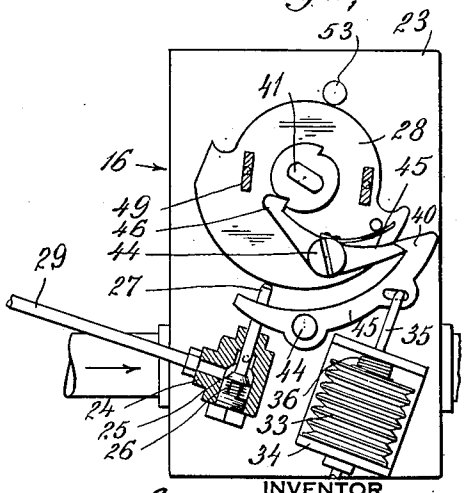


Fig. 3.



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Fig. 4,

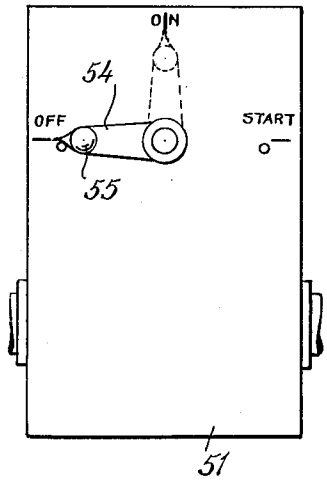


Fig. 5,

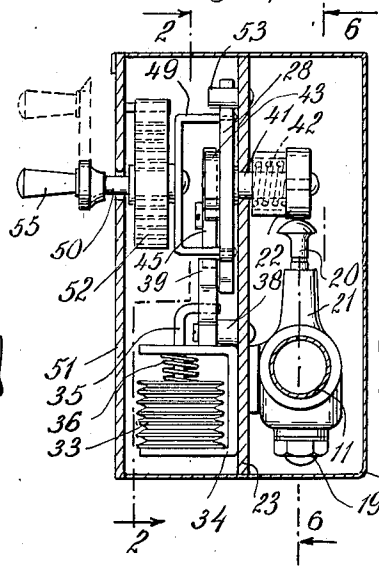


Fig. 6,

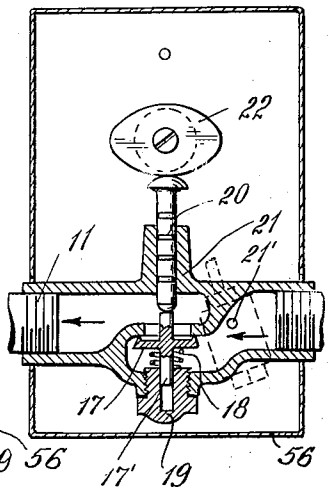
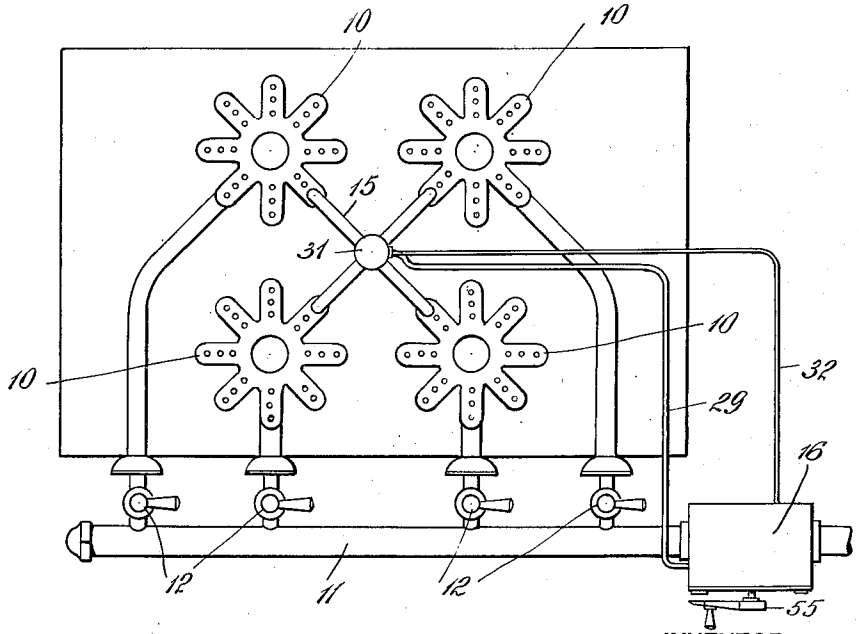


Fig. 7,



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1,975,142

THERMOSTATICALLY CONTROLLED FUEL CONTROL APPARATUS

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Application May 3, 1929, Serial No. 360,163

1 Claim. (Cl. 158—117.1)

This invention relates to thermostatically controlled fuel control apparatus, and has particular reference to apparatus for controlling the supply of fuel to one or more burners whose operation is in turn controlled thermostatically by the pilot light employed for igniting the fuel issuing from the burner or burners.

The principal object of this invention is to provide apparatus of the type described which is prepared by the user to automatically turn on the supply of fuel to one or more burners if the pilot burner is ignited, but which prevents the flow of fuel to the burner or burners in case the pliot burner fails or has become extinguished, whereby the dangerous emission and accumulation of the toxic and explosive fuel is prevented. Another object of this invention is to provide means whereby a burner whose flame has been extinguished for any reason at all is immediately relighted automatically so that the dangerous liabilities arising out of the accidental emission and accumulation of the toxic and explosive fuel due to this cause are eliminated.

Another object of the invention is to provide apparatus of the type described in which a preset motive mechanism is automatically released to positively turn off the supply of gas to one or more burners in the event that the supply of gas to the pilot burner is extinguished or temporarily interrupted.

A further object of this invention is to provide a simple, safe, fool-proof and automatic pilot flame-controlled apparatus for supplying fuel to one or more burners of a gas range or oven.

These and other objects of the invention are obtained in a preferred embodiment thereof which comprises a spring motor adapted to open and close a single valve in the fuel supply line, this motor being settable by the user and thereafter automatically operable under proper operating conditions to open or close the main fuel valve by the action of a thermostat responsive to the heat of the pilot flame. To prepare the apparatus, the user turns a combination setting and condition-indicating lever or handle to the starting position, which clutches the spring motor to the single valve, without opening the same, and latches the motor in starting position by means of a detent connected to a thermostat having a part responsive to the heat of the pilot burner whose supply valve is automatically operated by the act of setting the spring motor. The thermostat responds to the heat of the pilot flame to operate the detent and release the spring motor, which accordingly opens the valve to supply gas to the burner or burners selected by the user. The gas then issuing from the selected burner or burners is ignited by the pilot flame and the detent holds the valve in open position for supplying fuel to the burner or burners. In the event that the pilot flame is extinguished for any reason, the thermostat again operates the detent to release the spring motor, which closes the open valve and shuts off the flow of gas to the burner or burners.

Other features of the apparatus of this invention will become apparent upon examintion of the preferred embodiment thereof illustrated in the accompanying drawings, in which

Figs 1 and 7 illustrate a schematic arrangement of the apparatus of this invention as applied to a gas range;

Fig. 2 is an interior view of the fuel supply controlling mechanism as seen along the line 2—2 of Fig. 5, the mechanism being in the "Start" position as compared to the "Off" position shown in Fig. 1;

Fig. 3 is another view of the same, showing the mechanism in the "On" position;

Fig. 4 is a front view of the mechanism, showing the combination manual setting handle and condition-indicator;

Fig. 5 is a transverse section of the same taken along the line 5—5 of Fig. 2; and

Fig. 6 is a rear view of the same with the casing removed.

Referring to Figs. 1 and 7 of these drawings, numeral 10 designates the several burners of a gas range, these burners being distributed under a top grill in the usual way, and being normally fed through the gas supply manifold 11 through individual regulating cocks 12. Disposed between the burners 10 so as to serve each of them, is an igniter, which preferably takes the form of a pilot burner 13 mounted within housing 14, this housing being fitted with a plurality of tubular flame or explosion chambers 15, one of these explosion chambers being directed toward each burner 10, so that the open outer end thereof is disposed directly over at least one of the gas outlet apertures of the corresponding burner 10, as shown particularly in Fig. 1.

The intake end of manifold 11 is fitted with the fuel supply controlling mechanism, which is generally designated 16 in the drawings, this mechanism including a single disc valve 17 normally constrained in the closed position by a coil spring 18 mounted around the valve stem 17' between the valve 17 and the valve stem pilot nut 19 as shown in Fig. 6. Engaging the upper end of the stem 17' of valve 17 is a packing plunger 20 slidably mounted in the throat of the valve body 21, this plunger being adapted to open the valve 17 when oval cam 22 is rotated through 90° from the position shown in Fig. 6 in a manner to be described later.

The valve body 21 is secured to a mounting plate 23 by suitable means and through this mounting plate 23 the intake side of the valve body 21 is connected by way of passage 21' with a pilot valve body 24 also secured to mounting

plate 23 but on the opposite side thereof in the manner shown particularly in Figs. 1, 2 and 3. Slidably mounted in pilot valve body 24 is the pilot valve 25, which is normally closed by a coil spring 26. The extended stem 27 of this pilot valve 25 is adapted to be depressed by cam disc 28 under certain conditions to open pilot valve 25 in a manner to be described later. Pilot valve body 24 is connected by pipe 29 to pilot burner 13, so that when pilot valve 25 is unseated, gas flows through pipe 29 to pilot burner 13.

Mounted directly in the pilot burner housing 14 so as to be heated by the pilot flames, is a bomb 31 containing gas having a high co-efficient of expansion in response to heat, a liquid having a low boiling point so as to be readily vaporizable by heat, or any other medium which is readily expansible when exposed to heat. This bomb 31 communicates by capillary tube 32 with the interior of the variable volume container 33, which preferably takes the form of a flexible metal bellows, and which is freely expansible by the gas or other fluid contained therein when the bomb 31 is heated by the flames of pilot burner 13. This bellows is mounted at its lower end for free expansion within a bracket 34 secured to the front of mounting plate 23, as is shown particularly in Figs. 1, 2, 3 and 5. The top or movable end of the bellows 33 carries a plunger pin 35 around which and between the top of bellows 33 and bracket 34 is disposed a strong coil spring 36, which serves to maintain bellows 33 in a compressed condition at all times except when the gas therein is expanded by heat applied to bomb 31 in the manner described.

The upper end of plunger pin 35 is inserted in a slot formed in a lever 37 pivoted between its ends upon pin 38 secured to mounting plate 23. One end of pawl 37 serves as a pin detent 39 and the other end thereof is shaped to form a hook 40, which also serves as a detent. It will be seen that, as the bellows 33 is extended by the expansion of the gas therein its plunger pin 35 moves lever 37 about its pivot 38, so that the hook detent 40 is raised and the pin detent 39 at the opposite end is lowered. When bomb 31 is not heated, the bellows 33 is contracted by coil spring 36 so that its plunger pin 35 pulls lever 37 downwardly about its pivot 38 so as to lower its hook detent 40 and raise its pin detent 39.

Cam disc 28 is freely journalled upon shaft 41 in turn journalled in mounting plate 23 and carrying oval cam 22 at its outer end, this cam having a cup-shaped rear surface in which is concealed a coil spring 42 which by friction serves to hold the cam 22 in any position in which it is left by the mechanism. Secured to the flattened inner end of shaft 41 is ratchet disc 43 having two opposite notches, this ratchet disc 43 being disposed on the outer surface of cam disc 28. Pivoted upon cam disc 28 by means of pin or screw 44 is pawl 45, one end of which is shaped to form a hook 46 adapted to engage ratchet 43, and the other end of which serves as a dog adapted to engage with either pin detent 39 or hook detent 40 of lever 37. The pawl 45 is normally constrained about its pivot 44 to force the hook 46 thereof against the edge of ratchet disc 43 by means of a leaf spring 47 secured to pawl 45 and engaging a pin 48 fixed in the surface of cam 28.

Mounted upon the surface of cam 28 is a yoke 49 which spans ratchet disc 43 and pawl 45 and mounts a shaft 50 journalled in the face plate 51 of the mechanism. Secured at one end to shaft 50 and at the other end to face plate 51 is a coil spring motor 52 which tends to rotate shaft 50 and cam 28 in a counterclockwise direction as seen in Fig. 1, which rotation is prevented by a pin 53 secured to mounting plate 23 and engaging a notch of cam 28. The outer end of shaft 52 carries a pointer lever 54 fitted with a handle 55, and adapted to be rotated through an angle of 180° about the center of shaft 50 from the "Off" through the "On" and to the "Start" positions which are indicated on face plate 51 by the suitable inscriptions and index marks as shown in Fig. 4.

The mechanism as a whole is preferably enclosed by a casing 56 which may be mounted in any suitable way for ready removal for repair and inspection of the mechanism contained therein, and which is provided with suitable apertures through which the manifold 11 and tubes 29 and 32 project.

In operation, the user grasps the handle 55 and rotates the pointer lever 54 in a clockwise direction through 180° to the "Start" position, whereby cam disc 28 is rotated through an angle of 180° until this rotation is stopped by the engagement of the second notch in cam disc 28 with stationary stop 53 as shown in Fig. 2.

Before operation of the apparatus, the bomb 31 is cold and the bellows 33 is contracted by spring 36, so that hook detent 40 of lever 37 is out of the path of pawl 45, but pin detent 39 of lever 37 lies in the path of this pawl which snaps over the end of pin detent 39 so as to be held thereby. This latches cam disc 28 and pointer lever 54 in the position to which it has been turned by the user, i. e., the pointer lever 54 designates the word "Start" on the face plate 51. At the same time, the hook detent 46 of pawl 45 drops into a notch of ratchet 43, the 180° angle of rotation of cam disc 28 and its attached pawl 45 not having disturbed the ratchet 43 and its attached shaft 41 and cam 22, this cam still being placed as shown in Fig. 6 without having opened valve 17 so that no gas has as yet flowed to the manifold 11.

The cam edge of cam disc 28 is shaped to depress stem 27 and unseat pilot valve 23 when the cam disc 28 is rotated from the "Off" position shown in Fig. 1 to the starting position shown in Fig. 2. The unseating of pilot valve 25 allows a supply of gas to flow to the pilot burner 13, which is then ignited by the user, so that the resulting pilot flames directed upwardly against the bottom of bomb 31 heat the contents thereof. During the next few minutes, say two or three minutes, the contents of bomb 31 are heated sufficiently to expand through capillary tube 32 into bellows 33 whereby the latter is lengthened. This results in the compression of spring 36 and the upward movement of plunger pin 35 to cause lever 37 to be rotated about its pivot pin 38. This causes the withdrawal from and disconnection with the pawl 45 of the pin detent 39, so that cam disc 28 and its attached parts are released. The spring motor 52 accordingly rotates cam disc 28 in a counterclockwise direction as shown in Figs. 1, 2 and 3 until the end of pawl 45 engages hook detent 40 of lever 37, this detent having been placed in the path of pawl 45 when the pin detent 39 was disconnected therefrom by expansion of the bellows 33. The angle of this rotation is preferably 90° and places pointer 54 in the vertical position shown in phantom in Fig. 1, whereby it designates the "On" inscription on face plate 51. Inasmuch as hook detent 46 of pawl 45 was latched with ratchet 43, the ratchet

43 was also turned through an angle of 90° and the cam 22 attached thereto was rotated so as to depress plunger 20 to open valve 17, whereby gas flows therethrough into the manifold 11. So long as this condition exists, cam 22 maintains valve 17 open.

Either before or after preparing the mechanism in the manner described, the user selects the burner or burners 10 which are to be used and opens corresponding cock or cocks 12. If the mechanism has been prepared, gas issues through manifold 11 through the selected burner, a portion of which flows into explosion pipe 15 as seen in Fig. 1 to the flames of the pilot burner 13, so that the gas in the explosion chamber is ignited and the flame flashes back to ignite gas issuing from burner 10. Obviously, if other burners are to be used, it is only necessary to open their corresponding cocks 12. In the case where only one burner, such as an oven burner, or more than two burners are to be used at the same time, the cocks 12 may be eliminated so that the gas issues directly through the valve 17 to the burners. Also, while the apparatus is in operating condition, the burners 10 may be extinguished and turned on at any time by means of their corresponding cocks 12, the operation of a cock 12 to open the same serving to ignite the gas issuing from the corresponding burner, because of the explosion chamber and pilot arrangement shown in Fig. 1 and described above.

The apparatus remains in operation at all times during the period of use of any of the burners because the pilot flame 13 maintains the bomb 31 in heated condition and the bellows 43 accordingly holds its hook detent 40 in latched position with ratchet 45. In the event that one or all of the main burners 10 are extinguished by a draft or by the boiling over of food placed thereover, the gas issuing from these burners will be immediately relighted by the connection between them and the pilot burner 13 through explosion chambers 15.

However, should the pilot frame be extinguished for any reason at all, whether or not the other burners are extinguished, the bomb 31 will no longer be heated and the contents thereof will cool and contract so that bellows 33 is gradually contracted by spring 36, which causes its plunger stem 35 to be withdrawn, and with it the hook detent 40 of lever 37. This withdrawal of hook detent 40 unlatches pawl 45 to release spring motor 52, which immediately rotates the cam disc 28 to the "Off" position shown in Figs. 1, 5 and 6, so that cam 22 is turned to release plunger 20, whereby valve 17 is closed by its spring 18 to shut off the supply of gas to the manifold 11 and the burners 10, whether or not their individual cocks 12 are turned to the open position. Also, the return of cam disc 28 to the initial position shown in Fig. 1, causes it to release stem 27 of pilot valve 25 so that the coil spring 26 thereof closes this valve and shuts off the supply of gas to the pilot burner 13. Accordingly, no gas can escape and accumulate, and the apparatus remains inoperative until the defect therein is corrected, that is, whenever the pilot burner 13 is relighted and the lever 54 of the apparatus turned to the starting position described above.

In the event that the pilot flame is extinguished before or immediately after the user has prepared the apparatus by turning starting lever 54 to the starting position, and before bomb 31 has been heated sufficiently to expand bellows 33, the apparatus will remain in the starting position at all times without the escape of gas through the burners 10, except for the continuous small amount which escapes through the pilot burner 13. Under ordinary circumstances, however, the operator will first rotate starting handle 54 through 180° to the starting position, light the pilot burner 13 and open cocks 12 corresponding to the burner or burners which the user wishes to employ, and over which the food to be cooked has been placed. After a few minutes, say two or three minutes, the bomb 31 is heated and the spring motor 52 is released to automatically open the valve 17 to admit gas through manifold 11 to the selected burners, which are immediately lighted by gas issuing into explosion chamber 15 and which is immediately ignited by the flame of pilot burner 13 to ignite the corresponding burner. Accordingly, the user has prepared everything for the desired operation and may leave the range, being assured that within two or three minutes the apparatus will turn on automatically and ignite the selected burners.

It will be seen that this invention provides an effective, safe and fool-proof apparatus, which is controlled by the pilot flame, whereby the occupants of the chamber or house containing the gas range are protected at all times against the liabilities involved in the accidental escape and accumulation of the toxic and explosive fuel gases. Furthermore, the apparatus cannot operate unless the pilot burner is lighted and everything is in safe condition.

While a preferred embodiment illustrates this invention, it is to be understood that changes in form, detail, and arrangement may be made within the scope of the invention and that standard elements may be substituted for other elements of the apparatus without altering the invention. For example, instead of the explosion chamber igniter described herein, a flame projection type may be used wherein the pressure applied to the pilot valve causes the flames of the pilot burner to be projected to each range burner for igniting the gas issuing therefrom, and the like.

I claim:

In combination with a main burner and a fuel control device therefor, a fuel supply pipe leading to said burner, a burner valve therein, means normally urging the valve toward closed position, an igniter burner connected to said pipe operable to ignite said main burner, a motor operative to open said valve under predetermined conditions, a stop mechanism operative to hold said valve in closed position, a thermostat responsive to the heat of said igniter burner, and connections between said stop mechanism and said thermostat operable upon a heating of the thermostat to a predetermined temperature to release said stop mechanism to permit said motor to open said valve and to hold said valve open as long as the temperature is maintained at least at the predetermined value, said connections also being operable when the temperature falls below the predetermined value to permit the means normally urging the valve to closed position to function.

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