Aug. 28, 1934. L. S. CASTONGUAY 1,971,704

GAS BURNER CONTROL AND IGNITION SYSTEM

Filed March 3, 1930 3 Sheets-Sheet 1

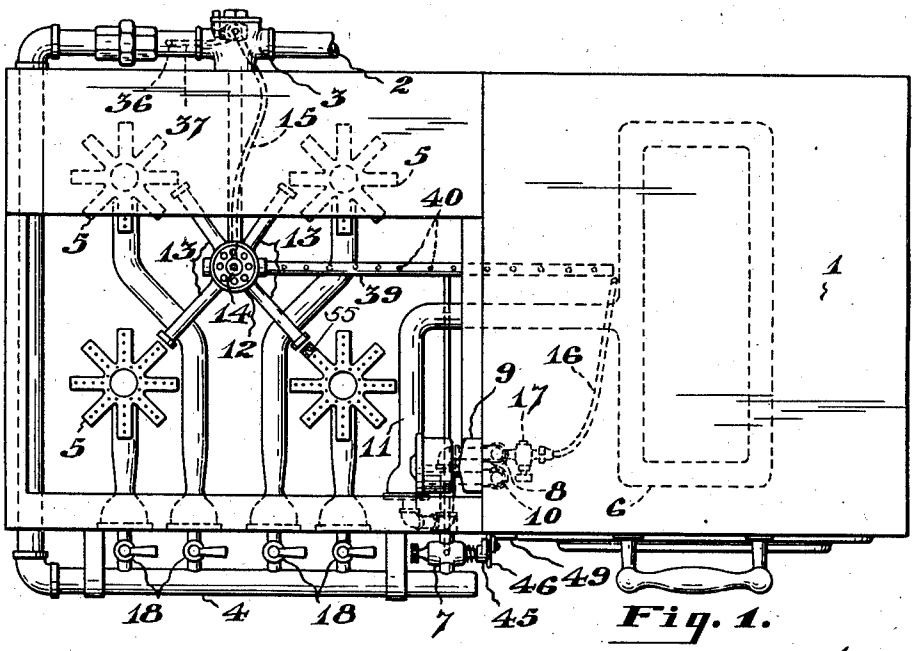


Fig. 1.

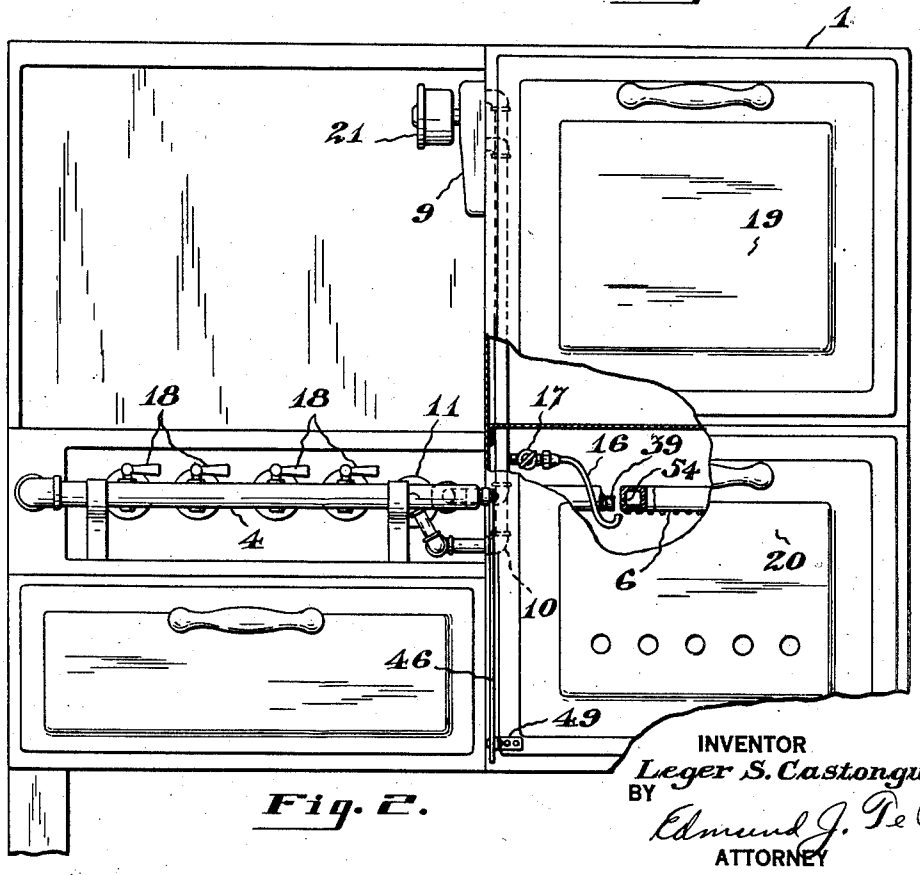


Fig. 2.

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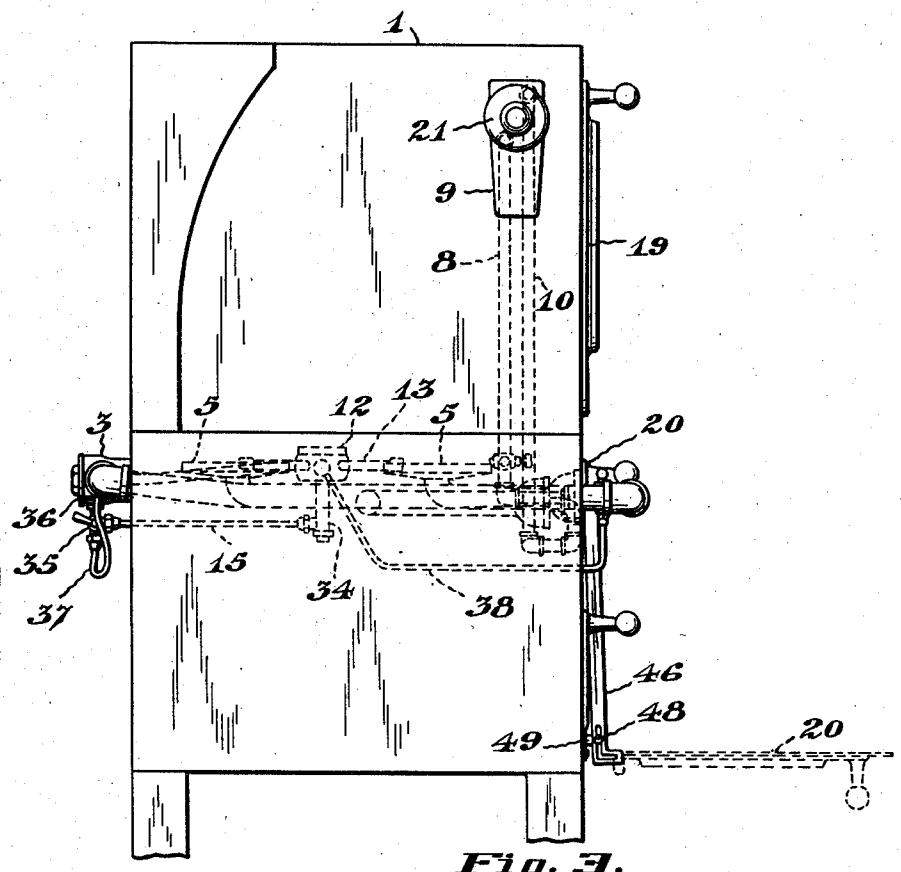


Fig. 3.

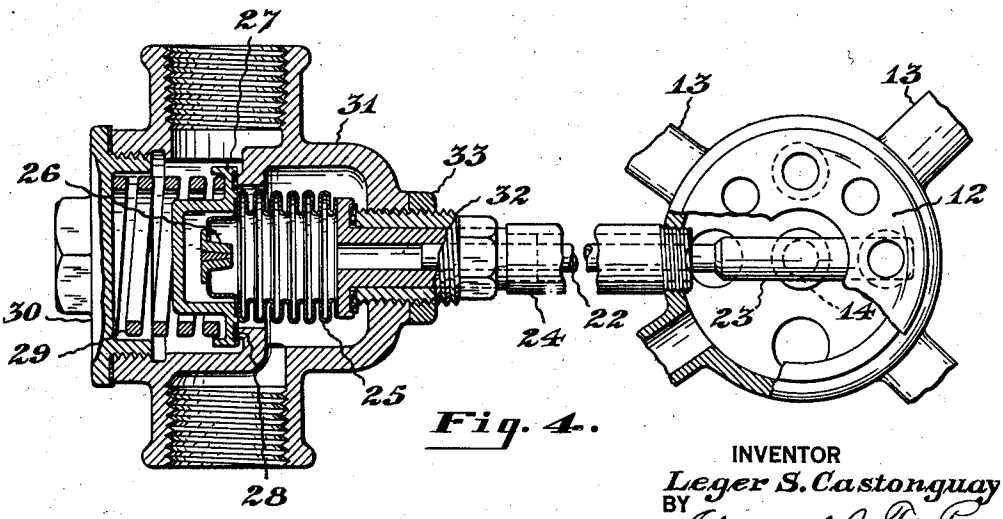


Fig. 4.

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GAS BURNER CONTROL AND IGNITION SYSTEM

Filed March 3, 1930 3 Sheets-Sheet 3

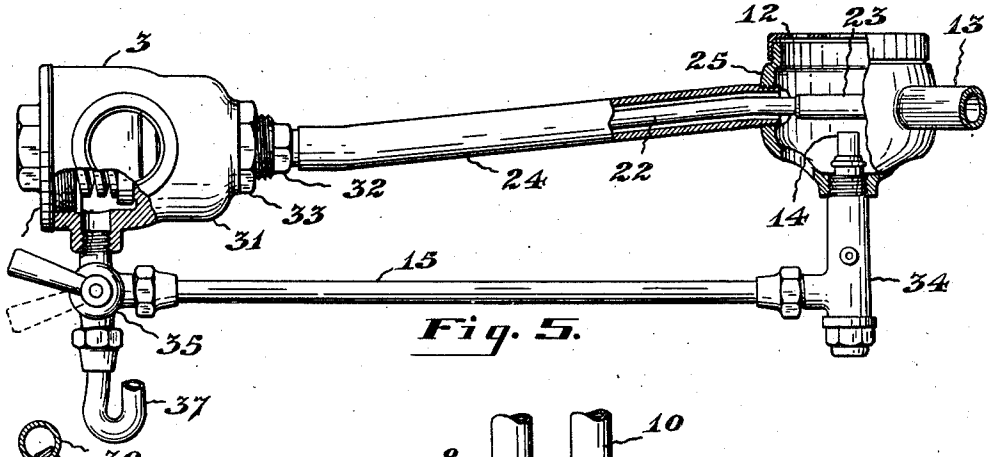


Fig. 5.

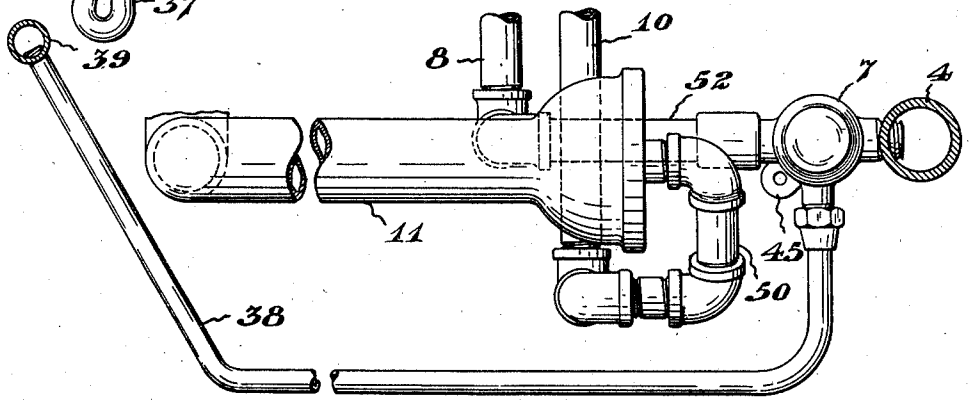


Fig. 6.

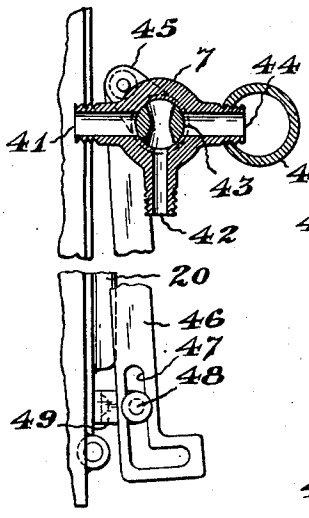


Fig. 9.

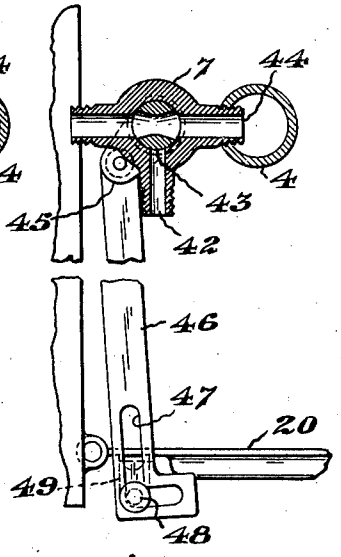


Fig. 8.

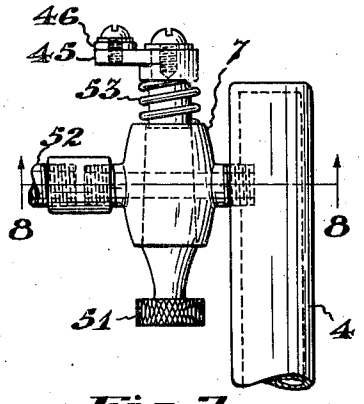


Fig. 7.

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UNITED STATES PATENT OFFICE

1,971,704

GAS BURNER CONTROL AND IGNITION SYSTEM

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Application March 3, 1930, Serial No. 432,708

23 Claims. (Cl. 158—115)

This invention relates to safety ignition controls for gas appliances having a plurality of burners adapted to be ignited from a single continuously operating pilot burner.

My improved gas burner control is particularly adapted for use in combination with a single pilot igniter burner adapted for the selective ignition of the individual burners of a gas range. Such lighters may be broadly divided into two classes. First; the flash tube type in which a constantly burning pilot is maintained adjacent the range burners and enclosed in a housing having tubes leading to the individual burners for the purpose of conducting gas therefrom to the pilot light so that upon supplying gas to any one of the burners a certain portion of it is conveyed to the pilot light where it is ignited, flashes back through the tube and ignites the burner.

Lighters of this type are disclosed in the following patents: C. H. Schaetzel 1,036,727—C. E. Methudy 1,675,899 and W. F. Dester, 1,688,487.

The second type of lighter is commonly referred to as a torch igniter and comprises a continuously operating pilot burner adjacent the range burners which operates ordinarily with a small flame under control of a push-button valve so that when gas is supplied to one of the burners the pilot valve may be operated momentarily to increase the gas supply of the pilot and flash a flame from the pilot light to the burners, igniting whichever one is being supplied with gas at that time. In addition to these two main classes of igniters there are various types of lighters which present certain modifications and embody in one way or another the fundamental principles disclosed by the above lighters.

Lighters of the torch type are disclosed in the following patents: A. O. Rutz 1,207,441—F. J. Legrer et al. 1,259,535 and E. L. Claus 1,339,102.

The flash tube igniters referred to above, provide a certain measure of safety in the operation of a gas range for in the event of extinguishment of the burner through any accidental cause such as from the boiling over of liquids that are subjected to the heat of the gas flame, the burner is automatically re-ignited in the manner accomplished upon the initial opening of the gas supply to the burner. This operation requires the presence of a flame at the pilot burner and in the absence of such a flame the ignition system is inoperative and under such conditions there is the possibility of a very hazardous condition arising due to the escape of raw gas with no provision for its ignition.

One of the objects of my invention is to provide a combined safety control and gas range ignition system which is adapted to cut off the supply of gas to the range burners in the event of extinguishment of the flame of the ignition pilot burner.

Another object of my invention is to provide in an appliance of the type disclosed, an improved and quick-acting igniter for the burners such as the oven burners which are located at a considerable distance from the pilot light.

Another object of my invention is to provide an igniter for the enclosed or oven burner of a range which may be operated in conjunction with the opening of the oven door for the dual purpose of facilitating the ignition of this burner and for insuring that the initial igniton thereof takes place with the oven door in open position for the quiet lighting thereof.

Another object of my invention is to provide an improved thermostatic cut-off valve which is particularly adapted for the purpose intended and for use in combination with igniters of the type disclosed in this application.

Another object of my invention is to provide an improved thermostatic shut-off valve which is adapted to close in a very short interval of time upon the extinguishment of the burner the heat of which maintains the valve in open position.

A further object of my invention is to provide a generally simplified and inexpensive control device for gas ranges which positively insures the safe operation of the range at all times and under all conditions.

By reason of my improved construction the escape of raw gas from any of the burners of the range is prevented. Upon accidental extinguishment of any of the main burners, the said burner is immediately and automatically re-ignited. Noisy ignition and popping of the oven burner upon the initial lighting is prevented by reason of the mode of operation requiring the opening of the oven doors in order to effect such ignition of this burner.

With these and other objects in view, the invention consists in the novel construction, arrangement and combination of parts, hereinafter described, illustrated in some of its embodiments in the accompanying drawings and particularly pointed out in the appended claims.

Referring to the drawings, Fig. 1 is a plan view of a gas range embodying one form of my invention. Fig. 2 is a front elevational view of the gas range shown in Fig. 1. Fig. 3 is an end elevational view of the gas range shown in Fig. 1. Fig. 4 is a plan view, partly in section of the combined

igniter and cut-off valve. Fig. 5 is a side elevational view partly in section of the combination of elements shown in Fig. 4. Fig. 6 is a side elevational view showing the fuel supply lines from the stove manifold to the oven burner and the flash tube thereof. Fig. 7 is a plan view of the oven burner supply valve. Fig. 8 is a side elevational view partly in section showing the details of the oven supply valve control. Fig. 9 is a view corresponding to Fig. 8 showing the valve in a different position.

For the purpose of illustration, I have shown my improved burner control and ignition system in combination with a conventional domestic range in which the numeral 1 refers to a gas range adapted to be supplied with gaseous fuel by way of the gas supply line 2 which connects with a manifold 4 for the distribution of the gas to the various burners of the range. A thermostatic shut-off valve 3 is interposed between the supply line 2 and the manifold 4 for the purpose of cutting off the gas supply to the range and manifold upon the extinguishment of an ignition pilot light. The manifold 4 is adapted to receive a number of manually operable control valves 18 for controlling the gas supply to the open top burners 5 of the range.

The range is provided with an oven having an upper and a lower door 19 and 20 respectively and is further provided with a burner 6 under control of the gas supply valve 7 which is in communication with the manifold 4. This control valve for the oven burner communicates with a thermostat 9 which is provided for the purpose of automatically maintaining the temperature of the oven at a predetermined point. The gas supply line leading from the oven regulator or thermostat 9 is indicated by the numeral 10 and communicates with the oven burner mixing tube 11 by way of the fittings 50.

The open or top burners 5 of the range are adapted to be ignited by a blue flame pilot burner 14 carried in an ignition device 12 which is provided with a number of radially extending conduits 13 one of which is adapted to terminate adjacent each of the burners 5. Upon the opening of any one of the valves 18 gas is supplied to the burner controlled thereby and a certain amount of the gas issuing from the particular burner is injected into one of the adjacent tubes 13 in the manner set forth in the Methudy patent previously mentioned whereupon an explosive mixture is generated in the tube which is ignited by the pilot burner 14 and which causes a flame to flash from the pilot 14 to the burner 5 causing its ignition. The oven burner 6 is provided with a similar ignition device adapted to be under control of the pilot burner 14. The ignition and control of the oven burner will be disclosed in detail presently.

The gas conduit leading to the oven thermostat 9 is provided with a small gas valve 17 which controls a supply of gas to the tube 16 the open end of which acts as a pilot light for the oven burner 6. The end of the conduit 16 terminates at a point directly below the flash tube 39 of the oven burner so that the gas issuing therefrom is available for the purpose of igniting the oven burner by means of the pilot light 14. The oven regulator 9 is provided with a manually settable wheel 21 by which the oven temperature may be regulated and maintained at any predetermined point.

The pilot burner 14 is located in a cup or housing 12 provided with suitable apertures for the circulation and supply of secondary air necessary to support its flame. Immediately above the pilot burner 14 there is located the closed end portion 23 of a tube 22 which connects with an expansible-contractible element or bellows 25. The stated tubes and bellows constitute a sealed chamber adapted for the reception of a thermo-sensitive fluid which serves to expand or contract the bellows in accordance with the operation of the pilot burner 14. A plug 26 is provided in one end of the bellows for the purpose of sealing the chamber after it has been charged with a thermo-sensitive fluid.

There are a large number of fluids which may be used for this purpose such as; ether, alcohol, water and most any liquid which is adapted to vaporize when subjected to the heat available and which will not attack the material of its container or break down under the heat to which it is subjected to form other compounds. The specific liquid used in connection with my improved valve does not form a part of this invention. I have found that suitable operating conditions may be obtained by either completely or partially filling the tubes 22 and 23 and the bellows 25 with a liquid so that when the portion 23 of the tube is heated the liquid therein is vaporized and the bellows is expanded by an amount proportional to the volume of liquid displaced at this portion of the device.

In a device of this kind it is extremely important that the safety shut-off valve close in a very short time after extinguishment of its heating flame. My improved valve is particularly adapted for this purpose. The low heat capacity of the tube 23 permits its quick cooling allowing the rapid condensation of vapors therein with the accompanying contraction of the bellows 25. By the proper selection of a filling liquid having a high or a low boiling point the valve may be made to operate within a predetermined range of temperatures. Its operating characteristics may be further varied by varying the pressure to which the fluid is subjected through the adjustment of the valve ports.

A section of pipe or protection tubing 24 is provided for the reception of the tube 22 in order to protect this tube from accidental breakage or bending and furthermore to insulate it from the influence of the heat of the adjacent burners 5. The tube 22 is preferably formed from copper and the end portion 23 is formed from Monel metal and they joined together in any suitable manner such as by hard soldering, brazing or welding. By reason of this construction the soft copper tube permits the device to be bent in any desired shape and the Monel metal tube 22 is highly resistant to any harmful action of the pilot burner 14 or any other flame to which it might be exposed, thus providing a device which may be readily applied to a variety of appliances by reason of the ability of the copper tubing to be bent to any desired shape and one in which long life is assured by reason of the use of a heat and corrosion resistant metal for the portion of the tube which is subjected to any considerable amount of direct heat. Obviously copper and Monel metal could be replaced by other materials so long as they possessed the desirable characteristics as set forth.

The unit defined by the bellows 25 and tubes 22 and 23 is carried by an adjusting member 32 which is adapted to be adjustably received in the valve body 31. A locknut 33 serves to lock the bellows and adjusting member 32 in the desired position. A valve head 27 is supported on the movable or free end of the bellows 25 and coop-

erates with a valve seat 28 formed in the valve body 31 for the purpose of controlling fluid flow through the valve. A compression spring 29 engages the valve head 27 at one end and at its other end is supported by the closure cap 30 which is provided for sealing a side opening in the valve body 31 which is provided for the machining of the interior of the valve and for the assembly and installation of the various elements of the valve. By reason of this construction it is possible after the valve is assembled to vary the time required to open or close it by simply adjusting the position of the bellows 25 in the body 31.

The valve body 31 is further provided with a bypass outlet communicating with a three-way control valve 35 of similar construction to the valve 7 and which in turn is connected to the conduit 15 leading to a combined gas and air mixing tube and needle control valve 34 for the burner 14. The above noted bypass from the valve body 31 being in the inlet side of the valve communicates at all times with the gas supply conduit 2. A second by-pass outlet 36 communicates with the gas supply line at the outlet side of the valve 3 and is connected to the pilot feed line 15 by way of the conduit 37 and the three-way valve 35. With the thermostatic valve 3 in the closed or cold position the device is placed in operation by opening the valve 35 so as to place the bypass from the valve body 31 in communication with the conduit 15 and then lighting the pilot 14 and in a few moments the thermostatic valve 3 is opened under influence of the heat from the pilot burner. Upon the opening of the thermostatic valve, the three-way valve 35 is manually operated to place the pilot 14 in communication with the bypass 36 and conduit 37 and at the same time cut off communication with the bypass outlet from the valve body 31. The purpose of this arrangement is to utilize the thermostatic valve 3 for cutting off the gas supply to the pilot burner 14 upon the extinguishment thereof and to provide a means for initially supplying gas to the pilot when the valve 3 is closed.

The oven burner control while being adapted to work in the manner described in connection with any of the burners 5 is further provided with a means for injecting a certain amount of gas into its flash tube to insure instantaneous ignition of this burner. The elements whereby this is accomplished comprise a three-way oven burner supply valve 7 which is operatively associated with the lower door 20 of the oven. The valve 7 is provided with a main and auxiliary outlet passage 41 and 42 respectively and is provided with a rotatable plug 43 having an aperture adapted to provide successive communication between the valve inlet 44 and outlets 42 and 41. A crank 45 is rigidly connected with the plug of the valve. This crank is pivotally connected to a lever 46 having an L shaped slot 47 at its lower portion provided for reception of a pin 48 carried on a bracket 49 which is rigid with the oven door 20.

Thus, upon opening the oven door 20 the pin 48 engages the connecting rod 46 rotating the valve plug 43 through one-quarter of a turn to the position shown in Fig. 8. In this turning of the valve plug, gas is first supplied to the outlet 42 communicating with the flash tube 39 and then to the outlet 41 which communicates with and supplies gas to the oven burner 6. The tube 39 is provided with a series of holes 40 in its under side in order to insure an explosive mixture in the tube through the intermingling of air and the gas supplied thereto by way of the conduit 38. From the mode of operation just stated it will be apparent that upon the opening of the oven door 20 gas will be first supplied to flash tube 39 and thence to the burner 6. In this manner an explosive mixture of gas and air is supplied to the tube 39 and in the event that the pilot burner 14 is operating, a flame is flashed from the pilot burner to the oven burner 6 practically instantly igniting the same. As this ignition takes place with the oven door open the force of the minor explosion incidental thereto is so rapidly dissipated that there is no noise or other terrifying circumstance attendant to the lighting of the oven burner.

The oven burner 6 is further provided with an outlet port 54 adjacent to the open end of the tube 39 providing second means for injecting gas into the tube 39 in order to effect the ignition of this burner in the manner stated in connection with the burner 5. The pilot burner provided by the open end of the pilot supply tube 16 being located below the end of the tube 39 also assists in the ignition of the burner 6 upon the extinguishment of its pilot and flame. Such ignition would occur only in the event of extinguishment of the flames of both the burner 6 and its pilot flame supported by the conduit 16. The control operated by the oven door is adapted to be manually operated by the knurled end 51 of the valve plug 43 which plug is tapered and held in gas tight position in its body by a spring 53. The main outlet 41 of the valve 7 communicates with the oven regulator by way of the conduits 52 and 8. The outlet side of the oven regulator connects with the conduit 10 and thence to the oven burner 6 by way of the fittings 50 and the mixing tube 11.

The oven control valve 7 may be manually controlled by the connecting rod 46 either independently of the operation of the oven door 20 or in conjunction with the operation of this door; that is, when it is desired to operate the valve 7 the same may be manually rotated by turning the knurled end 51 or by manually shifting the connecting rod 46 up or down. In order to further facilitate the closing of the oven supply valve the slot 47 is provided with a horizontal portion so that the rod 46 may be displaced inwardly toward the stove and if the door is then closed the valve 7 will be caused to close at the same time assuming the position shown in Fig. 9.

From the foregoing it is apparent that my improved control and ignition system is adapted to safely control the ignition and operation of a plurality of gas burners by means of the combination of a single ignition pilot and associated thermostatic cut-off valve. Upon opening of any one of the fuel supply valves of the various burners of the appliance, immediate ignition thereof is effected and upon accidental extinguishment of such burner it is automatically re-ignited in the manner previously described. In the event of extinguishment of the pilot light my improved thermostatic cut-off valve quickly shuts off the main gas supply to all of the burners including the pilot burner and in order to restart the device it will be necessary to go through the operations previously described and by reason of this arrangement it would be impossible to have gas escape from any of the burners in the absence of a flame for the ignition thereof. Due to the extreme rapidity with which my cut-off valve works I am able to shut off the gas supply

of the range in from ten seconds to a minute after the pilot light has been extinguished.

Furthermore, it is to be understood that the particular forms of apparatus shown and described, and the particular procedure set forth, are presented for purposes of explanation and illustration and that various modifications of said apparatus and procedure can be made without departing from my invention as defined in the appended claims.

Having thus described my invention, what I claim is:

1. An automatic igniter for a gas burner having ports for the emission of gas comprising a pilot burner, a casing enclosing said pilot burner and having an opening through the wall thereof, a conduit having openings intermediate its open ends communicating at one end with the opening of said casing and having its opposite end terminating adjacent a port of the gas burner for receiving and conducting gas from the burner to the pilot burner for effecting the ignition of the gas burner, and supplemental means for discontinuously injecting a quantity of gas into said conduit.

2. An automatic igniter as set forth in claim 1 wherein the gas burner is housed in an oven, and a door for the oven is associated with said supplemental means for injecting a quantity of gas into said conduit upon opening said door.

3. An automatic igniter as set forth in claim 1 wherein the supplemental means comprises a three-way supply valve adapted in its opening operation to successively supply gas to said conduit and to the gas burner.

4. A gas burner having flame supporting ports, a source of gas supply therefor, an oven for said burner, a door for said oven, a continuously operating pilot burner, a flash tube adapted to convey gas from a port of said burner to the flame of said pilot to effect the ignition thereof, and a three-way valve associated with said oven door for injecting a primary supply of gas into said flash tube and for placing said oven burner in communication with the source of gas supply, said valve being adapted for operation independently of said oven door.

5. A device as set forth in claim 4 wherein the three-way valve is connected to the oven door by means of a lost-motion connector whereby the valve is opened by the opening of the oven door and normally unaffected by the closing of the oven door.

6. A device as set forth in claim 4 wherein the three-way gas supply valve upon the opening of the oven door supplies a limited amount of gas to said flash tube and then establishes communication between the gas supply line and the gas burner, said valve remaining in this position upon the closing of the oven door.

7. A device as set forth in claim 4 wherein the opening of the oven door always insures the opening of said valve and selective means whereby the closing of the oven door serves to close said valve or not affect its position at the will of the operator.

8. An automatic igniter for a fluid fuel burner comprising a primary igniter spaced from the burner, a conduit extending between the igniter and the burner, for conducting gas from the burner to the igniter, and supplemental means in the form of a non-igniting injector for discontinuously injecting a quantity of fuel into said conduit.

9. An automatic igniter for a fluid fuel burner comprising a primary igniter spaced from the burner, a conduit extending between the igniter and the burner, for conducting gas from the burner to the igniter, and supplemental means for discontinuously injecting a quantity of fuel into said conduit intermediate the ends thereof.

10. An ignition system of the kind described, comprising a burner, a pilot spaced therefrom, and a flash tube adapted to receive fuel from the burner to be conveyed to the pilot, means for controlling the supply of fuel to the burner, and means interoperated with said control means for injecting a secondary supply of fuel into said flash tube intermediate the ends thereof.

11. An ignition system including a primary igniter, a burner spaced therefrom, a conduit extending between the two and adapted to receive fuel from the burner, and means for discontinuously supplying a secondary quantity of fuel to said conduit.

12. An ignition system comprising a primary igniter, a burner, a conduit between the two, a supply of fuel for the burner, the burner having means providing a primary source of fuel to the conduit, means providing a secondary source of fuel to the conduit, and a single means controlling both said sources of fuel.

13. An ignition system comprising a primary igniter, a burner, a conduit between the two, a supply of fuel for the burner, the burner having means providing a primary source of fuel to the conduit, means providing a secondary source of fuel to the conduit, and means for supplying both said sources with fuel and then supplying only one.

14. A safety fuel control and ignition device for gas ranges adapted to maintain one or more of the main gas burners of the range in normal operation as long as gas is supplied thereto, and to cut off the supply of gas to said burners upon the failure of the ignition means, comprising the combination of a plurality of spaced main gas burners, a source of gas supply therefor, means for controlling and operating said burners independently of each other, a continuously operating pilot burner positioned at a point outside the range of normal lighting proximity to said main gas burners, means cooperating with said pilot burner to effect the ignition of gas issuing from said main burners, a normally closed thermostatic valve adapted to open solely in response to heat supplied by the flame of the pilot burner and to close upon extinguishment thereof for controlling the gas supply of said burners in accordance with the operation of said pilot burner, and means for selectively connecting said pilot burner to said source of gas supply from a point either ahead of or behind said thermostatic valve.

15. In an ignition system, a burner, a primary igniter for said burner, a fuel supply line for said burner, a cut-off for said supply line responsive only when said igniter is operative for opening said fuel line, a second fuel supply line for said primary igniter, and means for selectively connecting said second supply line either ahead of or behind said cut-off.

16. In an ignition system, a burner, a primary igniter for said burner, a fuel supply line for said burner, a cut-off for said supply line responsive only when said igniter is operative for opening said fuel line, a second fuel supply line for said primary igniter connected behind the cut-off so the fuel supply to the igniter is discontinued when said igniter is inoperative, and means for selectively supplying fuel to said second supply line from a point ahead of the cut-off.

17. An ignition system comprising a burner, an enclosure therefor, said enclosure having an opening therein, a closure for selectively closing said opening, a primary igniter, a fuel line to the burner, means for conveying fuel from the burner to the igniter, further means for conveying additional fuel to the conveying means, said burner fuel line and said further means conveying additional fuel being controlled by the closure.

18. An ignition system comprising a burner, an enclosure therefor, said enclosure having an opening therein, a closure for selectively closing said opening, a primary igniter operable independently of said enclosure or its elements, a fuel line to the burner, means for conveying fuel from the burner to the primary igniter, the fuel supply to the burner and from there to the primary igniter being controlled by operation of said closure.

19. A device as set out in claim 18, wherein is provided means for supplying additional fuel to the conveying means.

20. A device as set out in claim 18, wherein is provided means for supplying additional fuel to the conveying means, the same being controlled by operation of the closure.

21. A device as set out in claim 17, in which the burner fuel line and said further means for conveying additional fuel may also be controlled independently of the closure.

22. A device as set out in claim 18, wherein the fuel supply to the burner may also be controlled independently of the closure.

23. An ignition system comprising a main burner, a pilot, a continuous flash tube interconnecting the main burner and the pilot, means supplying fuel to the flash tube at the burner end thereof, and additional means for supplying fuel to the tube intermediate its ends.

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