March 10, 1942. A. H. BRODBECK ET AL 2,276,015

AUTOMATIC IGNITION SYSTEM FOR BURNERS

Filed March 25, 1941 2 Sheets-Sheet 1

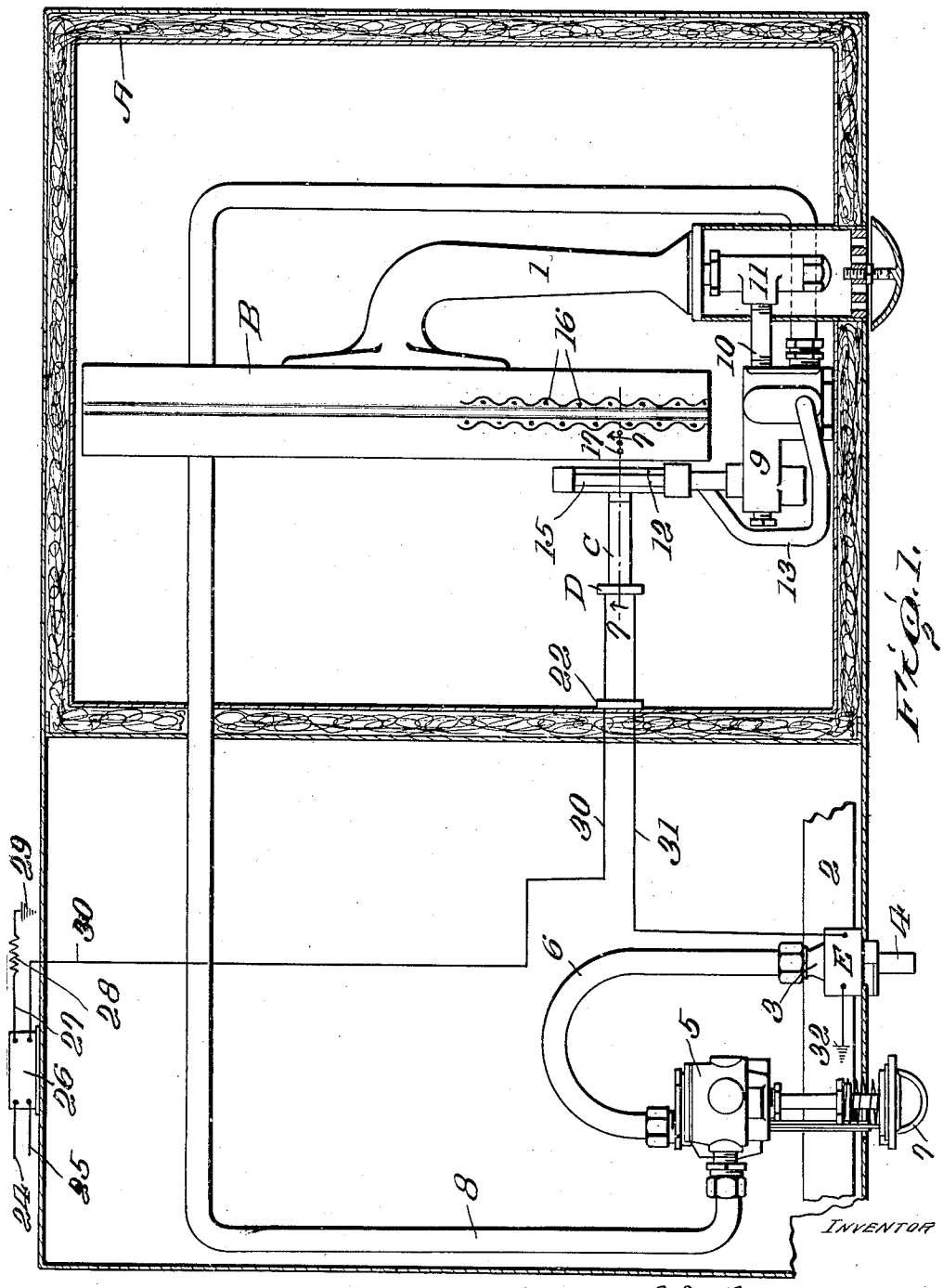


Fig. 1.

23y

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FIG. 2.

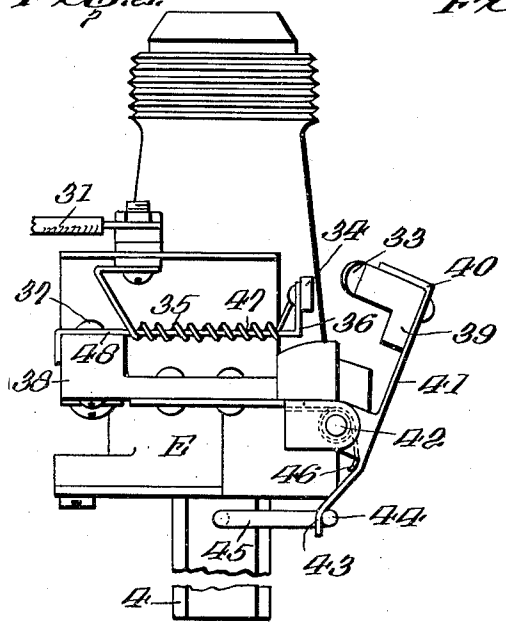


FIG. 4.

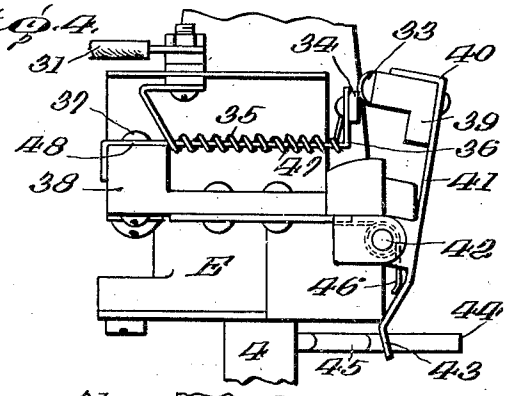


FIG. 6.

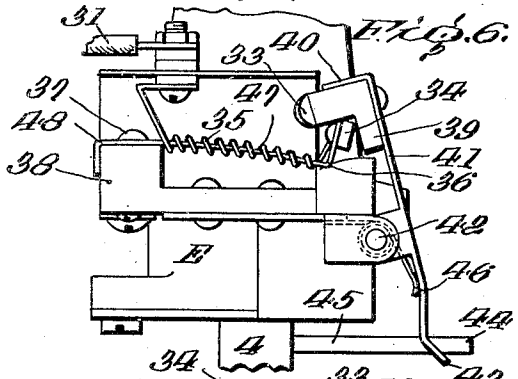


FIG. 3.

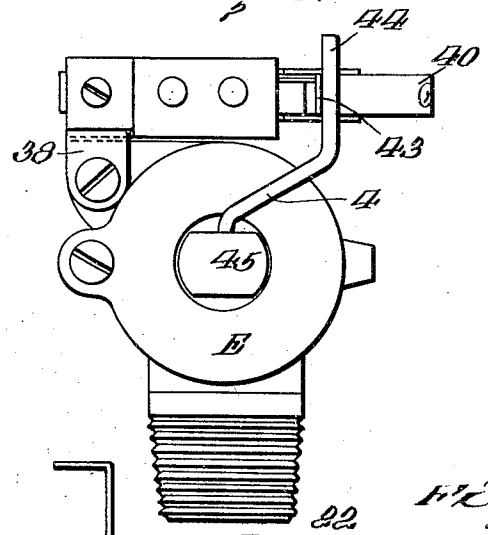


FIG. 5.

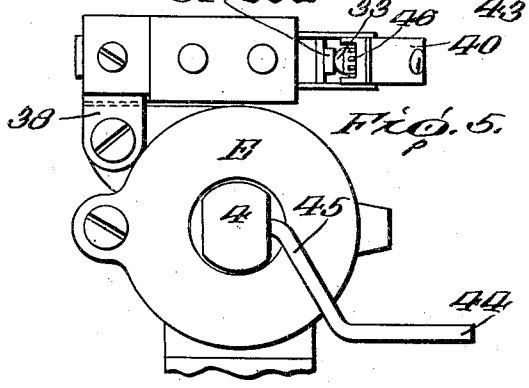


FIG. 8.

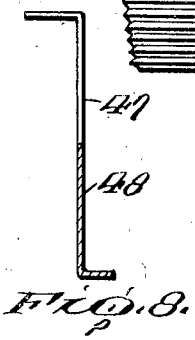
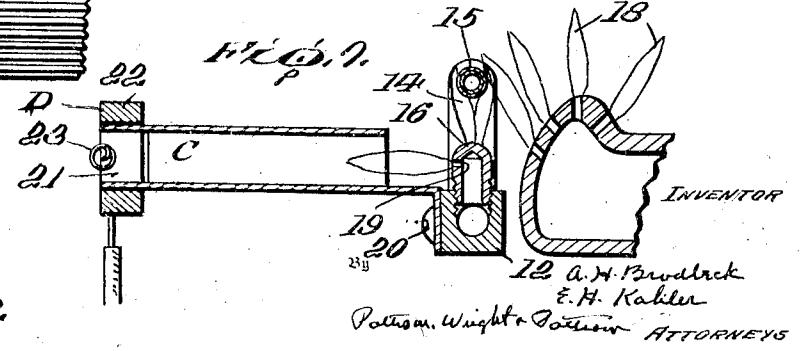


FIG. 7.



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UNITED STATES PATENT OFFICE

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AUTOMATIC IGNITION SYSTEM FOR BURNERS

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Application March 25, 1941, Serial No. 385,129

19 Claims. (Cl. 158—117.1)

This invention relates to an automatic ignition system for burners, and pertains more specifically to an automatic electric ignition system particularly adapted for use on gas ranges, although it is to be recognized and understood that the system can be advantageously used in connection with instrumentalities other than gas ranges.

Automatic ignition means for both the cooking top as well as the broiler and baking oven burners of a gas range is not new. In the past however the ignition means has ordinarily and usually included a constant burning gas pilot light and this has been found to be disadvantageous in that several constant burning pilot lights have been required with the result that these pilot lights increase the fuel consumption with a consequent increase in the cost of operation of the range. Where gas rates are high this additional fuel consumption is of material importance.

The constantly burning gas pilot lights tend to increase the kitchen temperature and this too is a disadvantage in hot climates of the country.

The primary object of the invention is the provision of an automatic ignition system which overcomes the aforementioned objections of additional gas consumption and the increase of room temperature.

Another and further object of the invention is the provision of such an ignition system which is electrical in nature and fully automatic in operation and constructed in a manner to safeguard the range and the operator against injury.

Other further objects and novel features of construction will appear from the following description of an embodiment of the invention as illustrated in the accompanying drawings.

In the drawings: Fig. 1 is a plan view illustrating the invention as applied to a gas range.

Fig. 2 is a top view of the combined gas cock and switch with the switch in an open position.

Fig. 3 is a front end view of Fig. 2.

Fig. 4 is a fragmentary top view illustrating the switch in a closed position.

Fig. 5 is an end view of the switch as it appears in Fig. 4.

Fig. 6 is a fragmentary top view showing the switch moved to a latched position with the circuit broken.

Fig. 7 is a vertical sectional view through the flash tube, pilot light burner and a portion of the main burner.

Fig. 8 is an edge view of the bi-metallic switch contact carrying arm.

Inasmuch as the particular construction of oven is of no material importance to the present invention and can be altered to suit the convenience of the producer or user, the oven is illustrated only diagrammatically and no detailed description of its construction is given.

As to the burner, the construction of it too can be varied and in consequence the invention is not to be limited to a burner constructed exactly as illustrated in the drawings and as hereinafter described.

Likewise it is to be recognized that the range can be equipped with an oven heat regulator, as hereinafter described, or the heat regulator can be eliminated where the same is not required such as in the cheaper types of ranges.

Attention is also called to the fact that the switch utilized, which we broadly refer to as a time switch, need not be built in exact accord with that illustrated in the drawings and hereinafter described but we have found this particular construction to be highly efficient in operation.

A further alteration could be made without departing from the spirit of the invention in that we believe the flash tube could possibly be dispensed with but we do not recommend its elimination.

Referring now to the drawings, A is an oven having therein a burner B provided with the usual intake manifold 1. Gas from any suitable source of supply is fed to the main gas manifold 2 and in ordinary practice all of the burners of the range receive their initial supply of gas from this manifold. A gas cock 3 is connected with the manifold and provided with an operating handle 4 conveniently positioned for manual operation. An oven heat regulator 5 receives gas through the manual valve 3 via a connecting pipe or conduit 6.

The heat regulator is of any conventional and well known type and is provided with a conveniently positioned manually operable setting valve and dial 7. Further description is considered unnecessary as many efficient and successful heat regulators are now in use and can be purchased on the open market.

A pipe 8 interconnects a safety valve 9 for fuel delivery thereto. This valve is normally in a closed position and held so under resilient or other suitable tension so as to prevent the flow of fuel from the valve through the pipe 10 to the fitting or jet 11 the delivery end of which is disposed within the intake end of the burner manifold 1.

A pilot light 12 is associated in ignition relationship to the burner B and receives fuel

through a by-pass conduit 13 which is connected to the safety valve. The safety valve construction is such that when fuel is permitted to flow to it a small amount by-passes the safety valve and reaches the pilot light through the aforementioned pipe 13.

The pilot light is in reality a burner which burns throughout its length a plurality of flames 14 which play upon and heat a thermal element or member 15 which element when it expands in response to the heat generated by said pilot burner operates to open the safety valve and permit fuel to flow to the main burner B.

The main burner orifices 16 of the main burner B are remote to the pilot burner but the burner is provided with a series of burner orifices 17 which extend toward the pilot burner and constitute a chain lighter. The flames 18 burned by these chain lighter orifices are in ignition relationship to the fuel escaping from the pilot light burner as clearly illustrated in the drawings.

The pilot burner in its side is provided with a substantially horizontally disposed burner orifice 19 which is in alignment with and discharges gas into the adjacent open end of a flash tube C. This flash tube is supported as at 20 on the pilot burner 12 and is of considerable length so that its opposite open end 21 is remote to the intense heat generated by the flames burned at the main and pilot burners B and 12.

An electric ignition means designated as an entirety at D is arranged in ignition relationship to the gas discharged into the flash tube by the pilot burner. The particular manner of association of this electric ignition means with the flash tube can be varied, but we have found it convenient and at the same time comparatively cheap to construct the electrical ignition means and associate it with the flash tube in the specific manner which will now be described.

The ignition means comprises an apertured block 22 composed of some suitable dielectric material the aperture in which is of the proper size and configuration to telescopically receive the end 21 of the flash tube, which tube may be either circular or angular in cross sectional shape. This block or unit is provided with what we have termed an ignition coil 23 which extends transverse the open end 21 of the flash tube and over which the gas discharged into the tube from the pilot burner must pass in its travel through the tube.

The electric circuit utilized is supplied with current from any suitable source such as the ordinary lighting circuit found in homes and places of business and which is ordinarily of 110 voltage. The lead-in wires from the source of supply are 24 and 25 and pass through a transformer 26 which provides a 10 volt circuit for heating the ignition coil 23 to incandescence. From the transformer one side 27 of the circuit is provided with a resistor 28 and then grounded at 29 to any suitable metallic part of the range. The other side or wire 30 of the circuit leads to the ignition block 22 and through the coil 21 and then continues through the wire 31 to a switch E the exact nature of which will be hereinafter described. This switch is normally open and one terminal thereof is suitably grounded to a metallic part of the range as at 32.

The switch E is for the purpose of providing a predetermined automatic time cycle of the closed condition of the normally open electric circuit.

As mentioned, the switch is normally open as the switch or contact points 33 and 34 thereof are normally held in separated relationship. The conductor 31 enters the switch in series relationship with the resistance wire 35 which passes to the contact 34. The contact 33 is grounded through the lever arm 41 to the switch housing which in turn is grounded to the gas cock or as shown diagrammatically grounded at 32 in Figure 1. The terminal to which the wire 31 is attached is insulated from the switch E. The bi-metallic lever 36 is rigidly mounted on the insulated member 38 by a rivet at 48. The resistance wire 35 is insulated so as to prevent a short circuit.

The switch contact point 33 is carried by a ceramic block or element 39 rigidly secured in or to one end 40 of a lever 41 which is pivotally mounted as at 42 intermediate its ends. The opposite end of the lever is crimped or kinked at 43 and is engaged by the end 44 of a crank arm 45 which is rigidly secured to and rotatable with the gas valve operating handle 4. The engagement of the crank arm 44 with the pivoted lever when the gas valve operating handle is in a closed position is such as to hold the contacts 33 and 34 of the switch in separated relationship. A spring 46 tends normally to urge the pivoted arm 41 in a direction to bring the contact points of the switch into engagement.

When the gas cock handle 4 is rotated to open the gas valve the end 44 of the crank arm 45 is swung out of engagement with the pivoted arm thus permitting the arm to be moved by the power of the spring 46 which results in bringing the contact point of the switch into engaging relationship thus closing the electric circuit.

Immediately upon the circuit being closed the ignition coil 23 is rapidly brought to a temperature sufficient to ignite any gas and air mixture conveyed to it through the flash tube. The electric circuit is also closed through the resistance wire 35 which immediately begins to heat the bi-metallic switch contact carrying arm or element 36. Upon being heated this strip deflects in the direction indicated by arrow causing it to wipe or pull the switch contact 34 across the pivoted arm carried switch contact point 33 and this deflection continues until the contact 34 has moved completely across and beyond the contact 33 which permits the pivoted arm 41 to move further under the action of the coil spring 46 with the result that the parts assume the positions illustrated in Fig. 6 of the drawings. In this figure of the drawings it will be seen that the circuit has been broken and the switch contact points have been definitely locked against possible re-engagement. Short circuiting is prevented by reason of the contact point 34 being in engagement with the non-conducting ceramic element 39 carried by the pivoted arm 41.

The parts will remain in this locked condition until the gas valve is manually rotated to a closed position at which time the end 43 of the pivoted arm 41 will again be engaged by the valve handle carried crank arm 45 which will swing the pivoted arm 41 back to its original position. The bi-metallic strip 36 in the meantime having cooled will automatically spring back to its original position and the parts are again in position for another and similar cycle of operation.

Obviously the duration of time the electric circuit will remain closed after it has once been closed can be adjusted to suit the particular conditions. A simple expedient for varying the adjustment would be through the selection of the proper bimetallic element and/or by regulating

the amount of heat applied to this element by the resistance coil 35 in any stated period of time.

The wiping action of the switch contact points when the circuit is broken has been found to be desirable as it tends to maintain these contacts clean and free of any foreign substance or material so as to assure good electrical conductivity. The wiping action is in a tangential manner and the degree of frictional contact between the points and the consequent degree of wiping action can be increased or decreased by strengthening or weakening the tension of the spring 46.

When the switch automatically breaks the circuit and moves into a self-latching position any possibility of an accidental reestablishment of a closed circuit condition is prevented which is a desirable feature inasmuch as the life of an ignition coil would be materially shortened if the circuit were accidentally closed and remained closed over a long period of time. The mechanical breaking of the circuit through the switch is obtained in a snap-action manner which is desirable as it will tend to prevent burning or pitting of the switch contact elements.

The switch is such that the circuit can be operated on either direct or alternating current so as to render the ignition system capable of universal use.

Inasmuch as the switch is closely associated with the range which will throw off considerable heat while in operation it is desirable to provide for compensation in the bi-metallic strip against ambient heat. One way in which this can be accomplished is to make a portion 47 of the strip responsive to ambient heat in a direction opposite to the remaining larger portion 48 of the strip which responds in the opposite direction to the heat supplied by the resistance coil 35. In other words in response to ambient heat the two parts of the strip neutralize one another but when the heat of the resistance coil is applied the portion 48 of the strip deflects to a greater degree thus causing the switch to operate, in the manner described, that is in a manner just as if the ambient temperature were actually the same as the room temperature.

The resistor 28 is used in the circuit to permit the use of a higher voltage than would normally or ordinarily be used and serves to break down contact resistance. Obviously a circuit where "hot" wires are brought to the switch could be substitutes for a grounded circuit should it be found desirable.

In view of the foregoing description a few words only need be said as to the operation of the invention. When the gas cock is turned on gas is permitted to flow through the oven heat regulator to the safety valve but cannot pass at this time to the main burner B. The safety valve however by-passes a small amount of gas to the pilot burner and this gas escapes through the burner ports thereof and is also injected into the flash tube. Simultaneously with the opening of the gas cock the electric circuit is closed as the pivoted switch lever 41 is released. The closing of the circuit heats the ignition coil 23 and is simultaneously causing the resistance coil 35 to heat the switch bi-metallic arm 36. The gas mixture injected into the flash tube comes in contact with the heat ignition coil and in accord with conventional flash tube ignition systems an explosion occurs which travels back through the flash tube and causes the gas issuing from the remaining ports of the pilot light burner to be ignited. The flame and heat from the pilot burner heat the thermal element 15 which in turn acts to open the safety valve and permit gas to flow to the main burner B. This gas upon issuing from the ports of the main burner is ignited from the flame burning at the pilot light burner through the action of the chain lighter ports or flames 18 of the main burner.

Throughout the time the pilot light thermal element 15 is being heated and acts to open the safety valve the resistance coil 35 is continuing to heat the switch bi-metallic element 36 and with proper timing of the cycle of operation this strip, shortly after the main burner has been ignited, will have become sufficiently hot to have deflected sufficiently to break the electric circuit through the switch in the manner which has been hereinbefore fully described.

When the fuel supply to the main burner is shut off the time switch is through this operation returned to its original position so that the parts are in the proper condition for a similar cycle of operation whenever the range operator desires to again bring the main burner into use.

It is to be noted that no gas can flow and escape in an unburned or raw state because ignition of the main burner is assured. If the pilot burner is not ignited to assure ignition of the main burner no fuel will be supplied to the main burner upon the initial opening of the manually operable fuel control valve 3.

It is to be further noted that although a gas burning pilot light is used for a short time in the cycle of operation of the invention the gas consumption incident to a constant burning pilot light is eliminated and that the invention automatically provides for the use of electric current over only an exceedingly short period. The device is accordingly extremely cheap to operate.

Recognizing that detail changes in mechanical construction can be made without departing from the spirit of the inventive concept, the invention is to be limited only within the scope of the hereinafter appended claims.

We claim:

1. The combination comprising, a main burner, a pilot burner for igniting said main burner, a manually operable valve for initially controlling the supply of fuel to both of said burners, a normally closed safety valve stopping the flow of fuel to the main burner from said manually operable valve, a thermo-responsive member operable by the heat generated by said pilot burner to open said safety valve, an open electric circuit including an electric igniter in lighting relationship to the fuel issuing from said pilot burner, a switch in said circuit operable by said manual fuel valve to close said circuit when said valve is moved to an open position, and means put into operation by the opening of said manual fuel valve to automatically cause said switch to open after a predetermined duration of time.

2. The combination comprising, a main burner, a pilot burner for igniting said main burner, a manually operable valve for initially controlling the supply of fuel to both of said burners, a normally closed safety valve stopping the flow of fuel to the main burner from said manually operable valve, a thermo-responsive member operable by the heat generated by said pilot burner to open said safety valve, an open electric circuit including an electric igniter in lighting relationship to the fuel issuing from said pilot burner, a switch in said circuit operable by said manual fuel valve to close said circuit when said valve is

moved to an open position, thermo-responsive means operable to open said switch, means to heat said thermo-responsive means, and said heating means being automatically put into operation by the opening of said manual fuel valve.

3. The combination comprising, a main burner, a pilot burner for igniting said main burner, a manually operable valve for initially controlling the supply of fuel to both of said burners, a normally closed safety valve stopping the flow of fuel to the main burner from said manually operable valve, a thermo-responsive member operable by the heat generated by said pilot burner to open said safety valve, an open electric circuit including an electric igniter in lighting relationship to the fuel issuing from said pilot burner, a switch in said circuit operable by said manual fuel valve to close said circuit when said valve is moved to an open position, thermo-responsive means operable to open said switch, electric means in said circuit to heat said thermo-responsive means, and the circuit to said electric heating means being closed by the operation of said manual fuel valve to an open position.

4. The combination comprising, a main burner, a pilot burner for igniting said main burner, a manually operable valve for initially controlling the supply of fuel to both of said burners, a normally closed safety valve stopping the flow of fuel to the main burner from said manually operable valve, a thermo-responsive member operable by the heat generated by said pilot burner to open said safety valve, an open electric circuit including an electric igniter in lighting relationship to the fuel issuing from said pilot burner, a switch in said circuit operable by said manual fuel valve to close said circuit when said valve is moved to an open position, an electric resistor heater in said circuit, a second thermo-responsive member responsive to the heat thrown off by said resistor, said electric circuit including an electric contact point carried by said second thermo-responsive member, a movable contact adapted to engage said last named contact to close said circuit, resilient means urging said movable contact into contacting relationship, the opening of said manual fuel valve permitting said movable contact to move into contacting relationship to close said circuit, the closing of said circuit causing the heating of said resistor and the distortion of said second thermo-responsive member to move the contact thereof out of engagement with the movable contact, and the resilient means urging said movable contact to a closed position acting to further move said contact to lock the two contacts against engaging relationship and the electric circuit in an open position.

5. The combination comprising, a main burner, a pilot burner for igniting said main burner, a manually operable valve for initially controlling the supply of fuel to both of said burners, a normally closed safety valve stopping the flow of fuel to the main burner from said manually operable valve, a thermo-responsive member operable by the heat generated by said pilot burner to open said safety valve, an open electric circuit including an electric igniter in lighting relationship to the fuel issuing from said pilot burner, a switch in said circuit and having a pair of electrical contact points, one of said contact points carried by a pivotally mounted arm, the second of said contacts carried by a thermo-responsive arm, means biasing said pivoted arm to move the same to bring said contacts into engagement, means operable by said manual fuel valve to hold said pivoted arm against its bias when said fuel valve is closed and to permit said arm to move in response to its bias when said fuel valve is open, a heater associated in heating relationship with said thermo-responsive member carrying said second contact, said heater being automatically brought into operation upon the meeting of said contacts and the closing of said circuit, and said thermo-responsive member after a predetermined time responding to the heat of said heater to move said second contact across the first contact carried by said pivotally mounted arm until the engagement between the contacts is broken, and the breaking of said circuit through said contacts acting to automatically discontinue the operation of said heater.

6. A construction such as defined in claim 5 wherein, upon the breaking of the contact between said contact points said pivoted arm in response to its bias moves into a latching position in respect to said thermo-responsive member to prevent the return of said member to its normal position upon its becoming cool.

7. The combination comprising, a main burner, a pilot burner for igniting said main burner, a manually operable valve for initially controlling the supply of fuel to both of said burners, a normally closed safety valve stopping the flow of fuel to the main burner from said manually operable valve, a thermo-responsive member operable by the heat generated by said pilot burner to open said safety valve, an open electric circuit including an electric igniter in lighting relationship to the fuel issuing from said pilot burner, a switch in said circuit having a pair of electrical contact points, the first of said contact points carried by a pivotally mounted arm, the second of said contact points carried by a flexible arm which is thermo-responsive in nature and flexes in response to the application of heat, means biasing said pivotally mounted arm and the contact points thereof towards said second contact, means associated with and operable by said manual fuel valve for locking said pivoted arm against its bias and releasing said arm to respond to its bias, an electric heater associated with said flexible thermo-responsive arm, said heater being in said circuit and said heater being brought into operation upon the closing of said circuit by engagement of said pair of contacts, and said heater upon the closing of said circuit acting to cause said flexible contact carrying arm after a predetermined time interval to flex and pull its electric contact point across and out of engagement with the contact point carried by said pivotally mounted arm.

8. A construction such as defined in claim 7 wherein, upon the disengagement of said contact points in response to the heat generated by said heater said pivotally mounted arm moves further in response to its bias and locks said thermo-responsive resilient arm against movement in a direction which would bring said contact points again into engagement, and wherein said pivotally mounted arm is automatically returned to its retracted position upon the operation of the manual fuel valve to a closed position.

9. A construction such as defined in claim 3 wherein, said electric resistor heater is in the form of a coil coiled about said second thermo-responsive member.

10. A construction such as defined in claim 5

wherein, the heater is in the form of an electric resistance coil mounted in said electrical circuit and coiled about said thermo-responsive member which carries said second contact.

11. The combination comprising, a main burner, a pilot burner for igniting said main burner, a valve for initially controlling the supply of fuel to both of said burners, a normally closed safety valve stopping the flow of fuel to the main burner from said fuel valve, an open electric circuit including an electric igniter in lighting relationship to the fuel issuing from said pilot burner, a thermo-responsive member operable by the heat generated by said pilot burner to open said safety valve, a switch in said circuit, and a common means for opening said fuel valve and closing said switch.

12. The combination comprising, a main burner, a pilot burner for igniting said main burner, a manually operable valve for initially controlling the supply of fuel to both of said burners, a normally closed safety valve stopping the flow of fuel to the main burner from said manually operable valve, a thermo-responsive member operable by the heat generated by said pilot burner to open said safety valve, an open electric circuit including an electric igniter in lighting relationship to the fuel issuing from said pilot burner, a switch in said circuit operable by said manual fuel valve to close said circuit when said valve is moved to an open position, an electric resistor heater in said circuit, a second thermo-responsive member responsive to the heat thrown off by said resistor, said switch including an electric contact point carried by said second thermo-responsive member and a movable contact adapted to engage said last named contact to close said circuit, means urging said movable contact into contact relationship, means locking said movable contact against movement in response to said urging means, and the opening of said manual fuel valve releasing said lock and permitting said movable contact to move into contacting relationship.

13. The combination comprising, a main burner, a pilot burner for igniting said main burner, a manually operable valve for initially controlling the supply of fuel to both of said burners, a normally closed safety valve stopping the flow of fuel to the main burner from said manually operable valve, a thermo-responsive member operable by the heat generated by said pilot burner to open said safety valve, an open electric circuit including an electric igniter in lighting relationship to the fuel issuing from said pilot burner, a switch in said circuit operable by said manual fuel valve to close said circuit when said valve is moved to an open position, an electric resistor heater in said circuit, a second thermo-responsive member responsive to the heat thrown off by said resistor, said switch including an electric contact point carried by said second thermo-responsive member and a movable contact adapted to engage said last named contact to close said circuit, means urging said movable contact into contacting relationship, means locking said contact against movement in response to said urging means, the opening of said manual fuel valve releasing said lock and permitting said movable contact to move into contacting relationship to close said circuit, and the closing of said circuit causing the heating of said resistor and the distortion of said second thermo-responsive member to move the contact thereof out of engagement with the movable contact to break said electric circuit.

14. A construction such as defined in claim 4 wherein, the closing of the manual fuel valve returns the movable contact into its original starting position.

15. The combination comprising, a main burner, a pilot burner for igniting said main burner, a manually operable valve for initially controlling the supply of fuel to both of said burners, a normally closed safety valve stopping the flow of fuel to the main burner from said manually operable valve, a thermo-responsive member operable by the heat generated by said pilot burner to open said safety valve, an open electric circuit including an electric igniter in lighting relationship to the fuel issuing from said pilot burner, a switch in said circuit operable by said manual fuel valve to close said circuit when said valve is moved to an open positon, a heater, a second thermo-responsve member responsve to the heat generated by said heater, said switch including an electric contact point carried by said second thermo-responsive member and a contact point carried by a movable member, means urging said movable member and the contact thereof into contacting relationship with said other contact, the opening of said manual fuel valve permitting said movable member to move and bring its contact into contacting relationship with said other contact to close said circuit, and the closing of said circuit bringing said heater into operation and causing the distortion of said second thermo-responsive member to move the contact thereof out of engagement with the contact carried by the movable arm to break said circuit.

16. A construction such as defined in claim 15 wherein, the urging means of said movable member carrying one of said contact causes said movable member to lock the two contacts against further engaging relationship after the second thermo-responsive member has caused the opening of the circuit.

17. A construction such as defined in claim 13 wherein, the electric resistor heater is in the form of a coil coiled about said second thermo-responsive member.

18. A construction such as defined in claim 13 wherein, upon the distortion of the second thermo-responsive member the contacts move into a latched position to prevent the return of said second thermo-responsive member to its normal position upon its becoming cool.

19. A construction such as defined in claim 13 wherein, upon distortion of said second thermo-responsive member said member and the movable contact move into a latched position, and means returning the movable contact to its original starting position upon the closing of the manual fuel valve.

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