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I. V. BRUMBAUGH ET AL

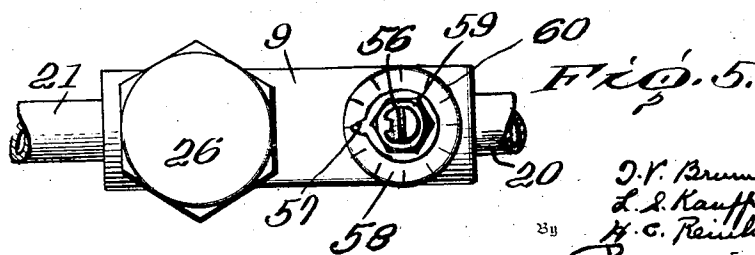
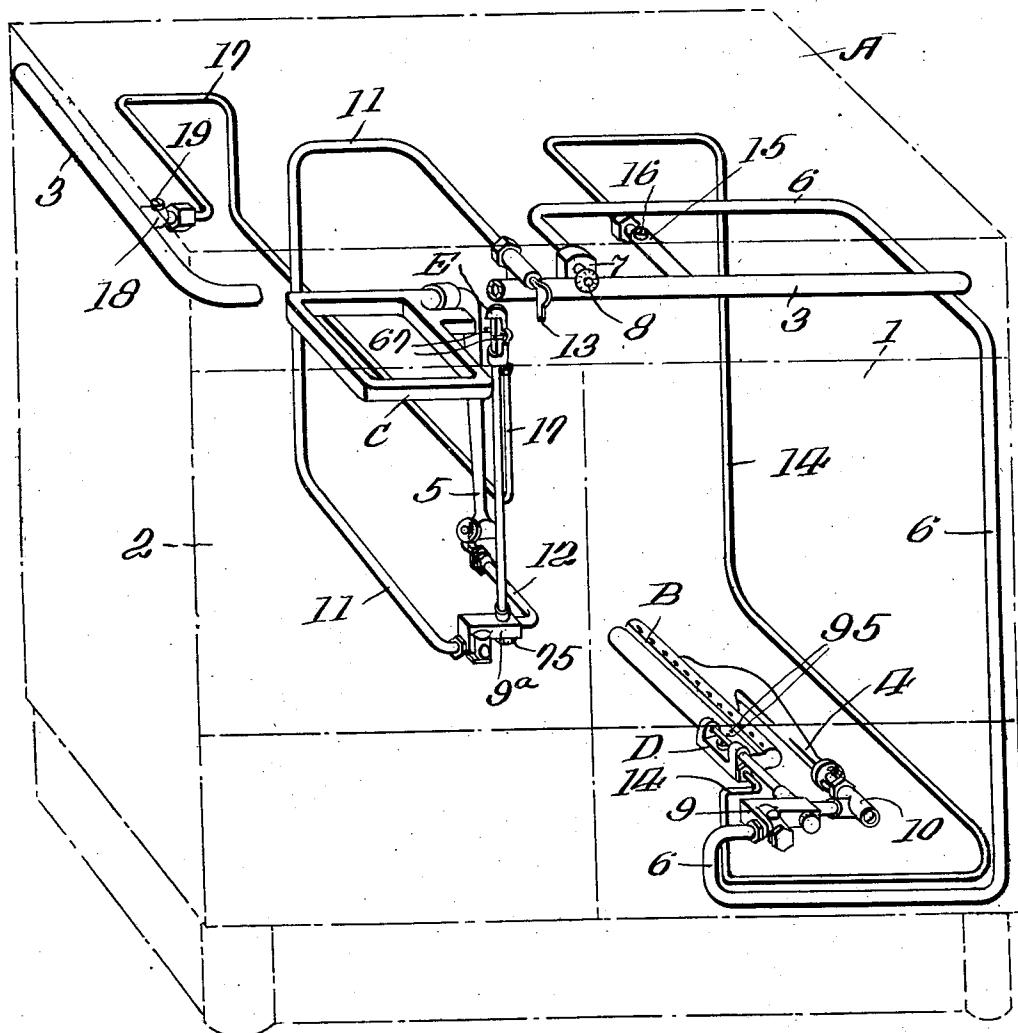
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AUTOMATIC FUEL CONTROL

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2 Sheets-Sheet 1

FIG. 1.



INVENTORS
 I. V. Brumbaugh
 L. L. Kauffman
 H. C. Reinhardt
 Patton, Wright & Patton
 ATTORNEYS

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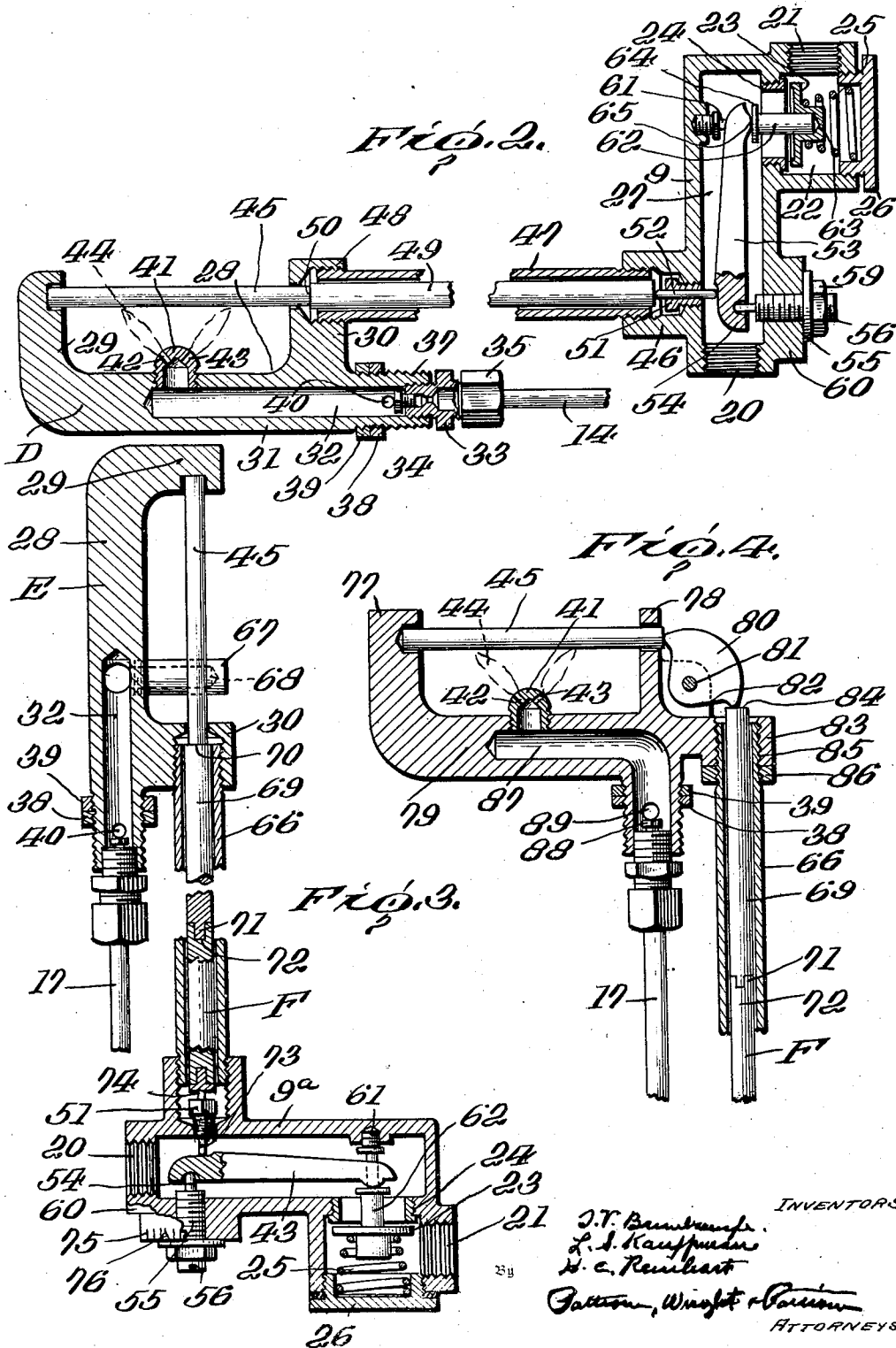
I. V. BRUMBAUGH ET AL

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2 Sheets-Sheet 2



INVENTORS
 I. V. Brumbaugh
 L. A. Kauffman
 W. C. Rembert
 Patton, Wright & Carson
 ATTORNEYS

UNITED STATES PATENT OFFICE

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AUTOMATIC FUEL CONTROL

Isaac V. Brumbaugh, Lester S. Kauffman, and
Harold C. Reinhart, St. Louis, Mo., assignors to
American Stove Company, St. Louis, Mo., a cor-
poration of New Jersey

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For a great many years automatic ignition has been provided for the cooking top burners of cooking ranges and particularly has this been the case in respect to gas ranges. Automatic ignition has also been provided for the oven burners of ranges but in devices of this character the problem of safe automatic ignition is much more difficult to solve because in this instance the highly inflammable and explosive gaseous mixture for both the burner and the automatic ignition device was delivered into a closed chamber and there is always the possibility, in the event of faulty operation, of a serious and highly destructive explosion.

The present invention has as its primary object the provision of a safe yet highly efficient device or apparatus for automatically igniting the gaseous fuel oven or broiler burners of a range.

In the provision of an apparatus to accomplish the above result we have provided novel, highly efficient and safe means for controlling the delivery of fuel to the oven and broiler burners and as a consequence a further object of the invention is the provision of an improved fuel control device.

In the provision of an automatic ignition device for the ovens and broilers of ranges of varying types and constructions other specific objects, novel features of construction and improved results are provided and accomplished the specific nature of which will appear in more detail from the following description when read in conjunction with the mechanical constructions illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a view in front elevation of a range having oven and broiler burners and in which the application of one form of the present invention to the range is illustrated.

Figure 2 is a vertical sectional view through the automatic ignition device utilized in conjunction with the oven burner.

Figure 3 is a vertical sectional view of the automatic ignition device used in conjunction with the broiler burner.

Figure 4 is a fragmentary vertical sectional view through a modified form of the invention.

Figure 5 is a front plan view of the safety valve housing.

Having reference now to the drawings and utilizing similar reference numerals and characters to designate like parts throughout the description, A designates any range of conventional form or type having therein an oven chamber provided with a conventional form of door 1 and

a broiler chamber provided with any conventional form of door 2. Within the oven there is a main oven burner B and in the broiler chamber a burner C. The exact construction and manner of operation of these two burners is immaterial to the present invention which will satisfactorily operate in conjunction with any conventional oven or broiler burner.

In conformity with the usual and accepted practice the range is provided with a main gas manifold pipe of conduit 3 which is connected to any suitable source of fuel supply (not shown). The oven burner is provided with a fuel intake manifold 4 and the broiler burner with a fuel intake manifold 5. Fuel is supplied to the oven burner through a conduit 6 which connects with the main gas manifold 3 through any conventional or well known oven heat regulator which is designated as an entirety at 7 and is provided with the usual temperature setting wheel 8. An oven heat regulator is not essential to the operation of the invention but has come to be more or less standard equipment with the better types of ranges. This pipe 6 discharges into a safety valve housing designated as an entirety at 9 and from this housing is led to the oven burner intake manifold 4 by a pipe and fitting 10. Fuel for the broiler burner is led from the main fuel manifold 3 by a take-off pipe 11 to a second safety control housing 9a, which is of identical construction to the hereinbefore mentioned housing 9, and from this housing is conveyed to the broiler burner intake manifold 5 by a short length of pipe or conduit 12. Fuel to the broiler burner is initially under the control of a valve operable by a gas cock handle 13 conveniently positioned exterior of the range.

A pilot burner designated as an entirety by D is positioned closely adjacent the oven burner B and receives fuel through a conduit 14 which has connection with the main gas manifold pipe 3 through a fitting 15 which is provided with a valve 16 which is adjustable by which the size of the flame burned at the pilot is adjustable.

A pilot light designated as an entirety at E is positioned closely adjacent the broiler burner and receives its fuel supply through a conduit 17 which is connected to the main gas manifold pipe 3 by a suitable fitting 18 provided with a valve 19 which provides means to adjust the flow of fuel to the pilot light and hence the size of the pilot light flame.

Referring now particularly to Figure 2 of the drawings it will be seen that the fuel supply pipe 6 for the oven burner is connected to the safety

valve housing 9 at the threaded opening 20 and that the fitting 10 which connects with the burner intake manifold is connected to the safety valve housing at the threaded opening 21 which has communication with the housing chamber 22 at a point in back of the reciprocable valve 23 which valve is normally urged against its seat 24 by a coil spring 25. The threaded cap 26 provides a means of entry into the chamber 22 to permit removal and insertion of parts. The housing has a main chamber 27 in front of the valve 23.

The pilot light as an entirety is designated, as previously explained, at D and comprises a metallic member 28 which is substantially of a U-shape in cross sectional configuration in that it has a pair of vertically extending legs 29 and 30 arranged in separated relationship. This metallic member has a low coefficient of expansion.

The bottom 31 of the U-shaped member is provided with a fuel conduit 32 to the inlet end of which is attached the hereinbefore referred to fuel supply pipe 14 which extends into a fitting 33 which is internally threaded into the conduit 32 as at 34. The outer end of the fitting 33 is externally threaded to receive a draw-up nut 35. The conduit 32 is elongated beyond the member 28 and is externally threaded as at 37 to receive a nut 38 and a lock nut 39. Adjustment of the nut 38 in respect to the air inlet opening 40 of the conduit 32 serves as a means of controlling the admission of air to mix with the fuel.

The pilot burner is designated at 41 and is positioned in the bottom of the low coefficient of expansion member 28 approximately intermediate the legs 29 and 30 thereof and is provided with two oppositely upwardly and outwardly inclined burner orifices 42 and 43 at which burn flames 44 which play against the under side of and around a thermal member 45 which is supported in the legs 29 and 30 of the negative member 28 above the pilot light in the manner clearly indicated in Figure 2 of the drawings.

The low coefficient member 28 is supported from the safety valve housing 9 in a manner now to be described. The housing 9 is provided with an internally threaded and hollow extension 46 which threadedly receives one end of a tube 47 the other end of which is threadedly attached as at 48 in the leg 30 of the negative member 28. This tube 47 is of sufficient strength and rigidity to support the entire pilot light assembly D, and is preferably made of stainless steel.

A rod 49 is within and extends throughout the length of the tube 47 and has its outer end in abutment with the thermal member 45 as indicated at 50 while its inner end is in abutment with a pin 51 which passes through a bushing 52 into the safety valve chamber 27. The rod 49 is made of the same material as the tube 47 so that they will have the same coefficient of expansion and contraction. The rod is freely movable in the tube. The bushing 52 fits the pin sufficiently snug to prevent gas seepage.

The inner end of the pin within the chamber 27 abuts a lever 53 adjacent one end thereof but at a point to the inner side of the engagement of said lever by a second pin 54 carried by a screw 55 which is threadedly adjustable within one wall of the valve housing 9 and adjustable from a point exterior of the housing by the application of a suitable tool to its curved end 56.

A pointer 57 surrounds the screw exterior of the valve housing and is movable over a dial 58 which visibly indicates the setting of the pin 54. After proper adjustment has been made the parts are locked in their adjusted positions by a lock nut 59. The dial reading is shown as being impressed or imprinted upon the face of the boss 60 but if desired the dial could be a separate and distinct member.

The lever 53 acts to multiply the movement of the thermal member 45 and at its end remote to its engagement with the pins 51 and 54 the lever is forked for the passage of a guide pin 61 upon which is reciprocally mounted a sleeve 62 which engages a suitable seat 63 provided in the fuel control valve 23. The inner end of the sleeve is provided with an enlarged head 64 which is engaged by the end 65 of the lever as is clearly illustrated in Figure 2 of the drawings.

To those skilled in the art a few words will suffice to describe the operation of the fuel control valve and safety pilot light thus far described. In Figure 2 of the drawings the pilot light is illustrated as being ignited and it is to be borne in mind that this is a constant burning pilot light which stands ready at all times to ignite the main oven burner B whenever fuel is permitted to flow thereto through the operation of the manual valve 8. With the pilot light burning the thermal element 45 has been caused to expand from the heat generated by the pilot light and has therefore exerted a pressure upon the rod 49 pushing it to the right, as viewed in Figure 2 of the drawings, which has caused the multiplying lever 53 to exert sufficient pressure upon the sleeve 62 and the main fuel control valve 23 as to open that valve against the pressure of the coil spring 25 which normally tends to hold the valve in a closed position.

In reading the foregoing description of operation it is to be understood that the thermal member is made from some suitable alloy or material which has a very high coefficient of thermal expansion whereas the member 28, which has been referred to as negative in nature, has a much lower coefficient of thermal expansion.

From the foregoing it will be seen that the operator of the stove will be at all times assured that the manual valve can be safely opened to deliver fuel to the oven burner for the reason that if the pilot burner is not ignited to assure that the main oven burner will be ignited then none of the gas flowing in the oven burner conduit 6 will reach the oven burner because the safety valve 23 will be in a closed position. This valve will be closed by the spring 25 if the pilot light is not ignited because the thermal member 45 will be in a contracted rather than an expanded position and when the thermal member is contracted the spring 25 can and does act to close the valve 23 against the delivery of any fuel whatsoever to the oven burner.

The adjustable pin carrying the screw 55 provides the means for the adjustment of the safety valve. The adjustment is made when the pilot light is out and the thermal member is cold and at this time the safety valve 23 is of course in a closed position. The pointer and dial heretofore referred to simplify and aid in making the proper adjustment.

In the range illustrated in the drawings there is a broiler chamber or compartment which is separate and distinct from the baking oven and in accord with the usual and accepted practice the broiler burner C is in the upper end of the

broiler chamber. By reason of the fact that temperatures within broiling chambers become exceedingly high a compensator is used in conjunction with the thermal member of the fuel control device and the safety pilot light and the safety valve itself is positioned remote to the broiler burner rather than closely adjacent the burner as it is in the baking oven.

In many respects the arrangement and construction utilized in connection with the broiler burner is identical to that heretofore described in connection with the oven burner and to a limited extent the same reference numerals are utilized in respect to Figure 3 of the drawings as have been utilized in respect to the construction illustrated in Figure 2 of the drawings and duplicate description is eliminated.

In a broiler it has been also found necessary to so position the safety valve as to assure that it will not be subjected to the full heat of the broiler burner.

So far as the safety valve housing 9a and the valve operating mechanism and valve therein is concerned the structure is identical to that heretofore described the only difference being, as clearly appears in Figure 1 of the drawings, that this housing is positioned within the lower part of the broiling chamber and remote from the broiler burner C. Accordingly the same numeral designations are applied to the parts within the safety valve housing 9a as have been used on like parts in the heretofore described safety valve housing 9.

Referring now to Figure 3 of the drawings it will be seen that there is the same thermal element 45 supported in the legs 29 and 30 of the low coefficient of expansion member 28. It is to be observed however that the low coefficient of expansion member 28 rather than being disposed in a horizontal plane, as was the case in respect to the oven burner, this member is disposed in a vertical plane and by reason of the respective positions of the low coefficient of expansion member 28 and the safety valve housing 9a a much longer tube 66, than the tube 47, is necessary to provide interconnecting and supporting means between the low coefficient of expansion member 28 and the safety valve housing 9a.

The low coefficient of expansion thermal element and pilot light carrying member is provided with the same fuel conduit 32 to which gas is supplied by the heretofore mentioned fuel pipe 17 so as to provide a constant supply of fuel to the pilot light burner which in this instance is designated at 67. There is the same air inlet 40 adjustable by means of the nut 38 and lock nut 39. The pilot light comprises a pair of jets 67 positioned closely adjacent and at each side of the lower end of the thermal element 45 and have their burner orifices 68 so arranged as to direct pilot flames upwardly along and around the length of the thermal element.

In this particular and specific construction there is within the tube 66 a rod 69 made of the same material as the tube so as to have the same coefficient of thermal expansion. The upper end of this rod engages the thermal element 45 as at 70 while the lower end of the rod is provided with a tongue 71 having interfitting connection with the forked end 72 of a compensator rod F which compensator is within the tube 66 and together with the rod 69 are of a length substantially the same as the length of the tube. This compensator rod has a much higher coefficient of thermal expansion than that of the pusher rod 69 and the

purpose of the inclusion of this compensator rod will more fully appear hereinafter.

The lower end of the compensator rod has engagement with a pin 73 as at 74 which pin passes through a bushing 81 identical to that heretofore described.

Due to the very high temperatures prevalent in the broiler chamber the low coefficient of expansion member 28 becomes very hot and it has been found that the thermal element 45 under these conditions does not open the valve 23 far enough to prevent the valve moving backwardly towards its seat when the high temperature in the broiler chamber has caused the low coefficient of expansion member to expand to some degree. The additional thermal element F which we designate as a compensator member will expand under the high temperature when the same is reached within the broiler chamber and act as a booster to the initial movement imparted to the safety valve by the main thermal element 45 and thus prevent the valve 23 from approaching too near its seat when these high broiler chamber temperatures are reached. If the compensator or booster element is not provided the necessary high temperature to successful broiling operations may not always be maintained by reason of the fact that once the high temperature is reached the fuel control valve of the broiler burner may tend to approach a closed position and so reduce the flame of the broiler burner as to make it impossible to maintain within the broiler chamber the high temperature necessary to successful broiling.

In this form of the invention the dial 75 for indicating the setting of the lever engaging pin 54 is on the side wall of the boss 60 and the pointer is bent rearwardly as at 76 to travel over this dial.

In Figure 4 of the drawings a third type of device is illustrated and inasmuch as the difference in construction of this device resides entirely in the connection between the thermal element and its connection with the push rod 69 the device is only fragmentarily illustrated and an illustration or description of the safety control valve is unnecessary.

The construction illustrated in Figure 4 is for use in connection with broiler burners and is such as to permit the thermal element, the low coefficient of expansion member in which it is mounted, as well as the pilot light to be mounted in a horizontal plane near the broiler burner.

There is the same thermal element 45 and it is mounted in the vertical legs 77 and 78 of a low coefficient of expansion member designated as an entirety by 79. This thermal element moves freely through the vertical leg 78 and has engagement with a bell crank 80 which is rotatably mounted on a pin 81 supported between the ears 82 provided on the extending end 83 of the low coefficient of expansion member. The push rod 69 is within the same tube 66 and has engagement as at 84 with the bell crank lever. It will be obvious that by reason of the threaded connection 85 between the tube 66 and the extension 83 of the low coefficient of expansion member the low coefficient of expansion member can be swung into any position in a horizontal plane and locked in that position by a lock nut 86.

The pilot light is the same light 41 described in respect to the Figure 2 form of the invention and receives its fuel from a conduit 87 which has a downwardly extending portion within the downward extension 88 of the low coefficient of expansion member. There is an air inlet opening 89 into the fuel conduit which is controlled, as

heretofore described, by the nuts 38 and 39 respectively. Fuel for the constant burning pilot light is brought from the main range manifold through the herein referred to conduit 17.

The construction immediately above described converts the horizontal movement of the thermal element 45 to a vertical movement on the rod 69 and compensator or booster rod F so as to operate the safety control valve 23, as will be readily understood from the description given in respect to the other forms of the invention.

By providing a structure in which the carrier which includes the pilot light burner can be swung to any desired position in a horizontal plane it will be obvious that the proper positioning of the pilot burner in respect to the main burner can be easily and readily accomplished.

From the foregoing description it will be seen that we have provided an automatic ignition means for liquid fuel burners which is extremely simple of construction yet highly efficient in operation and yet has the very necessary attribute of providing an automatic ignition device which is absolutely and dependably safe in operation.

To facilitate and assure ignition of the main oven burner B from the pilot light a chain of ignition burner orifices 95 is provided which extend from a point adjacent the pilot burner to a point adjacent the main burner orifices of the main burner. In the case of the broiler burner the fuel issuing from the ports thereof reach the pilot flame and assure ignition of the broiler burner.

We claim:

1. In a device of the character described, a main burner and a thermally operated valve for controlling the flow of fuel thereto, a thermally responsive element having operative connection with said valve, said operative connection including a rigid tube having therein in end to end relationship, a push rod and a second thermally responsive element, said push rod and tube having the same coefficient of thermal expansion which is much lower than that of the second thermal element, a constant burning pilot light burner positioned to heat said first thermal element and to ignite said main burner, said main burner and second thermal element being within a chamber heated by said main burner, said second thermal element being responsive to the temperature built up in said chamber by the operation of said main burner but positioned remote to the actual flames burned by either said main or pilot light burners, and a second valve operable to deliver fuel to said thermally operated valve when operation of the main burner is desired.

2. In a device of the character described, a main burner, a fuel delivery conduit for said burner, a valve in said conduit controlling the flow of fuel to said burner, means constantly urging said valve to a closed position, a constantly burning pilot light burner positioned to ignite said main burner, a thermal responsive element positioned to be heated by the flame of said pilot light burner, a second thermal responsive element positioned remote to said pilot burner and responsive to the heat generated by said main burner, a rod operatively interconnecting said pair of thermal elements, said rod and second thermal element being arranged in end to end relationship within a tube, said rod and tube having the same coefficient of thermal expansion, said second thermal element having a higher coefficient of thermal expansion, said

pilot burner responsive thermal element being of rod-like form and having an extremely high coefficient of thermal expansion and being disposed in axial alignment with said rod, said last named thermal element expanding longitudinally of its axis in response to the heat generated by said pilot burner and having one end in abutment with a carrier and its other end freely movable in said carrier and operatively connected to said rod, said carrier having a low coefficient of thermal expansion, and said second thermal element having operative connection with said fuel control valve.

3. In a device of the character described, a main burner, a fuel delivery conduit for said burner, a valve in said conduit controlling the flow of fuel to said burner, means constantly urging said valve to a closed position, a constantly burning pilot light burner positioned to ignite said main burner, a thermal responsive element positioned to be heated by the flame of said pilot light burner, said fuel control valve being positioned remote to said main burner, a carrier positioned closely adjacent said main burner and composed of a material having a low coefficient of thermal expansion, said thermal element being an elongated member mounted on said carrier and having one end axially movable in respect thereto, said thermal element having a high coefficient of thermal expansion longitudinally of its axis, a carrier support and operative connection between said thermal element and said valve comprising, a tube having its longitudinal axis in alignment with the longitudinal axis of said thermal element and having supporting connection with said carrier, a rod within said tube having one end in operative engagement with said thermal element, a booster thermal element within said tube and having operative engagement with the opposite end of said rod, said rod and tube having the same coefficient of thermal expansion, said booster thermal element having a comparatively high coefficient of thermal expansion as respects said rod and tube and being positioned remote to said pilot burner and responsive to the heat of said main burner, and operative engagement between said booster thermal element and said valve.

4. A construction such as defined in claim 3, wherein the main thermal element is disposed with its longitudinal axis in substantially a vertical plane, said pilot light burner comprising a pair of jets disposed at either side of said thermal element and adjacent the lower end thereof, and said jets provided with burner orifices adapted to direct flames upwardly along the opposite sides of said elongated thermal element.

5. In a device of the character described, a main burner, a fuel delivery conduit for said burner, a valve in said conduit controlling the flow of fuel to said burner, means constantly urging said valve to a closed position, a constantly burning pilot light burner positioned to ignite said main burner, a thermal responsive element positioned to be heated by the flame of said pilot light burner, said main burner being disposed within the upper end of a chamber, said fuel control valve being within a housing in the lower portion of said chamber and remote to the flames burned by said main burner, a vertically extending tube having its lower end secured to said housing, a carrier secured to the upper end of said tube, a tubular booster thermal element in the lower end of said tube having operative engagement with said fuel control

valve, a rod in the upper end of said tube having operative engagement with said booster thermal element, said main thermal element comprising an elongated member disposed in a vertical plane with its longitudinal axis in alignment with the longitudinal axis of said rod, said thermal element having its upper end in abutment with said carrier and its lower end freely movable in respect to said carrier and in operative engagement with the upper end of said rod, said carrier having a low coefficient of thermal expansion, said main thermal element having a high coefficient of thermal expansion longitudinally of its axis, said rod and tube having the same coefficient of thermal expansion and said booster thermal element having a substantial coefficient of thermal expansion longitudinally of its axis.

6. A device of the character disclosed, comprising an oven, a main burner in said oven, a safety valve housing communicating with said main burner, a pilot burner support in said oven located near said main burner, a thermal member supported by said pilot burner support and heated by said pilot burner, said thermal member extending from said pilot burner to and operating said safety valve, said thermal member at the pilot burner consisting of metal having a high co-efficient expansion, and the balance of said thermal member having one part having a low co-efficient of expansion and the other part of said thermal member having a relatively high coefficient of expansion, said parts operating as and for the purpose described.

7. A device of the character disclosed, comprising a main burner housing, a horizontally elongated main burner having a plurality of burner ports parallel with said burner and located within said housing, a fuel supply conduit connected with said main burner, a U-shaped pilot burner support in said main burner housing with the bottom of said U extending parallel with said main burner, a safety fuel control valve in said conduit controlling the flow of fuel to said main burner, means constantly urging said valve to a closed position, a thermal member connecting the arms of said U member and extending to and adapted to operate said safety valve to an open position, a pilot burner located below said thermal member and between said arms and operable to heat said member and to ignite said main burner, a fuel supply for said pilot burner independent of said main burner fuel supply, a manually actuated valve for controlling the flow of fuel to said safety valve, said thermal member including an extension of rod-like form one portion of which has a lower coefficient of expansion than said thermal member and a further portion having the same coefficient of expansion as said thermal member, and said last named portion acting as a booster or compensator to the initial movement imparted to said safety valve by said thermal member.

ISAAC V. BRUMBAUGH.
LESTER S. KAUFFMAN.
HAROLD C. REINHART.