

April 10, 1962

B. FAURE
GAS BURNERS

3,028,909

Filed Aug. 26, 1957

4 Sheets-Sheet 1

FIG. 1

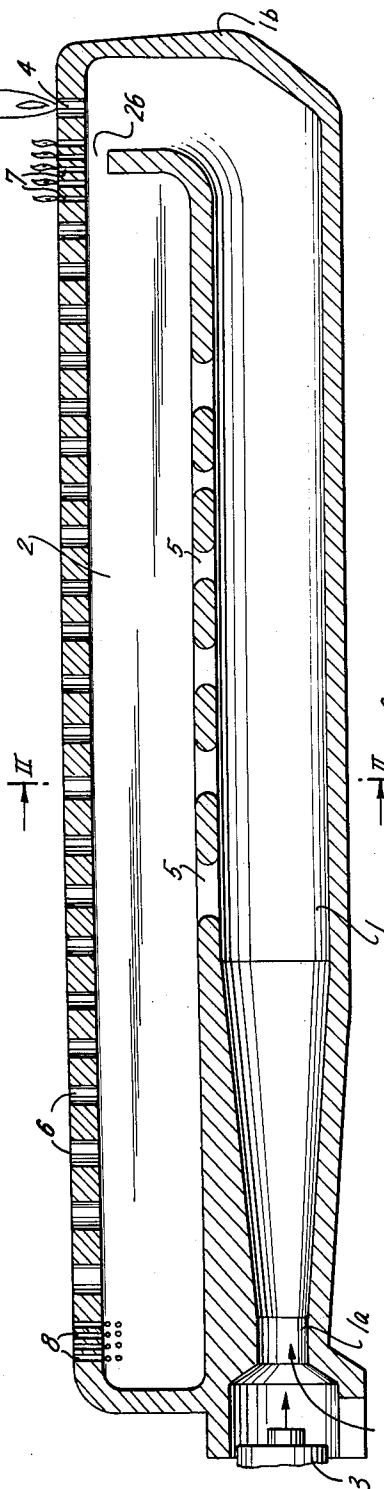
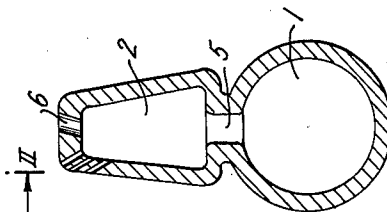


FIG. 2



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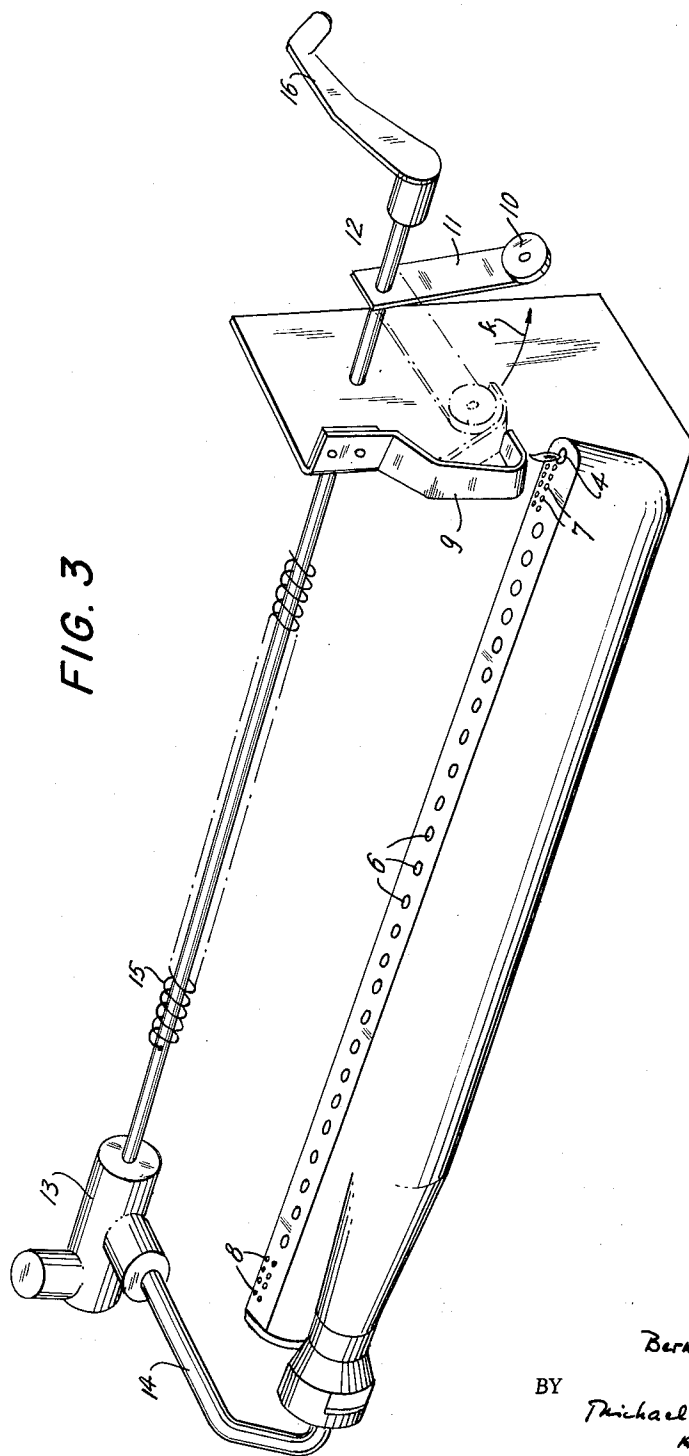
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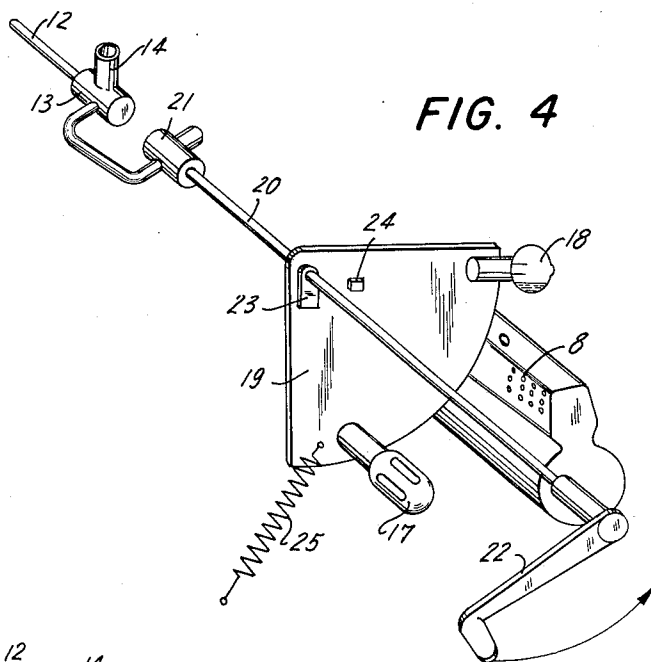


FIG. 4

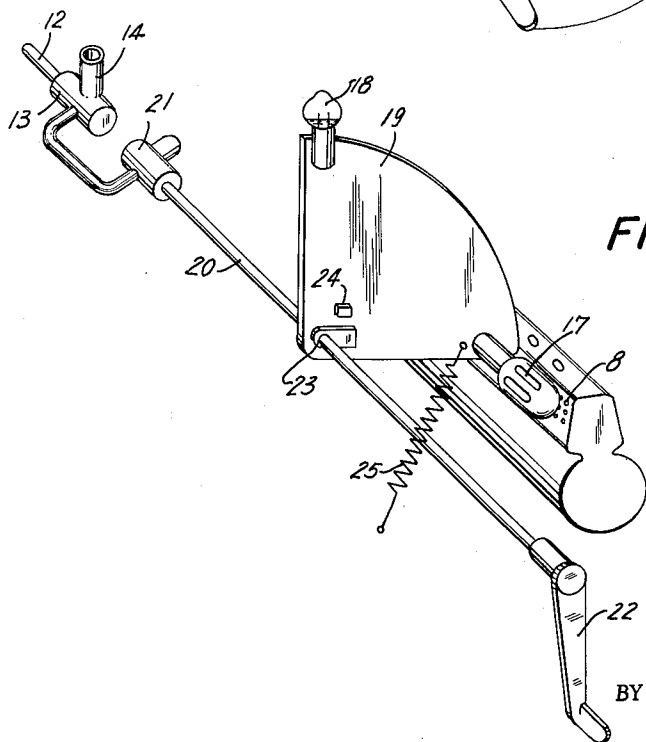


FIG. 5

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FIG. 7

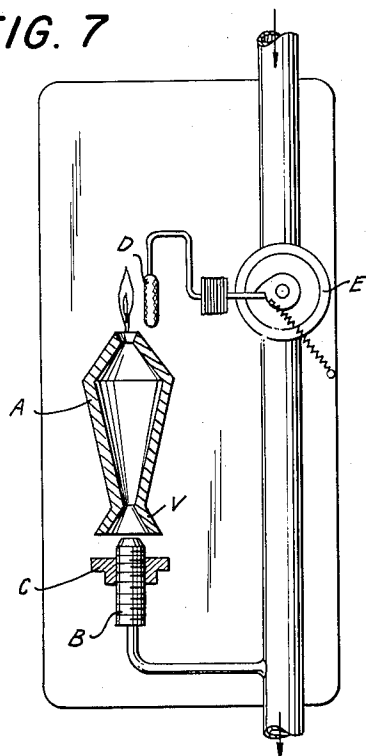


FIG. 8

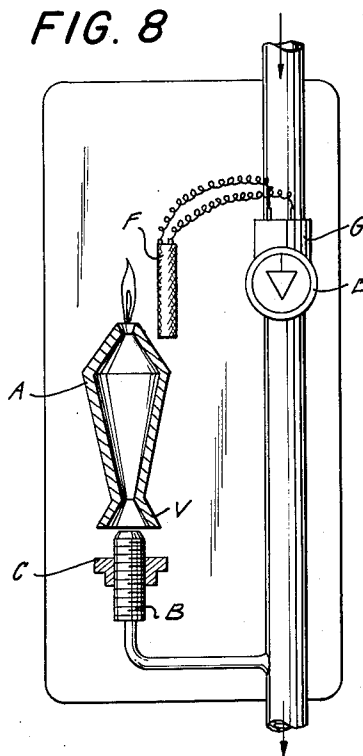
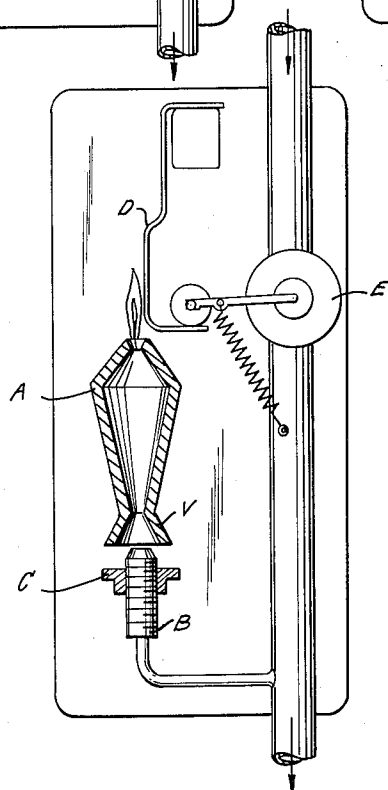


FIG. 6

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GAS BURNERS

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Claims priority, application France Sept. 14, 1956
4 Claims. (Cl. 158—132)

The present invention relates to gas burners for domestic appliances such as radiators or cookers fed with gas from any source such as a town mains gas pipe or a flask of compressed gas such as butane or the like.

The subject of the invention is a gas burner provided with a safety means adapted to cut off the supply of gas when certain disturbances occur in the air for combustion and, more particularly, when the oxygen content of the air for combustion falls below a critical value.

The invention is particularly useful in the case of gas burners functioning without a means of evacuating the burnt gases, such as portable radiators or appliances intended for use indoors without a chimney.

The device according to the invention is characterised by the combination of:

(a) a standard bank composed of a series of flame holes of known dimensions for heating purposes.

(b) at least one pilot light orifice so dimensioned as to produce a stable flame when fed with air having an oxygen content higher than a predetermined value and unstable when the oxygen content of the air falls below this value.

(c) pyrostatic means for controlling a cock situated on the feed pipe for the gas fuel, said means being sensitive to the heat of the pilot flame in such a way as to cut off the feed when the latter is extinguished.

The invention likewise comprises the following arrangements, considered together or separately:

(a) the pilot flame orifice or orifices are situated on the same bank as the ordinary flame holes.

(b) the pilot flame orifice or orifices are situated on a separate bank from that of the ordinary flame holes.

(c) the pilot flame orifices are located at a point at which the static pressure of the gases and the dynamic pressure of their flow simultaneously prevail.

(d) the ordinary flame holes are of such dimensions as to produce a flame which remains stable when the oxygen content of the air falls below the critical value which renders the pilot flame or flames unstable.

(e) the burner is divided into two chambers, on the one hand a first chamber into which the gas fuel penetrates through one of its ends (for example a venturi) and passes out at the other end under its dynamic and static pressure through a pilot flame hole and, on the other hand, a second chamber forming the customary burner bank and connected to the first chamber by ducts, the passage section of which is such that in normal conditions of use only the static pressure of the gas prevails in said second chamber.

(f) the safety device controlled by the pilot flame is constituted by a pyrostat (such as a bimetallic strip) which, when hot, locks in its open position a control lever of the inlet cock for the gas, and when cold releases said lever, which automatically returns into its position of closure.

(g) the pyrostat may have a hook which holds, when hot, the control lever of the inlet cock and which comprises a return-spring which tends constantly to bring it back into its closure position.

(h) lighting is effected by means of an electrical resistance mounted on a movable unit which is able for lighting purposes to be instantaneously brought in front of the gas outlet orifices, said unit being equipped with a

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return-spring which is able to bring it back into a position in which said resistance is out of the flame.

(i) the movable unit carries a contact, for example a mercury contact, which cuts off the current in any position other than the lighting up position.

(j) the lighting contact and resistance may be mounted on a fishplate pivoting on an axis of rotation and restored by a spring to the position in which the resistance is inactive.

(k) a selective tap permits variations in the rate of flow and is controlled through a lever designated "lighting lever" which is adapted to drive said fishplate as far as it will go in order to bring it into its position for lighting.

(l) the selective tap and the tap for controlling the inlet of gas to the burner are coaxial.

(m) the control lever described under (f) and the lighting lever described under (k) are one and the same member.

The invention will be described hereinbelow with reference to the accompanying drawings, in which is shown, simply by way of example:

In FIGURE 1 a longitudinal section through a burner according to the present invention.

In FIGURE 2 a section along the line II—II in FIG. 1.

In FIGURE 3 an isometric projection of the burner and the device for controlling the cock.

In FIGURES 4 and 5 isometric projections of the lighting device in its position of rest and its position for lighting, respectively.

In FIGURES 6, 7 and 8 three variants in construction of the pilot flame and of the safety tap control.

Referring to FIGURES 1 and 2, it is seen that the burner illustrated has two elongated chambers 1 and 2. The chamber 1 receives the gas under pressure from the injector 3 through its end in the form of a venturi 1a. Its other end 1b, which is bent, is pierced with an orifice 4. The chamber 1 is in communication with the chamber 2 by holes 5. The chamber 2 comprises a first row of holes 6 of normal section, a second series of holes 7 of slight section and a series of lighting holes 8 also of slight section. The holes 7 are located between the holes 6 and the hole 4 in such a manner that the pilot flame emerging from the hole 4 can be lighted by the flames emitted from the holes 6 without causing any appreciable deformation of the pyrostat 9, which will be described hereinbelow. The cross-section of the chamber 1, as can be seen in FIGURE 2, is substantially circular while that of the chamber 2 resembles a trapezium.

Near the hole 4 there is disposed a bimetallic strip pyrostat 9 which in the hot position lodges on the trajectory of a roller 10 carried by an arm 11 keyed on the shaft 12 of the cock 13 which controls the gas inlet duct 14 to the chamber 1. A spring 15 tends to rock the lever 11 in the direction of the arrow f. As long as the bimetallic strip 9 is hot, the control lever 16 cannot be brought into the position of closure of the cock 13. When using a compressed gas fuel in a flask it is thus necessary to close the discharge valve of the flask in order to extinguish the burner, and escapes between the valve and cock 13 are thereby avoided.

The igniting device is constituted by a resistance 17 which is heated by a cell battery, not shown, and which is brought in front of the holes 8. The circuit of said resistance comprises a mercury switch 18. The resistance 17 and the switch 18 are supported by a single bracket 19 mounted loosely on a shaft 20. The switch 18 closes the circuit of the resistance 17 in the igniting position as shown in FIGURE 5. The resistance 17 thus heated causes the gas passing out of the narrow holes 8 to light up.

A lever 22 keyed on the shaft 20 controls a selective

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cock 21 coaxial with the stopcock 13 and which permits different rates of flow into the duct 14. This shaft 20 has an arm 23 which at the end of its stroke strikes a stop 24 carried by the bracket 19 and thus at the same time causes the displacement of the electrical resistance 17 and the pivoting of the mercury contact 18.

A spring 25 brings the assembly of the bracket 19, resistance 17 and contact 18 into the position of rest shown in FIGURE 4 and with the aid of the stop 24 and the arm 23 brings the lever 22 and the cock 21 into its position of restricted flow.

The present invention is not confined to the example described. Thus, for example, the lever 16 and the lever 22 may be constituted by a single member, while the cocks 13 and 21 are in that case also in one piece.

The apparatus described affords numerous advantages, notably the following:

(a) As the holes 6 are supplied under the static pressure of the gas alone, that is to say under a pressure lower than that of the gas supplied to the hole 4, the velocity of flow of the combustible mixture through the holes 6 is necessarily smaller than the velocity of flow of the combustible fluid through the hole 4 and the pilot flame emitted from the latter is extinguished in the event of any accident (for example a reduction in the oxygen content of the air surrounding the burner) before the flames emerging from the holes 6. In these circumstances, the latter flames burn up the gas arriving in the burner between the moment when the pilot flame goes out and the moment when, in consequence, the cock 13 is effectively closed as a result of being freed by the pyrostat 9.

It should here be observed that the cross-section of the holes 5 must be such that when the burner is working, any dynamic gas pressure is avoided in the chamber 2.

(b) In the event of catching fire at the outlet of the injector 3, the gas will fail at the outlet of the holes 4 and 6 and consequently the pyrostat 9 automatically causes the inflow of gas to cease.

(c) Due to the shape of the pyrostat 9 and its position, it is impossible, as has already been indicated, to close the cock 12; the only method of stopping the supply is by closing the stop valve of the gas inlet duct or of the gas flask.

(d) Since the resistance 17 is automatically returned into its position of rest, it cannot be destroyed by the flame.

(e) In order to hasten the evacuation of the air contained in the end 1b of the chamber 1 and hence to reduce the interval before the flame emitted from the hole 4 is ignited, an orifice 26 is provided which connects the chambers 1 and 2.

In the case of FIGURES 6, 7 and 8, the pilot flame orifice is disposed on a bank separate from the bank provided with normal flame holes.

For this reason, the normal bank has not been shown, as it may be constructed in any conventional and normal manner, but only the safety device which may be combined with said normal bank.

In the case of FIGURE 6, the control device of the cock controlling the supply is a bimetallic strip, whereas in the case of FIGURE 7 it is a fluid expansion device and in that of FIGURE 8 a thermo-couple system.

In all three cases the pilot burner A is fed with fuel gas by the injector B and with primary combustion air through the ring C regulating the supply to the venturi V.

The burner A is so adjusted as to give a metastable flame, that is to say at the limits of detachment for a normal atmosphere.

It is in fact known that for a given gas the speed of propagation of the flame in said gas depends on the one hand on the initial regulation of the burner, and on the other hand on the absolute oxygen content of the atmosphere.

By adjusting the burner so as to obtain a metastable

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flame, that is to say at the limits of detachment in normal atmosphere, positive safety is thereby obtained.

If in fact the atmosphere in which the burner is functioning should become poorer in oxygen beyond the limits necessary to normal health, the stability of the flame is affected and as said flame has been regulated beforehand at the limit of detachment, it disappears, with the result that the gas circuit is interrupted and consequently the row of normal jets is put out, while however the latter remain in conditions of flame stability.

In the case of FIGURE 6, the flame of said burner acts on the bimetal strip D, which itself controls in any suitable manner the cock E controlling the general supply and in particular that to the main bank of jets, not shown; according to the example, this control consists in the release of a spring which closes the cock E if the burner A goes out.

In the case of FIGURE 7, the device D is a liquid or gas expansion device comprising a bulb connected to a cap controlling a locking device which locks the cock E so long as the burner is lit. When it goes out, the cock is freed and closes under the action of a spring.

In the case of FIGURE 8, a thermo-electric couple F is acted on by the flame and feeds a solenoid controlling the shutting off and admission F of the supply of gas.

These devices operate as follows:

The safety tap E having been turned on and being held in its open position, the main bank of jets is lighted and also the flame of the safety burner A. The tap is kept in its open position until the device which is sensitive to the flame of the burner ensures that the tap E is locked in the open position.

The burner A is so adjusted as to ensure that the flame has a metastable condition approaching the limit of detachment.

If any danger arises of the atmosphere becoming injurious to health, the flame passes from the metastable to unstable condition and is extinguished by detachment, thereby releasing the locking devices and at the same time cutting off the supply to the useful appliance and that to the safety burner.

The safety burner may have one or more flames. The burner may be supplied with a gas fuel differing from that used to feed the main jets, without departing from the scope of the present invention.

I claim:

1. In a burner assembly, in combination, a burner unit including an elongated tubular member formed with a series of openings constituting a main burner and with at least one additional opening spaced from said series of openings; means cooperating with said tubular member for supplying thereto a combustible fluid which has a velocity of flow at said additional opening which is greater than the velocity of the fluid at said series of openings so that the flame at said additional opening will become extinguished when the oxygen content of the surrounding atmosphere falls below a given value while flames at said series of openings will continue to be supported; and means cooperating with the flame at said additional opening for automatically cutting off the supply of fluid to said supplying means which cooperates with said tubular member when said flame at said additional opening is extinguished.

2. In a burner assembly, in combination, an elongated tubular member formed with a series of openings constituting a main burner and with at least one additional opening spaced from said series of openings and of approximately the same size as each of said series of openings; supply means cooperating with said tubular member for supplying a combustible fluid to said series of openings substantially only at a given static pressure and to said additional opening at said given static pressure plus a given dynamic pressure so that the pressure of the combustible fluid supplied to said additional opening is greater than that supplied to said series of openings, said supply

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means providing a greater rate of flow of combustible fluid through said additional opening than through said series of openings, whereby when the oxygen content of the atmosphere surrounding said tubular member falls below a given value a flame at said additional opening will be extinguished while the flames at said series of openings will continue; and means cooperating with the flame at said additional opening and with said supply means for cutting off automatically the flow of combustible fluid to said supply means when the flame at said additional opening is extinguished.

3. In a burner assembly, in combination, an elongated tubular housing having an exterior wall portion formed with a series of openings constituting a main burner, said series of openings being located relatively distant from one end of said housing and said exterior wall portion being formed with an additional opening spaced from said series of openings and located adjacent to said one end of said housing, said additional opening being of approximately the same size as each of said series of openings; an elongated partition extending along the interior of said housing, defining with said wall portion a first elongated chamber communicating with said series of openings and defining with the space in said housing on the side of said partition opposite from said series of openings an elongated continuous passage extending to said additional opening, said partition being formed with relatively large openings passing therethrough so that when a combustible fluid is supplied to said elongated passage to flow therealong to said additional opening the fluid will be delivered to the latter opening with both static and dynamic pressure while the fluid passing through the openings of said partition to said series of openings will be delivered to the latter at substantially only said static pressure, whereby the pressure and velocity of flow of the fluid at said additional opening is greater than the pressure of the fluid at said series of openings; and means cooperating with the

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flame at said additional opening for automatically cutting off the flow of combustible fluid.

4. In a burner assembly, in combination, main burner means having main burner opening means; means supplying a combustible fluid through said main burner opening means of said main burner means into the surrounding atmosphere at a velocity of flow which will provide at said main burner opening means a main flame which will remain burning even if the oxygen content of the surrounding atmosphere falls below a predetermined value; control burner means having control burner opening means; means for supplying through said control burner opening means a combustible fluid which passes into the surrounding atmosphere at a speed which will maintain a control flame at said control burner opening means burning as long as the oxygen content of the surrounding atmosphere is above said predetermined value but which will extinguish the control flame when the oxygen content of the surrounding atmosphere drops below said predetermined value; and control means automatically actuating upon extinguishing of said control flame by the drop of oxygen content of the atmosphere below said predetermined value for cutting off the supply of fluid to said main burner means.

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