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GAS BURNER

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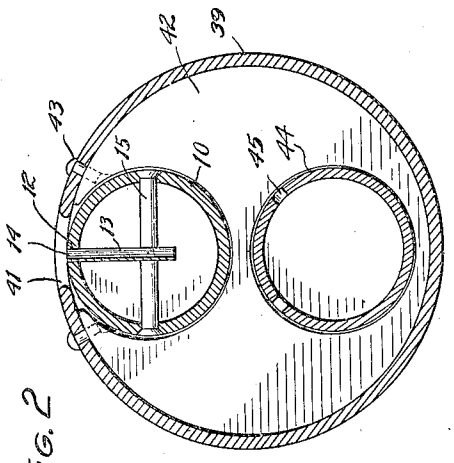

FIG. 2

FIG. 1

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GAS BURNER

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The present invention relates to improvements in gas burners.

In certain cases where gas burners are often used, as in core ovens, japanning ovens and drying ovens, fumes from the work seriously interfere with combustion. The primary object of the present invention therefore resides in the provision in a gas burner of novel means for protecting the flame against surrounding fumes or inert gases so as to permit free and efficient combustion.

A more specific object resides in the provision in a gas burner of novel means for supplying secondary air of combustion about the flame so as to envelop the flame in an oxidizing atmosphere, and hence to keep fumes and gases which would interfere with combustion away from the flame.

An important object resides in the provision in a burner of the foregoing character of novel means for automatically controlling the supply of secondary air in proportion to the supply of the primary fuel mixture so as to maintain a predetermined air-gas ratio.

Still another object is to provide a novel gas burner in which the supply of primary air, of gas, and of secondary air, in a given proportion is under the control of a single regulating member.

A more specific object resides in the provision of novel means for supplying secondary air in which part of the secondary air is taken from the primary air line, and in which the rest of the secondary air is induced from the atmosphere.

Various general objects of the invention reside in the provision of a novel gas burner of the foregoing character which is rigid, sturdy, simple and inexpensive in construction, which is safe and efficient in operation, and in which there is an equal distribution of the fuel mixture and the secondary air.

Further objects and advantages will become apparent as the description proceeds.

In the accompanying drawing, Fig. 1 is a sectional view, partially diagrammatical in character, of a gas burner embodying the features of my invention.

Fig. 2 is a transverse sectional view taken along line 2—2 of Fig. 1.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawing and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Ovens having relatively large surfaces, such as those referred to in the foregoing, are often provided with gas burners adapted to give a ribbon flame. While the invention is not limited thereto, it is particularly applicable to burners of this type, and in the accompanying drawings is illustrated in connection with one form thereof.

Referring more specifically to the drawing, the burner constituting the exemplary embodiment of the invention comprises an elongated hollow burner member 10 preferably tubular in form and tightly closed at one end in any suitable manner, as by means of a plug 11. Formed in one side of the tube 10, preferably in a milling operation, and terminating slightly short of the ends thereof, is a narrow longitudinal slot 12. A suitable strip 13 which is corrugated laterally and which is substantially coextensive in length with the slot 12 is fitted tightly therein, and with the sides of the slot defines a series of closely spaced ports or jet passages 14 longitudinally of the tube 10. Gas from the tube 10 is adapted to pass through these passages 14 for ignition in the form of a ribbon flame.

To prevent the sides of the slot 12 from moving away from the strip 13, through peripheral expansion of the tube 10, a plurality of rivets 15 extend through the tube at spaced points and laterally of the slot.

To hold the strip 13 positively against displacement in the slot 12, it is made of a width to extend a substantial distance into the tube 10. Preferably, the strip 13 extends a short though substantial distance beyond the cen-

ter of the tube. The rivets 15 extend through the strip 13, and serve to hold the latter in position. The strip 13 also serves to divide the flow of gas in the tube 10 to the passages 14, thereby improving the distribution of the fuel mixture.

The burner tube 10 may be connected to any suitable source of fuel, and in the present instance is connected to a mixing and proportioning device 16, preferably in the form of a Venturi suction T. More specifically, the device 16 comprises a casing 17 having an outlet opening 18 and inlet openings 19 and 20.

Secured in the opening 18 is a suitable expanding nozzle 21 having an inlet port 22 in the casing 17 and being connected to the open end of the tube 10.

An air line 23, adapted to be connected to a suitable source of air under pressure (not shown), is connected to an inlet nozzle 24 secured in the opening 19. The nozzle 24 is in alignment with the nozzle 21, and opens directly in front of the port 22. Interposed in the line 23 is a suitable regulating valve 25.

A gas line 26 adapted to be connected to a suitable source (not shown) of fuel is connected to the opening 20. Interposed in the line 26 is a suitable adjustable orifice 27 and a suitable zero governor 28. Preferably, the zero governor 28 is of standard construction, and comprises a casing 29 and a diaphragm 30 dividing the casing into chambers 31 and 32. The chamber 31 opens through a suitable port 33 to the atmosphere, and the chamber 32 opens through a suitable vent passage 34 to the line 26 at the outlet side of the governor. Interposed in the gas line 26 is a suitable valve comprising a seat 35 and a valve member 36 connected by a stem 37 to the diaphragm 30. A spring 38 connected at one end to the diaphragm 30 and adjustably anchored at the other end in the casing 29 tends to flex the diaphragm in a direction to close the valve.

Air under pressure passes from the inlet nozzle 24 to the expanding nozzle 21, and in so doing creates a vacuum which serves to induce a flow of gas proportional to the flow of air. The ratio may be adjusted by means of the orifice 27, and the amount of the mixture may be adjusted by the valve 25.

In certain instances, surrounding fumes and/or inert gases tend to interfere seriously with combustion. One of the primary objects of the invention resides in the provision of means for protecting the burner from such influences. To this end, the burner tube 10 is mounted in a relatively large enclosing member 39 which preferably is tubular in form and which is closed at the ends by suitable means, such as plugs 40. The tube 39 is formed with an elongated slot 41 substantially coextensive in length and in registration with the slot 12. Disposed in longitudinally spaced relation in the tube 39 are a plurality of transverse, suitably recessed castings 42. These castings 42, together with the end plugs 40 serve to hold the tube 10 in position, and the margins of the slot 41 are secured thereto, as by cap screws 43, to prevent the margins from moving away from the tube 10 due to peripheral expansion of the tube 39.

Means is provided for supplying secondary air of combustion to the tube 39 for passage about the tube 10 to the slot 41, and for automatically controlling the supply of secondary air in accordance with the supply of gas and primary air to the tube 10. In the present instance, this means comprises a tube 44 extending in parallel relation to the tube 10 through the tube 39, and having a plurality of apertures 45 along its length. Of the tube 44, one end is closed in any suitable manner, as by a plug 46, and the other end extends outwardly through one of the plugs 40, and is provided with an injector 47. The injector 47 comprises a Venturi tube 48, the discharge end of which is connected to the tube 44, and the inlet end of which is provided with a casing 49 opening to the atmosphere. Disposed in the casing 49 and having a restricted discharge orifice 50 opening to the Venturi tube 48 is an air nozzle 51 connected through a small by-pass line 52 to the primary air line 23 at the discharge side of the valve 25. An adjustable shutter 53 is provided to regulate the opening from the atmosphere to the casing 49. It will be evident that the air from the line 52 will be proportional to the air flowing to the tube 10, and that the air induced from the atmosphere will be proportional to the discharge from the orifice 50.

In operation, the burner is controlled by means of the regulating valve 25 which in the present disclosure controls the supply of air. Primary air entering the device 16 induces a proportional flow of gas from the line 26. This proportion may be varied by adjusting the orifice 27. Preferably the proportion is slightly less than that necessary to effect complete combustion. The resulting mixture passes to the tube 10 from which it is discharged through the passages 14 for ignition. Secondary air in direct proportion to the fuel mixture is supplied to the tube 44 by the injector 47. Most of the secondary air is induced from the atmosphere, and the proportion of secondary air can be varied by means of the shutter 53. The secondary air is discharged from the tube 44 to the tube 39 from which it passes about the tube 10 to the slot 41. The secondary air is sufficient to complete combustion, and being discharged at opposite sides of the passages 14 tends to envelope the flame and to prevent surrounding fumes or gases from interfering with combustion.

Thus, the burner involves a supply of primary air, secondary air and gas, with the amounts of secondary air and gas controlled by the amount of primary air and always directly proportional thereto. The burner pressure is derived from the primary air pressure. The amount of secondary air supplied is controlled by the amount of primary air. The amount of gas supplied is controlled by the amount of primary air. The flow of gas and secondary air is energized by the primary air. This permits of a single control which is embodied in the valve 25.

I claim as my invention:

1. A gas burner comprising, in combination, an enclosed casing having an opening, a burner element disposed in said casing and having means for defining a gas flame in registration with said opening, a proportioning device connected to said element, means for supplying a fluid under pressure to said device as an inducing fluid, means for supplying another fluid by induction to said device, and means for supplying secondary air to said casing, said last mentioned means being responsive to the pressure of said inducing fluid.

2. A gas burner comprising, in combination, a burner tube having means for defining a longitudinal flame, a closed casing having an opening in registration with said first mentioned means, a perforated air tube in said casing, a proportioning device having a pressure inlet and a suction inlet for supplying a mixture of air and gas to said burner tube, an injector for supplying air from the atmosphere to said air tube, said injector being connected to the pressure inlet of said proportioning device.

3. A gas burner comprising, in combination, a burner element having means for defining a gas flame, means for supplying a mixture of air and gas under pressure to said element, and means for automatically supplying secondary air in proportion to said mixture about said element at said first mentioned means, said last mentioned means including an induction passage open to the atmosphere and a jet nozzle opening into said passage and longitudinally thereof, and connected to said second mentioned means for a supply of inducing pressure fluid.

4. A gas burner comprising, in combination, an outer casing having an opening, a burner element mounted in said casing and having means for defining a flame, said means being in registration with said opening to direct the flame therethrough, the edge of said opening being spaced from said element to define a secondary air discharge passage adjacent said means, adjustable means for supplying a variable volume of a proportioned primary mixture of gas and air to said element, means for adjusting the proportions of the mixture, means responsive to the supply of the mixture for supplying a proportional volume of secondary air to said casing for discharge through said passage, and means for adjusting the proportion of the secondary air to the mixture.

5. A gas burner comprising, in combination, a burner element, a casing enclosing said element and having an opening, said element having means for directing a flame through said opening, an injector connected to said element, said injector having a gas suction inlet and an air pressure inlet, means for regulating the supply of air to said injector, and an injector for supplying air to said casing, said last mentioned injector being responsive to the air flow to said first mentioned injector.

6. A gas burner comprising, in combination, an elongated outer casing formed with a longitudinal opening in one side, an elongated burner tube in said casing, said tube being formed longitudinally with means in registration with said opening for defining a flame, and being spaced from the sides of said opening to define secondary air discharge means at opposite sides of said first mentioned means, an elongated air tube in said casing substantially parallel to said burner tube, said air tube being perforated to discharge into said casing, one end of said air tube being open to the atmosphere, and means for supplying a fuel mixture to said burner tube.

7. A gas burner comprising, in combination, an elongated outer casing formed with a longitudinal opening in one side, headers closing the ends of said casing, an elongated burner tube in said casing with its ends anchored in said headers, said tube being formed longitudinally with means in registration with said opening for defining a flame, and being spaced from the sides of said opening to define secondary air discharge means at opposite sides of said first mentioned means, an elongated air tube in said casing substantially parallel to said burner tube and anchored at its ends in said headers, said air tube being perforated longitudinally, intermediate spaced transverse supports in said casing for said tubes, one end of said air tube being open to the atmosphere, and means for supplying fuel mixture to said burner tube.

8. A gas burner comprising, in combination, a casing having an air outlet, a burner having a fuel outlet in registration with said air outlet, a proportioning Venturi fuel mixer connected to said burner, an induced fluid line connected to said mixer, means in said line for governing the pressure of the induced fluid, an adjustable orifice in said line between said means and said mixer for regulating the proportion of gas and air, an inducing fluid line connected to said mixer, a volume control valve in said last men-

tioned line, an air injector connected to said casing and opening to the atmosphere, adjustable means for controlling the opening to the atmosphere, said injector including a jet nozzle, and a pressure line connecting said nozzle to said last mentioned line at a point between said volume control valve and said mixer.

9. A gas burner comprising, in combination, a casing having an opening, a burner mounted in said casing and having fuel discharge means in registration with said opening, a proportioning fuel mixer for supplying a mixture of gas and air to said burner, a Venturi injector for supplying air to said casing, said injector including a chamber open to the atmosphere and a nozzle for discharging a jet of fluid under pressure to induce a proportionate flow of air from the atmosphere through said injector into said casing, and means for supplying a fluid under pressure to said nozzle.

10. A gas burner comprising, in combination, a casing having an opening therein, a burner mounted in said casing and having fuel discharge means in registration with said opening, an expanding cone mounted on and discharging to said casing, an air chamber communicating with the inlet of said cone and with the atmosphere, an adjustable valve for controlling the communication of said chamber with the atmosphere, an injector nozzle mounted to direct a jet of fluid under pressure axially into the inlet end of said cone, a fluid pressure supply line connected to said nozzle, and means for supplying a fuel mixture to said burner.

11. A gas burner comprising, in combination, a burner element, means for supplying primary air under pressure to said element, said means including a volume control valve, means responsive to the primary air supplied for automatically supplying a proportional volume of gas to said element, and means responsive to the primary air supplied for automatically supplying a proportional volume of secondary air to said element, whereby said valve constitutes a single member for proportionately controlling the supply of primary air, gas and secondary air.

12. A gas burner comprising, in combination, a burner element having means for discharging a fuel mixture, an air and gas mixing chamber connected to said element, a gas chamber connected to said mixing chamber, means for supplying gas at a constant pressure to said gas chamber, a nozzle in said gas chamber and adapted to discharge into said mixing chamber, an air line including a control valve for supplying air under pressure to said nozzle, and means for supplying secondary air to said element, said last mentioned means including an air line connected to said first mentioned line at the discharge side of said valve.

13. A gas burner comprising, in combination, a burner element, a proportioning device connected to said element, means for supplying a fluid under pressure to said device as an inducing fluid, said means including a manual regulating valve for adjusting the supply of said fluid to said device, means for supplying another fluid at a substantially constant pressure by induction to said device for proportional mixture with said first mentioned fluid, and means for supplying secondary air to said burner element, said last mentioned means being automatically responsive to the pressure of said inducing fluid at a point between the discharge side of said valve and said device.

14. A gas burner comprising, in combination, an elongated outer casing formed with a longitudinal opening in one side, end plugs closing the ends of said casing, an elongated burner tube extending longitudinally through said casing and eccentrically thereof and having its ends anchored in said plugs, said tube being formed longitudinally with means in registration with said opening for defining a flame, and being spaced from the sides of said opening to define secondary air discharge passages at opposite sides of said first mentioned means, an elongated air tube extending through said casing in substantially parallel relation to said burner tube and anchored at its ends in said plugs, said air tube being perforated longitudinally, spaced intermediate transverse disks in said casing, said disks fitting the inner perphery of said casing and being formed with apertures through which said tubes extend, means for securing the marginal portions of said casing along said opening to said disks, means for supplying fuel to said burner tube, and means for supplying air to said air tube.

15. A gas burner comprising, in combination, an elongated outer casing formed with a longitudinal opening in one side, an elongated burner tube extending longitudinally in said casing and eccentrically thereof, said tube being formed longitudinally with means in registration with said opening for defining a flame, and being spaced from the sides of said opening to define secondary air discharge passages at opposite sides of said first mentioned means, an elongated air tube in said casing in substantially parallel relation to said burner tube, said air tube being perforated longitudinally, means for supplying fuel to said burner tube, and means for supplying air to said air tube.

In testimony whereof, I have hereunto affixed my signature.

GARNET W. McKEE.