A forced draft gas burner having a burner tube, a surrounding blast tube, a fuel orifice discharging into the inlet of the burner tube, and a centrifugal blower supplying combustion air to the burner and blast tubes. An air baffle is positioned adjacent the inlet ends of the burner and blast tubes and between the fuel supply orifice and the burner tube, and extends transversely across a considerable portion of the blast tube; the baffle has a central round aperture therein concentric with the burner tube and operative to increase the static pressure and effect a better distribution of air flow through the blast tube to maintain a predetermined ratio of air-fuel flow through the burner tube and to reduce or eliminate audible pulsing of the burner.

8 Claims, 6 Drawing Figures
BAFFLE FOR FORCED DRAFT GAS BURNER

This invention relates generally to gas burners of the type usually called power gas burners in which a blower provides a forced draft for combustion. It more particularly concerns an unusually compact construction of a burner of this type capable of efficient high heat output operation and adapted to, but not limited to, use as a space heater in mobile homes, or the like, wherein combustion chambers are small and air ducts constricted but wherein heat requirements are relatively high.

Burners of this type have an inherent tendency to pulsate, apparently at a frequency related to that of pulsations of the air supply caused by the blower impeller blades. Reduction in the size of the combustion chamber into which the burner and blast tubes discharge, reduction of the spacing between the blower impeller and burner and blast tubes, increasing the fuel and air input to increase the heat output, and variations in the fuel-air ratios required for efficient combustion, all aggravate these burner pulsations.

It is an object of the present invention to provide a generally new and improved power gas burner of particularly compact design incorporating means to preclude objectionable burner pulsations under conditions of high heat output operation.

It is a further object to provide a gas power burner having a burner tube, a concentric surrounding blast tube, and a blower supplying air to the burner and blast tubes in which means is provided to limit the air flow through the burner tube when the total air supplied to the burner and blast tubes is increased.

A further object is to provide a gas power burner having a burner tube, a concentric surrounding blast tube, and a blower supplying air to the burner and blast tubes including baffle means in the air stream anterior to the burner and blast tubes operative to effect a more uniform flow of air through the blast tube.

A further object is to provide a gas power burner having a burner tube, a concentric surrounding blast tube, a gas jet discharging axially into the burner tube, and a blower supplying air to the burner and blast tubes, in which orifice plate means interposed between the gas jet and burner tube reduces the rate of increase in flow into the burner tube relative to the rate of increase in total air flow supplied to the burner when the total air supply is increased but permits an increase in air flow into the burner tube with increased flow of fuel from the gas jet.

Other objects and advantages will appear from the following description and accompanying drawings.

In the drawings:

FIG. 1 is a side elevational view of a power gas burner constructed in accordance with the present invention;

FIG. 2 is a side elevational view of the burner, looking along line 2—2 of FIG. 1;

FIG. 3 is an enlarged, fragmentary, cross-sectional view taken through the blast tube and blower casing along line 3—3 of FIG. 1;

FIG. 4 is an enlarged, fragmentary, cross-sectional view taken through the blast tube and blower casing along line 4—4 of FIG. 2;

FIGS. 5 and 6 are side elevational and top plan views, respectively, of the air baffle member.

Referring to the drawings in more detail, the burner comprises a volute housing 10 on one side of which is mounted a driving motor 12 having a shaft 14 extending into the blower housing and carrying thereon a squirrel cage fan 16 having generally radial blades 18.

An air inlet is provided on the other side of the housing for admitting air to the central portion of the blower housing and fan, and the air inlet includes a rotatable shutter 20 for controlling the air flow to the blower housing and, consequently, to the burner.

The housing 10 has an outlet flange 22, see FIGS. 3 and 4, to which is connected by suitable means the flanged inner end of a blast tube 24. Overlaying the flanged inner end of the blast tube 24 and suitably connected to the casing flange 22 is a circular mounting flange 26. A fuel and air mixture tube, heretofore referred to as a burner tube 28, is supported substantially coaxially in the blast tube 24 on an angle bracket 30. One end of the horizontal leg of angle bracket 30 is welded to the tube 28 at 31 and the other end to a transversely extending gas supply conduit 32 at 33. The gas supply tube is provided with a perforated lateral boss 34 having a screw-threaded bore which receives a screw-threaded fuel orifice 36. The boss 34 and fuel orifice 36 are concentric with the burner tube. The rear or inlet ends of the burner and blast tubes 24 and 28 are spaced forward from the fuel orifice 36, and the burner tube is provided with an axially adjustable flared collar 38 thereon, thereby to provide for adjustable spacing of the inlet end of the burner tube with respect to orifice 36. The flared collar 38 is fixed in adjusted position on burner tube 28 by a set screw 39.

The gas supply conduit 32 passes through and is rigidly connected, as by welding, to a removable plate member 40, which plate member covers an opening 42 in the side of volute housing 10. The opening 42 extends downward from the top of volute housing 10, and the housing has an opening 43 in the top thereof, thereby to permit insertion of the burner tube. The removable plate 40 is detachably connected to the housing in a position to cover opening 42 by clips 44 and screws 46. The opening 43 in the top of volute housing 10 is covered by a hinged plate member 48 hinged at 49, see FIG. 2.

The burner is further provided with a thermostatically controlled fuel valve 50 and ignition means 52 of conventional construction. The fuel control valve 50 is supported on the end of an exteriorly extending portion of gas supply conduit 32, and the ignition means 52, which may include a pilot burner and an electrical resistance igniter, is supported on the burner tube 28 by a bracket 54 welded to the side thereof. Gas is supplied to the pilot burner through a small fuel conduit 56, and electrical energy is supplied to the igniter through conductors 58, both of which extend through removable plate 40. An electrical connector box 60 and ignition transformer 62 are supported on the hinged plate member 48.

Positioned transversely between the fuel orifice 36 and the inlet ends of the burner and blast tubes, is an air baffle having the form of a flat round disc 64 with a central round perforation 66 concentric with the burner tube and fuel orifice. The periphery of disc 64, see FIGS. 6 5 and 6, is provided with a radial notch 68 which receives the horizontal leg of mounting bracket.
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30 edgewise and a horizontally formed lip 70 which is connected to the horizontal leg of mounting bracket 30 by a bolt 72. The horizontal leg of bracket 30 has a slot 74 through which bolt 72 passes, thereby providing axial adjustable positioning of the disc 64 relative to the inlet end of burner tube 28 and fuel orifice 36. The diameter of circular disc 64 is less than the inside diameter of the blast tube and is substantially concentric therewith.

While I prefer to make the disc 64 circular and position it substantially concentrically with respect to the blast tube, variations from this concentric positioning or from a circular configuration of disc 64, to compensate for obstructions incidental to providing and igniting fuel at the burner orifice or to compensate for the angle of incidence of the air stream from the blower, are contemplated. The axial spacing of disc 64 with respect to the rear or inlet end of blast tube 24 may be adjusted by slidably moving the bolt 72 in slot 74, and the axial spacing of the disc 64 from the rear or inlet end of the burner tube may be maintained when the disc is moved by adjusting the collar 38.

In operation, the disc 64 effects a zone of increased static pressure on the fan inside thereof, wherein any surging or pulsing of the air stream is damped. Also, from this zone of increased static pressure, a more constant and uniform distribution of air flow through the blast tube 24 is achieved. This improvement becomes more marked as air velocities are increased to provide for combustion of greater fuel input. Numerous experiments which I have conducted in the operation of a power gas burner of the type described, with and without the baffle disc 64, have clearly shown that the objectionable rhythmic noise, or pulsing, in the combustion chamber, characteristic of burners of this type, is either completely obviated or reduced to negligible amplitude by the provision of the disc 64. During these experiments, it was also observed that the frequency of this pulsing of the burner varies with the speed of the blower.

Further and distinctive functions of the disc 64 are: in the proportioning of the air flow through the burner and blast tubes in some predetermined ratio, in substantially reducing variations in the flow of air through the burner tube through a range of variation in total air flow under conditions of constant fuel input, and in varying the air flow through the burner tube with variations in fuel flow.

The diameter of disc 64, its axial spacing from the inlet end of blast tube 24 and burner tube 28, and the diameter of the central perforation 66 therein relative to the internal diameter and length of the burner tube, is such that a ratio of primary to secondary air flow through the burner and blast tubes, respectively, results in efficient and quiet combustion for a given fuel input. If air flow from the blower is now increased for any reason, as by opening the air shutter 20 controlling the inlet to the blower, increased turbulence of flow through perforation 66, which constitutes a "thin plate" orifice, limits the increase in flow through the burner tube. In the absence of perforated disc 64, the air flow through the burner tube would increase, as total air flow is increased, at a greater rate than that required to maintain the predetermined ratio, due to the fact that the burner tube is conventionally positioned more or less centrally in the air stream from the blower. The perforated disc 64 functions in this manner, therefore, to reduce variations in a predetermined ratio of primary to secondary air flow through the burner and blast tubes, respectively, when the total air flow is varied.

If, however, the flow of gaseous fuel from fuel orifice 36 is increased, the resulting velocity pressure drop in the central area of perforation 66, through which the gas stream passes, results in an increased flow of primary air through the perforation 66 and, consequently, through the burner tube 28. The perforated disc 64 functions, therefore, in this manner to reduce variation in the ratio of primary air to fuel flow when the flow of fuel is increased. The axial spacing of the perforated disc 64 from the fuel orifice 36 may be adjusted to provide the best results for any fuel input.

I claim:

1. In a gas burner, a casing, a blast tube, a coaxial burner tube of smaller diameter supported therein, a fuel orifice supported in axially spaced relationship with the inlet ends of said blast and burner tubes and arranged to discharge centrally into said burner tube, blower means including casing means leading to the inlet ends of said blast and burner tubes to supply air thereto, and baffle means comprising a transversely arranged, centrally perforated, circular disc supported and positioned between said fuel orifice and the inlet ends of said blast and burner tubes, said disc being larger in diameter than said burner tube and smaller in diameter than the inside diameter of said blast tube, thereby to provide a zone of increased static pressure anterior to the inlet end of said blast tube, whereby a damping of pulsations and surging in the air stream and a more uniform distribution of air flow through said blast tube is effected.

2. The gas burner claimed in claim 1 in which said central perforation in said disc is circular, and in which the diameter thereof relative to the inside diameter and length of said burner tube and the axial spacing of said disc from the inlet end of said burner tube is such that said central perforation is effective in predetermining a ratio of air flow through said blast and burner tubes at a predetermmed rate of total air flow supplied by said blower.

3. The gas burner claimed in claim 2 in which said circular perforation in said baffle disc comprises a square-edged, thin plate orifice operative due to increased turbulence of flow therethrough to reduce the increase in rate of flow therethrough, which would otherwise occur when the total air supply by the blower is increased for any reason above said predetermined rate, thereby to reduce the introduction of excess primary air to the burner tube.

4. The gas burner claimed in claim 2 in which said fuel orifice discharges centrally through said circular central perforation in said disc, and is so spaced axially therefrom as to provide by injection an increased portion of said total air flow through said central perforation and into said burner tube when the flow of fuel from said fuel orifice is increased.

5. The gas burner claimed in claim 1 in which said centrally perforated circular disc is adjustably mounted in said casing for axial adjustment relative to said fuel orifice and relative to the inlet ends of said burner and blast tubes.
6. The gas burner claimed in claim 1 in which the inlet end of said burner tube is axially adjustable.

7. In a gas burner, a volute casing having an outlet, a centrifugal blower in said casing, means for driving said blower, a round blast tube connected to said casing at its outlet, a burner tube supported coaxially in said blast tube, a fuel supply conduit having an end portion thereof entering said casing and supported by said casing and including a fuel discharge orifice positioned adjacent to and arranged to discharge centrally into the inlet end of said burner tube, and a circular, centrally perforated, baffle disc arranged transversely in said casing outlet between said fuel orifice and the inlet ends of said blast and burner tubes, said baffle disc being smaller in diameter than the inside diameter of said blast tube but being of sufficient diameter to provide a substantial zone of increased static pressure anterior thereto to effect a more uniform distribution of flow through said blast tube, and said central perforation in baffle disc being circular, and concentric with said burner tube, and of such diameter as to effect a predetermined ratio of flow through said blast and burner tubes under conditions of predetermined total airflow.

8. The gas burner claimed in claim 7 in which said fuel supply conduit is attached to a small, detachable, panel section of said casing and in which said burner tube is supported by said supply conduit.

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