Dec. 8, 1970 H. C. LOHMAN 3,545,908

GAS BURNER

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FIG. 4

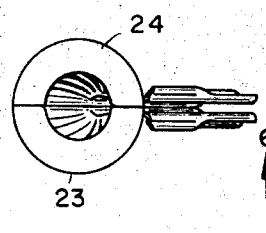


FIG. 3

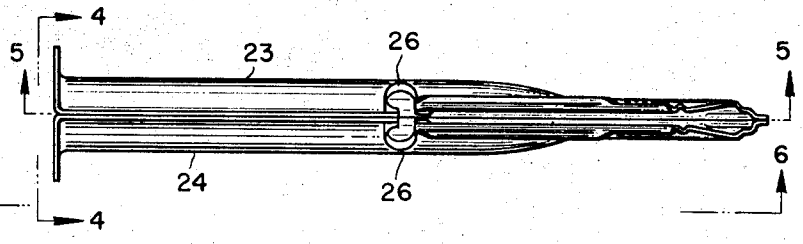


FIG. 1

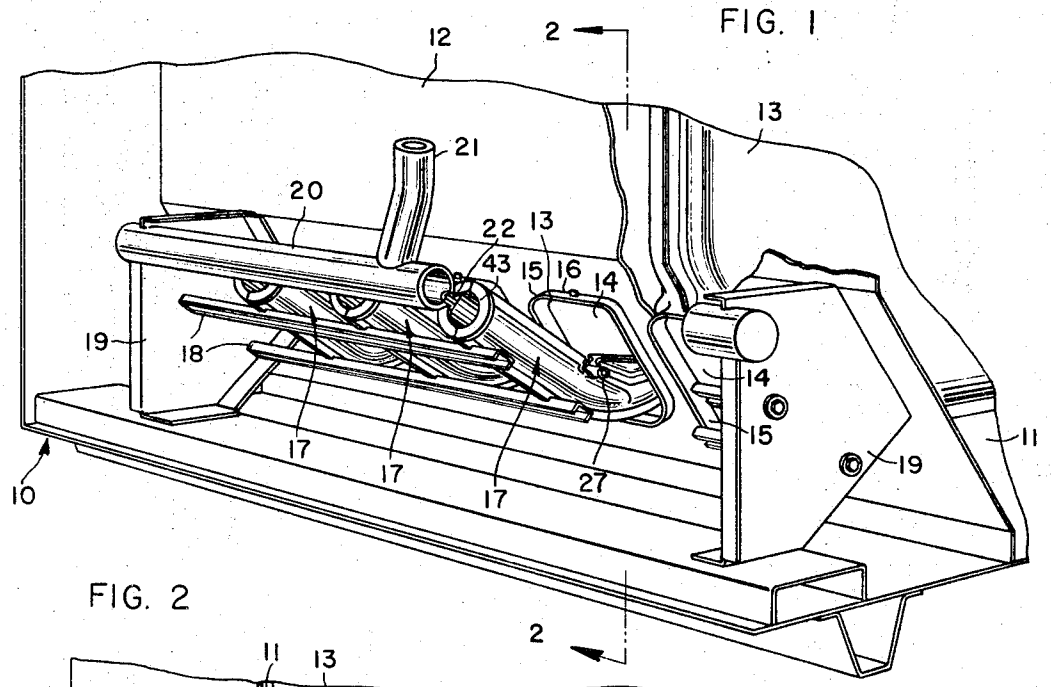
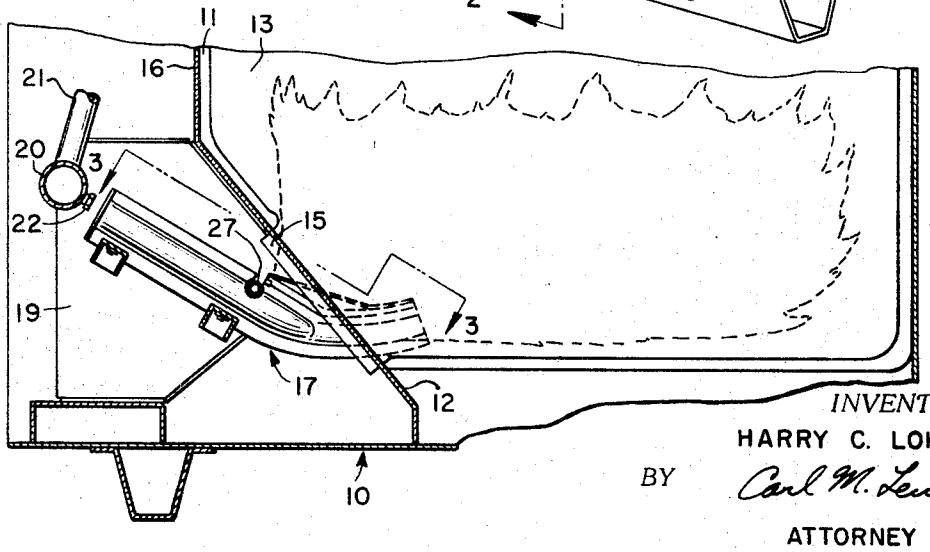


FIG. 2



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FIG. 5

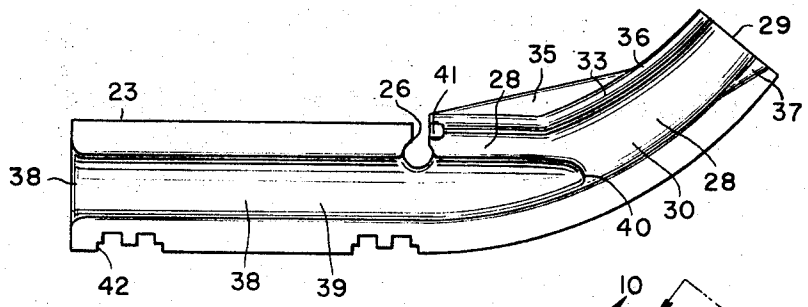


FIG. 6

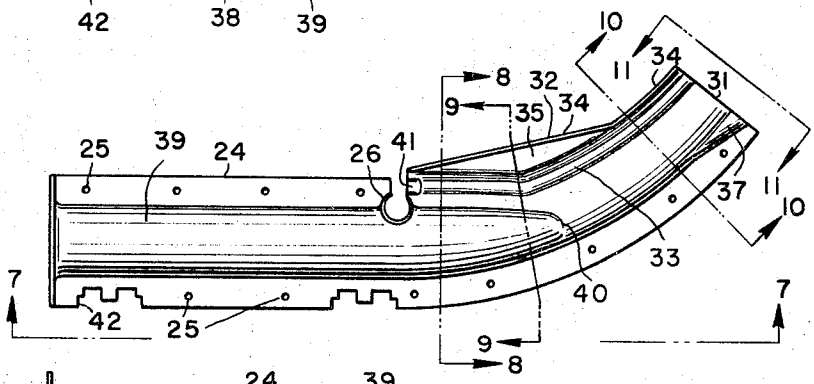


FIG. 7

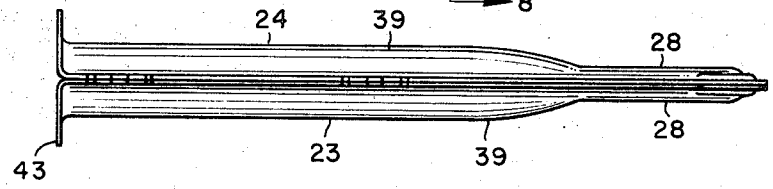


FIG. 8

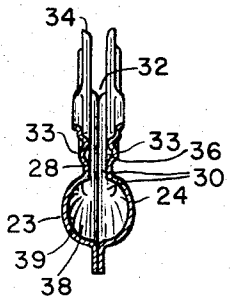
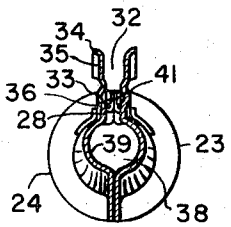


FIG. 9



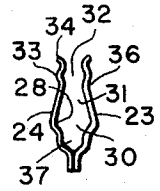


FIG. 11

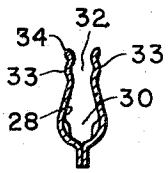


FIG. 10

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3,545,908

GAS BURNER

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Int. Cl. F23d 13/36
U.S. Cl. 431—286 7 Claims

ABSTRACT OF THE DISCLOSURE

An "inshot" gas burner formed from two connected vertically oriented allochiral sheet metal shells or plates which are spaced from each other along their forward and upper edges to provide contiguous port areas for discharging a fluid fuel both vertically upward and horizontally forward into a clamshell heat exchanger.

This invention relates broadly to gas burning equipment. More particularly, this invention pertains to constructions used for the purpose of mixing gaseous fuel and air to form a combustible mixture to be supplied to apparatus such as furnaces designed to heat air for use in residential homes and the like.

Equipment of the kind under consideration is used to blend a mixture of air and a gaseous fuel to present a combustible product for ignition and flow through a heat exchanger employed in a furnace for heating air. Burners of the kind under consideration utilize a mixing tube arranged in conjunction with a nozzle for supplying the gaseous fuel so that the energy in the gaseous fuel is used to induce a flow of air from the ambient into the tube in proportions designed to provide a mixture of the kind desired.

This invention has, for its chief object, the construction of a gas burner of the kind described wherein the parts constituting the burner are primarily sheet metal stampings that can be formed and assembled with the use of simple machine techniques leading to the production of a relatively inexpensive gas burning unit.

A second object of the invention is the provision of a gas burning unit formed from structural parts which lend themselves to simple machine operations, such as stamping and spot welding and which may be made in high production quantity at relatively low cost.

Another object of this invention is the provision of a gas burner construction primarily of sheet metal stampings wherein novel means are included within the burner body for shaping the flame produced thereby so as to present a relatively uniform combustion area across the lower portion of a clamshell heat exchanger without the use of target type flame deflectors disposed within the high temperature areas of the flame.

An additional object of the invention is the provision of an improved gas burner of the well known "inshot" or single port type wherein the combustible gas-air mixture emanates from a single port in the burner.

These and other objects of the invention are attained through the provision of a gas burner unit comprising a first plate member having portions deformed from its plane and a second plate member having a like configuration wherein the members are joined together with the planar portions of each in mutual engagement and the deformed portions confronting one another to provide passageways for the accommodation of air-gas mixtures suitable for combustion.

Other objects and features of the invention will be apparent upon a consideration of the ensuing specification and drawings wherein:

FIG. 1 is a perspective of a partial rear portion of a gaseous fuel burning furnace utilizing gas burners of the subject invention;

FIG. 2 is a vertical section taken at line 2—2 of FIG. 1;

FIG. 3 is a view as seen looking downwardly and rearwardly on a single gas burner as indicated by line 3—3 in FIG. 2;

FIG. 4 is a rear end view of the burner as indicated by the line 4—4 of FIG. 3;

FIG. 5 is a vertical longitudinal section taken at line 5—5 of FIG. 3;

FIG. 6 is a side elevation taken at line 6—6 of FIG. 3;

FIG. 7 is a view taken at line 7—7 of FIG. 6;

FIG. 8 is a section taken at line 8—8 of FIG. 6;

FIG. 9 is a section taken at line 9—9 of FIG. 6;

FIG. 10 is a section taken at line 10—10 of FIG. 6; and

FIG. 11 is a view taken at line 11—11 of FIG. 6.

Referring more particularly to the drawing wherein like reference characters have been used throughout to designate like elements, furnace 10 has a chamber 11, the back wall of which is formed by partition 12, through which the air to be heated is circulated by a fan (not shown).

Disposed within chamber 11 are a plurality of clamshell heat exchangers 13 of which each has an inlet opening 14 provided with a collar 15 which extends through a corresponding opening 16 in the lower portion of partition 12. Each such clamshell heat exchanger also has an outlet opening (not shown) for discharging products of combustion to a flue passage as is well known to the art. The air which is circulated through chamber 11 externally of clamshells 13 is heated by the walls of clamshells 13 which have been heated by the combustion gases formed within the clamshell units. A gaseous fuel burner 17 is disposed at the inlet of each clamshell heat exchanger 13. Burners 17 are supported at grooves 42 on a pair of channel members 18 which extend between side support plates 19. Side plates 19 also support a fuel gas manifold 20 which has a fluid fuel inlet 21 and a plurality of outlet orifices or nozzles 22 each of which is oriented to direct a jet of gas into the fuel-air mixing chamber of a burner 17.

Each burner consists of two allochiral sheet metal elongated downwardly and forwardly extending plates 23 and 24 which are spot welded in face-to-face relationship along the lower margin and along the rear portion of the upper margin as indicated at 25 in FIG. 6. Each of plates is provided with a radially extending rear flange 43 which helps direct the flow of air induced by nozzles 22 into the mixing chamber yet to be described.

Since plates 23 and 24 are virtually identical except for being allochiral, the description of one will be equally applicable to the other.

Each burner plate has notch 26 extending inwardly from the approximately mid-point of the upper edge adapted to receive ignition crossover tube 27. The edges of notch 26 are flared laterally of the burner (FIGS. 3 and 6) and the flared portions are formed to fit closely to the ignition crossover tube 27 to effect a seal between the burner 17 and the tube 27. Each burner plate has an elongated bulge 28 extending rearwardly from the forward end 29 to notch 26. Bulge 28 as well as the forward portion of the burner plate is curved about a point above the burner. The lateral displacement of bulge 28 is greater at the lower edge as seen in FIGS. 10 and 11. Thus it will be seen that bulges 28 in plates 23 and 24 define a cavity or fluid fuel distribution chamber 30 therebetween which extends through the forward portion of the burner to an end discharge port 31. End port 31 is enlarged at its lower edge by an extension 37 of bulge 28 for the purpose of shaping the flame at the end burner port.

The plates 23 and 24 are spaced from each other along the upper margin thereof forward of notch 26 in the area immediately above bulges 28 to thereby define an elongated upper discharge port 32 which is in direct fluid communication with the chamber 30. Thus chamber 30 serves to distribute a fluid fuel-air mixture there within to elongated upper discharge port 32 and end discharge port 31. In order to reduce warping of the wall or portions of the burner plates defining port 32 under wide variations of thermal conditions and to thereby stabilize the gap therebetween, an elongated bulge 33 of relatively small outward lateral displacement extends along the upper margin of each burner plate in the spaced portions defining the upper discharge port 32. The upper edge of these portions is provided with an outwardly directed lateral flare or lip 34. It has been found that by the addition of flares 34, the flame established by the ignition of the combustible mixture emerging from port 32 is relatively stable in the lateral direction and the area of ignition does not lift excessively above the burner. To further stabilize the flame and the area of ignition from lifting excessively above the burner, the plates 23 and 24 are each provided with a planar area 35 disposed between flare 34 and bulge 33. Areas 35 are more widely spaced from each other than space between the upper edges 36 of bulges 28 whereby the gas moving upwardly through the zone between areas 35 is caused to decelerate prior to issuing above the flared edges of the burner. This has the effect of maintaining the area of ignition close to the burner even at high operating capacity.

The fluid fuel and air mixture is delivered to distribution chamber 30 by way of a fluid fuel and air mixing chamber 38 which is formed by an elongated outward bulge 39 between the upper and lower margins of burner 17 which extends longitudinally from the rear end of burner 17 to a point 40 disposed forwardly of notch 26 coextensive with bulge 28. The portion of bulge 39 between the rear end of burner 17 and notch 26 is generally cylindrical while that portion of bulge 39 forward of notch 26 is longitudinally tapered to a reduced cross section of mixing chamber 38 at point 40.

Since chamber 38, which has a substantially greater cross section than chamber 30, effectively terminates at point 40, the forward velocity of some of the gas flowing in chamber 38 is reduced and the forward velocity pressure thereof reduced and converted to static pressure which in turn causes the gas to be propelled upwardly and out of the upper port with a substantially reduced forward component. This buildup of static pressure adjacent the rear portion of the upper port may be of sufficient magnitude to propel the gas emerging from the rear portions of the upper port in a slight rearward direction.

The ignition crossover tube 27 which extends through the notches 26 of all the burners 17 has a plurality of relatively large apertures on the lower side (not shown) each of which is in registry with the mixing chamber 38 of one of the burners thereby communicating the mixing chambers 38 with the interior of tube 27 for admitting a combustible gas mixture to the ignition tube. The upper side of tube 27 is provided with a plurality of relatively small apertures or ports (not shown) for establishing a series of small flames along the length of the tube. These apertures are sufficiently close so that ignition of one will effect ignition of all thereby igniting the gas emerging from all the burners 17.

Experiments with operation of burners 17, when supplied with "bottle gas" i.e. liquid petroleum gas containing low pressure propane or butane, would tend to flash back, i.e., the area of gas ignition would move into the burner rather than remain at the edge of the ports 32 and 31. It was found that by partially closing the rear end of chamber 30, this flash back problem was eliminated. The rear end of chamber 30 is partially closed by the inwardly extending dimple 41 on each of the burner plates as shown in FIGS. 5, 6 and 9.

During operation gas is supplied at inlet 21 to manifold 20 and is directed by nozzles 22 into the mixing chambers 38. In passing into the mixing chamber, this gas induces a flow of air over flange 43 into the mixing chamber whereupon the gas and air are thoroughly mixed to form a combustible fluid mixture. The mixture moves upwardly out of upper discharge port 32 and forwardly out of end discharge port 31 whereupon it is ignited by the ignition crossover tube 27. It has been found that the illustrated burner operates efficiently, quietly and with a high degree of stability. Moreover, it operates to shape the flame in a generally rectangular pattern as indicated by the dashed line of FIG. 2 which is desirable in many applications. This is accomplished in the illustrated inshot burner by properly directing the flow of the gas-air mixture prior to combustion rather than via target type of flame spreaders and deflectors.

Having now described the preferred embodiment of my invention, I contemplate that many changes may be made without departing from the scope or spirit of my invention and I accordingly desire to be limited only by the claims.

I claim:

1. Gas burner apparatus comprising: a pair of sheet metal plates disposed in face-to-face relationship along a generally vertical plane; a first elongated lateral bulge in the face of at least one of said plates and extending generally horizontally to the forward edge of said plates thereby defining an elongated fluid distribution chamber therebetween and an end discharge port at the forward edge thereof; the portions of the margin of said plates above and longitudinally coextensive with said elongated fluid distribution chamber being spaced one from the other thereby defining an elongated upper discharge port in fluid communication with said elongated fluid distribution chamber; a second elongated bulge in the face of at least one of said plates having a greater lateral magnitude than said first bulge and extending downwardly and forwardly and terminating in an area below and forward of the rearmost portion of said upper port in fluid communication with said elongated fluid distribution chamber thereby defining a fluid fuel and air mixing chamber of greater cross section than said elongated fluid distribution chamber for supplying a fluid fuel-air mixture to said elongated fluid distribution chamber.

2. The apparatus as defined by claim 1 wherein the portions of said margins of said plates that define said upper port include a laterally outwardly protruding lip for establishing flame stability at said upper port.

3. The apparatus as defined by claim 1 including a third elongated bulge substantially smaller in lateral magnitude than said first and second bulges and extending along each of the portions of said margins of said plates that define said upper discharge port and disposed above said elongated distribution chamber for establishing dimensional stability to said upper discharge port for a wide variation of thermal conditions.

4. The apparatus as defined by claim 3 wherein said portions of said margins of said plates that define said upper port include a laterally outwardly protruding lip for establishing flame stability at said upper port, and wherein each of said portions of said margins of said plates that define said upper discharge port includes an area above said third bulge thereof and below said lip thereof which is more widely spaced from the corresponding area of the other plate than the spacing of the plates immediately below said third bulges.

5. The apparatus as defined by claim 3 including an ignition carry-over tube extending traversely of said first elongated bulge immediately rearward of said upper discharge port in fluid communication with said mixing chamber.

6. The apparatus as defined by claim 1 wherein said

first and second elongated bulges are curved generally about an area above said burner apparatus.

7. Gas burner apparatus comprising first and second elongated sheet metal shells disposed in face-to-face relationship and connected along a generally vertical plane at their margins; said shells extending forwardly and downwardly and being spaced from each other intermediate their upper and lower margins along a fluid flow path extending from their upper rear ends to their lower front ends thereby defining a fluid flow passage therebetween; the upper rear end and the lower front end of said passage defining a fluid inlet opening and an end discharge port respectively; the upper margins of the forward portion of said shells being spaced from one another thereby defining an elongated upper discharge port in fluid communication with said fluid flow passage therebelow, and said fluid flow passage being substantially

arched in the forward portion thereof and narrowed in cross section from rear to front by a transition immediately in front of the rearmost portion of said upper port whereby a substantial flame above the said rearmost portion is established.

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CARROLL B. DORITY, JR., Primary Examiner

U.S. Cl. X.R.

431—349, 354; 239—592, 597