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FLAME RETENTION HEAD FOR GAS BURNERS

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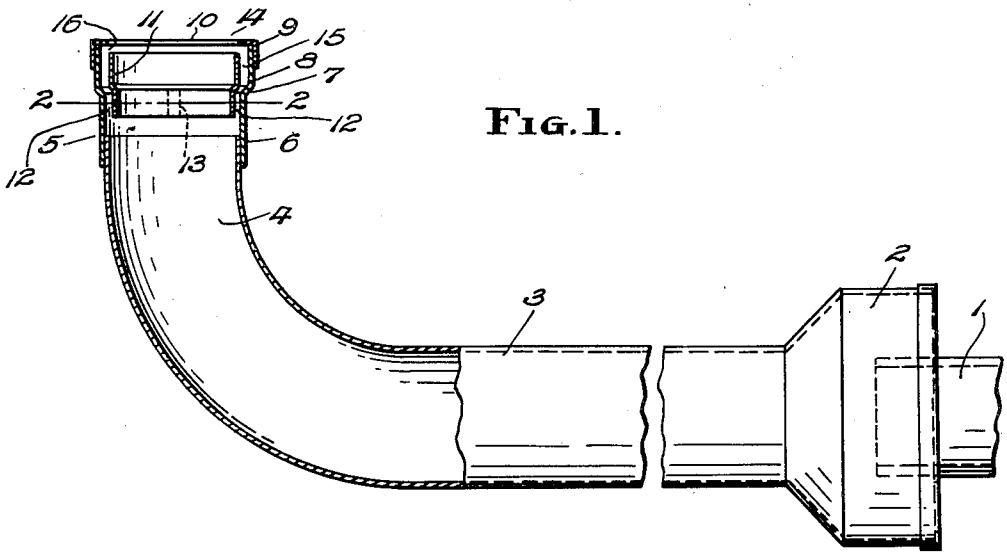



FIG. 1.

FIG. 2.

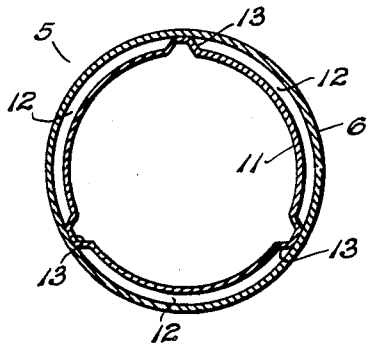
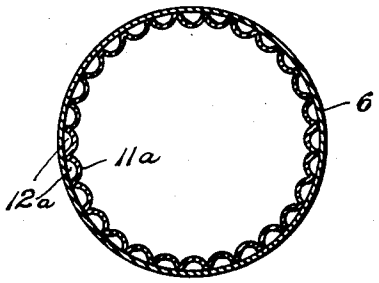



FIG. 3.




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## FLAME RETENTION HEAD FOR GAS BURNERS

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6 Claims. (Cl. 158—116)

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This invention relates to gas burners, and has particular reference to gas burners of the type employed in house-heating furnaces. While it is not so limited, my invention has particular reference to gas conversion burners which may be installed in furnaces originally designed for burning solid fuels, and has for its general object to provide a burner which shall be unique from the standpoint of its relative simplicity and low cost of manufacture.

In accordance with the present invention, a burner is provided which embodies a mixing tube wherein the gaseous fuel is mixed with primary air and wherein the tube is formed with an upturned extension which terminates in a burner head at the top of the extension, the burner head being of the single port type, the head having approximately the same diameter as the tube whereby to avoid the development of static pressures in the tube and its associated burner head during operation thereof.

Previous burners of this type have been used primarily for high fuel inputs at elevated pressures and consequently the outlet ports in the burner heads have been smaller in diameter than the fuel inlets, thus producing in their operation static pressures within their mixing tubes. While such previous designs are adaptable for a large capacity, the same possess the disadvantage of what is known as flash-back or concussion on extinction. In accordance with the present invention, a burner head is provided of the open single port type in which no static burner head pressure is developed and at the same time providing the same fuel-burning characteristics as prior burners but with the advantage that quiet non-concussive combustion extinction is effected.

One of the disadvantages, however, of the single port burner head resides in the fact that the velocity of the air-gas mixture upon issuing from the head is apt to be greater than the velocity of flame propagation and there is a tendency for the flame to "blow off" and thereby extinguish combustion. To overcome this condition, it is an object of the present invention to form the head with an inner sleeve which is slightly spaced from the inner wall surfaces of the head to produce a restricted passageway open at both ends, the passageway serving to entrap a portion of the fuel gas mixture passing through the head, whereby to reduce the flow velocity of the entrapped mixture so that when it issues from the discharge end of the restricted passage, its velocity will be such as to support

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and maintain flame combustion, producing what is known as pilot combustion for the purpose of insuring sustained combustion on the part of the main body of the fuel mixture issuing from the burner head and, specifically, to prevent its so-called blowing off.

For a further understanding of the invention, reference is to be had to the following description and the accompanying drawing, wherein:

Fig. 1 is a vertical sectional view taken through a gas burner constructed in accordance with the present invention;

Fig. 2 is a horizontal sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a similar view of a modified form of the invention.

Referring more particularly to the drawings, the numeral 1 designates a gas supply pipe or other conduit through which is passed fuel gas under regulated conditions of pressure. The pipe terminates axially in the Venturi chamber 2 of a burner tube 3, where primary air is admixed with the gas in the usual manner. The fuel mixture thus formed is passed through the tube, which is substantially uniform in its cross sectional area throughout its length, the tube terminating in an upwardly directed extension 4. Inserted on the open upper end of the extension 4 of the tube is a burner head 5, the construction and features of which constitute the present invention.

The head 5 is formed with a depending skirt 6 which is adapted to be applied and secured to the open upper end of the extension 4. In this instance, the head above the skirt is outwardly and annularly flared as at 7 and then upwardly directed to provide a vertical cylindrical wall 8. Fitted over this wall is a cap ring 9 which at its upper end is terminated in an inwardly directed, horizontally disposed and circular flange 10. Stationarily positioned in the head is a cylindrical sleeve 11 which, in the main, is disposed in spaced relationship from the inner wall surfaces of the skirt 6 and the wall 8 to form one or more restricted passages 12 around the inner wall of the head through which passes a limited portion of the fuel gas mixture delivered to the head. The sleeve may be provided with outwardly directed ribs 13, for example three in number, which engage with the inner wall surfaces of the skirt in order that the ribs may be fused to the sleeve to retain the latter in its stationary and operative position within the head.

In the operation of the burner, fuel gas and air mix at the venturi 2 and pass through the

tube 3 to the burner head. A small percentage of this mixture is diverted into the restricted passageways shown at 12, while the greater part of the mixture goes straight through the single outlet port 14 of the burner head. That part of the mixture which travels through the passages 12 is delivered to an annular chamber 15 formed between the upper end of the sleeve 11 and the inner surfaces of the wall 8, there being a restricted annular slot 16 formed between the upper edge of the sleeve 11 and the flange 10. The mixture through restriction or confinement in the passages 12 and the chamber 15 loses its velocity and hence will ignite and burn at the outlet slot 16. This is due to the fact that the velocity of flame propagation is greater than the velocity of the mixture which travels through the restricted passages. The main body of the mixture passing outwardly of the head through its port 14 has a velocity greater than the velocity of flame propagation and, therefore, would blow off and become extinguished at the port 14 if normally ignited. However, the small annular slot or port 16 through which the low velocity gas issues will sustain combustion and provide a pilot source of combustion which will produce sustained combustion on the part of the main body of the fuel mixture at all times and specifically will prevent it from blowing off or becoming extinguished.

In the modified form of the invention disclosed in Fig. 3, the sleeve 11*a* is of corrugated form, producing a multiplicity of restricted passageways 12*a*. However, its operation is the same as that in the first described or preferred form of the invention.

It will be understood that further modifications may be made in the construction of my improved burner head without departing necessarily from the scope of the following claims.

I claim:

1. In a gaseous fuel burner, a tube for the advancement of a gaseous fuel mixture, a head applied to a mixture discharge end of said tube, said head possessing an internal diameter at least as great as that of said tube, said head intermediately of the length thereof being formed with an annular outwardly flared shoulder, a thin-walled tubular sleeve stationarily positioned within said head and formed with an annular outwardly flared shoulder disposed in spaced concentric relation to the outwardly flared shoulder of said head, the walls of said sleeve being closely positioned to the inner wall surfaces of said head but in the main slightly spaced therefrom with means to form a multiplicity of passages for the travel of limited peripheral portions of a fuel mixture issuing from said tube during passage of the main portion of the fuel mixture axially through said sleeve, and an inwardly directed annular flange formed on the upper edge of said head, the said flange having an internal diameter not substantially less than that of said sleeve, the inner portions of said flange being spaced from the upper edge of said sleeve to produce an annular inwardly facing slot from which the diverted mixture traveling through said passages emerges in a lateral direction and at retarded flow rates with respect to the main body of the mixture issuing from said sleeve.

2. In a gaseous fuel burner, a tube for the advancement of a gaseous fuel mixture, a head applied to a mixture discharge end of said tube, said head at one end thereof possessing an internal diameter at least as great as that of said tube and at an intermediate portion thereof a still greater internal diameter, a thin-walled sleeve stationarily positioned within said head, the walls of said sleeve in the main being closely spaced from the inner wall surfaces of said head with means to form a multiplicity of longitudinally disposed passages throughout the length of the sleeve for the travel of limited peripheral portions of a fuel mixture issuing from said tube during passage of the main portion of the fuel mixture through said sleeve, and an inwardly directed annular flange formed on the upper edge of said head, the said flange having an internal diameter not substantially less than that of said sleeve, the inner portions of said flange being spaced from the upper edge of said sleeve to produce an annular inwardly facing slot from which the diverted mixture traveling through said passages emerges in a lateral direction and at retarded flow rates with respect to the main body of the mixture issuing from said sleeve.

3. In a gaseous fuel burner, a tube for conducting a gaseous fuel mixture having an open discharge end, a burner head carried on the discharge end of said tube and comprising a cylindrical tubular body having an internal diameter at least as great as that of the discharge end of said tube, a stationary open-ended tubular sleeve having an internal diameter substantially that of the internal diameter of the discharge end of the tube positioned in said body and formed on its outer surface with a plurality of radially extended ribs connected with the inner side surface of said body, said sleeve, in the main, having its outer surface disposed in relatively closely spaced parallel relation throughout its length to the inner surface of said body and defining therewith a plurality of open-ended longitudinally-disposed passages for conducting a limited amount of fuel mixture discharged from said tube longitudinally between the inner surface of said body and the outer surface of said sleeve during passage of the main portion of fuel mixture axially through said sleeve, said sleeve terminating at one end slightly inwardly of the outer end of said body, and an annular flange carried on the outer end of said body and extending radially inwardly thereof in overlapping relation to the passages defined between said body and sleeve for directing that portion of a fuel mixture conducted by said passages inwardly to impinge the main body of fuel mixture passing axially through said sleeve, the said flange having an internal diameter not substantially less than that of said sleeve.

4. A head for single port gas burners comprising a body formed at one end with a cylindrical skirt for application to an open end of an associated conduit through which a gaseous fuel mixture is advanced, said body above said skirt being outwardly flared and formed with a vertically disposed annular wall terminating in a discharge opening, an annular ring carried on the annular wall of said body and extending slightly radially inwardly over the discharge opening defined thereby, and an open-ended annular sleeve positioned coaxially within said body and formed with a plurality of relatively spaced radial projections connected with the inner surface of said body, said sleeve between said projections being spaced from the inner surfaces of the skirt and vertical wall portions of said body and defining therewith a plurality of open-ended passages for conducting a portion of a fuel mixture between the inner surface of said body and

said sleeve while providing for the passage of the majort portion of the fuel mixture axially through said sleeve, said sleeve being outwardly flared intermediate its length in conformity with said body and terminating at its upper end slightly inwardly of the upper end of said body in vertically spaced relation to said annular ring and defining with said ring an annular discharge slot communicating with said passages and opening radially inwardly of said body at the discharge opening thereof.

5. A head for single port gas burners comprising a tubular body formed at one end with a cylindrical skirt for application to a fuel mixture supply conduit, said body above said skirt being outwardly flared to provide a relatively enlarged cylindrical outer end portion terminating in a discharge opening, an annular flange carried on the outer end portion of said body and extending slightly radially inwardly over said discharge opening, and a thin-walled tubular sleeve member positioned coaxially within said body and formed upon its outer surface with a plurality of relatively spaced radially extended ribs connected with the inner surface of said body, said sleeve member between said ribs and throughout its length being spaced from the inner surfaces of said body and defining therewith a plurality of open-ended passages for conducting a portion of a gaseous fuel mixture introduced through the skirt of said body between the inner surfaces of said body and said sleeve member, said sleeve member providing a relatively large open-ended axial passage for conducting the major portion of a fuel mixture axially through said head, said sleeve member being outwardly flared intermediate its ends in corresponding relation to said body and terminating at one end in closely spaced relation to said flange and defining therewith a radially and inwardly opening annular slot adjacent the discharge opening of said body for discharging that portion of a fuel mixture conducted through said first-named passages in impinging relation to that portion of a fuel mixture conducted axially through said sleeve member.



6. A head for gas burners comprising an open-ended cylindrical tubular body for the passage of a gaseous fuel mixture, said body having a skirt portion for attachment to a burner and a portion extending from the skirt portion and of greater internal diameter than the skirt portion, an inturned annular flange carried at one end of said body, and an annular stationary sleeve positioned in said body and terminating at one end in slightly spaced relation to said flange, said sleeve having portions of different internal diameters correspondingly spaced throughout the sleeve length from the inner wall surfaces of the respective aforesaid portions of said body, means for retaining said sleeve in said body in stationary position whereby at least one longitudinally disposed restricted passageway is provided between the sleeve and the inner wall surfaces of the body for conducting a limited portion of a gaseous fuel mixture therethrough while providing for the passage of the main body of the fuel mixture axially through said sleeve without developing substantial static burner head pressure when the same is attached to a burner, said flange having an internal diameter not substantially less than that of said sleeve and serving to direct that portion of the fuel mixture conducted by said passageways radially inwardly toward the main portion of the fuel mixture passing through the said end of said sleeve.

EDWARD A. NORMAN, JR.


## REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 1,978,477 | Robertson | Oct. 30, 1934 |
| 2,237,889 | Rickert | Apr. 8, 1941 |
| 2,241,295 | Clark | May 6, 1941 |

FOREIGN PATENTS

| Number | Country | Date |
|---|---|---|
| 23,291 | France | May 21, 1921 |
| 61,031 | Denmark | June 21, 1943 |
| 577,854 | Germany | June 6, 1933 |