Oct. 24, 1950 N. E. HILL 2,526,748

GAS BURNER WITH ADJUSTABLE FLAME SLOT AND CENTRAL SECONDARY AIR SUPPLY

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Fig. 1.

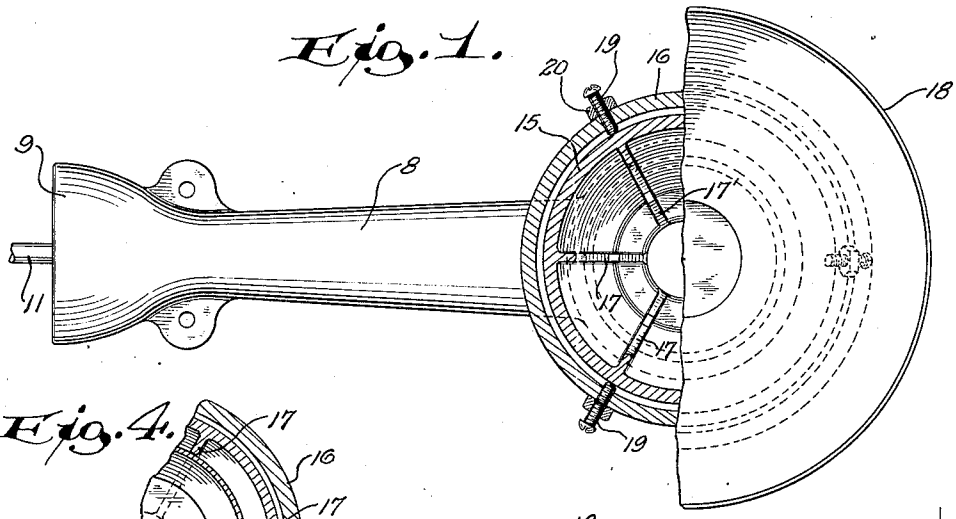
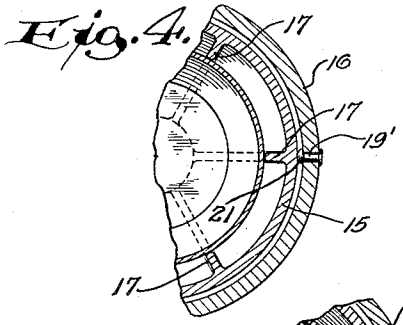


Fig. 4.



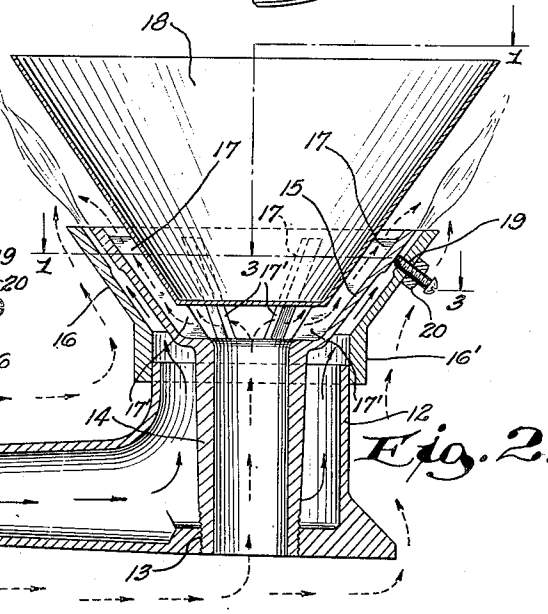
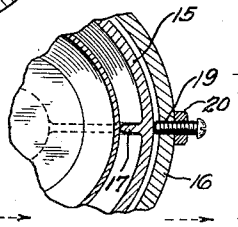


Fig. 3.



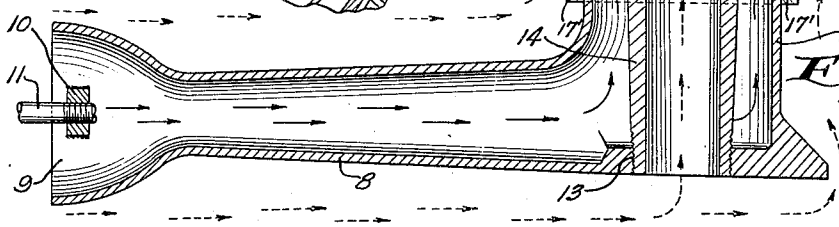


Fig. 2.

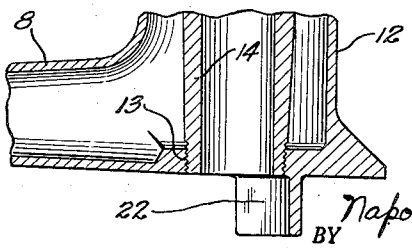


Fig. 5.

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GAS BURNER WITH ADJUSTABLE FLAME SLOT AND CENTRAL SECONDARY AIR SUPPLY

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Application February 9, 1946, Serial No. 646,605

1 Claim. (Cl. 158—117)

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This invention relates to improvements in gas burners, and more particularly to gas burners having adjustable, annularly arranged combustible fluid discharge orifices.

Conventional gas burners for heating apparatus are designed to afford only a definite maximum gas input which cannot be advantageously exceeded. The conventional gas burner output is dependent upon the cubic content of the burner head passage or chamber for the combustible fluid, together with the area of the combustible fluid orifice or outlet port. Heretofore, it has not been possible, in gas burner constructions to change or vary the outlet port area to adapt the gas burner to different types of gas. The latter is an important consideration because a burner may be originally designed to burn manufactured gas, but it may become necessary to use the burner with natural gas. The burner ports, for the correct utilization of manufactured gas, are ordinarily of less area than those required for the successful operation of the burner with natural gas. It is well known in the art of gas burner design that the quantity of gas which can be efficiently burned depends upon the area of the gas outlet ports, and this is a major factor in reference to modifying a burner for use with natural gas rather than with manufactured gas, or vice versa.

With the above in mind, it is, therefore, a primary object of the present invention to provide a gas burner in which the area of the outlet port or ports can be easily and readily varied to give optimum operating characteristics at various rates of gas input, or for different types of gas.

A further object of the invention is to provide a gas burner wherein the area of the gas outlet port or ports can be easily changed or modified by a simple manual adjustment, without the necessity of redrilling or reslotting the gas outlet orifices.

A further object of the invention is to provide a gas burner from which will emanate a flame of annular formation and wherein the burner has means for efficiently aerating the flame both on its inner and outer surfaces.

A further object of the invention is to provide a gas burner which is of very simple construction and which can be produced without the use of expensive machine tools, which is strong and durable, which is efficient in operation, which is susceptible of easy manual adjustment without disassembly of the burner head, and which is well adapted for the purposes described.

With the above and other objects in view, the

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invention consists of the improved gas burner, and its parts and combinations as set forth in the claims, and all equivalents thereof.

In the accompanying drawing in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a plan view of the improved gas burner with part being broken away and shown in section, as indicated by the line 1—1 in Fig. 2;

Fig. 2 is a longitudinal vertical sectional view of the improved gas burner;

Fig. 3 is a fragmentary detail sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a fragmentary detail sectional view similar to Fig. 3 only showing a slight modification of the invention; and

Fig. 5 is a fragmentary detail sectional view of the lower portion of the burner head showing a modification in the form of a baffle to direct the inflow of the secondary air stream.

Referring now more particularly to the drawing, it will be evident that the improved gas burner therein illustrated is adapted for installation within the fire pot of a conventional heat exchanger (not shown) and the burner may be a conversion unit or it may be a burner for a specific type of special gas fired heat exchanger. While the burner head is shown and described herein as being of conical formation to produce a circular flame, it should be understood that the invention is not restricted to this particular shape and any form of burner which will produce a circuitous flame is contemplated.

The improved gas burner construction includes a laterally or horizontally extending mixing tube 8, preferably in the form of a Venturi. The outer end of the mixing tube 8 is flared and is open, as at 9, for air inlet purposes, and adjacent said flared portion 9 there may be a suitable adjustable air shutter (not shown) to control the quantity of primary air entering the Venturi tube 8. A suitable supporting means 10 is provided within the tube portion 9 for the attachment of a gas supply pipe 11 leading to a source of gas. Said gas supply pipe 11, within the tube portion 9, terminates in a conventional type of gas orifice.

The inner end portion of the mixing tube 8 is in the form of an upwardly projecting collar portion 12 and the base thereof is flattened and arranged for support above the bottom of the fire pot of the heat exchanger. A lower wall portion of the collar portion 12 of the mixing tube is formed with a threaded opening 13 concentric with but of less diameter than the open-

ing through the collar portion 12. The lower extremity of an inner burner head supporting tube 14 is provided with threads to engage in the threads 13 whereby said inner burner head, which comprises generally a conical member 15 connected with the stem 14, is adjustably maintained in spaced relation to other component parts of the burner head as will hereinafter appear.

The outer burner head is indicated generally by the numeral 16 and it is an open shell-like member, as is the inner burner head 15, whose major portion is of conical shape terminating in a lower collar 16' which has a force fit with the upper peripheral portion of the collar 12 of the mixing tube 8. However, it is obvious that the outer burner head 16 and the mixing tube 8 may be of integral construction. The inner surface of the outer burner head 16 is machined or relatively smooth, and its upper annular wall portion is somewhat thicker than the wall portion therebelow, forming a protuberance. The same is true of the outer surface of the inner burner head 15, and it will, therefore, be obvious that the upper chamber or passage formed between the adjacent annular surfaces of the burner heads 15 and 16 is reduced in cross sectional area at the orifice or outlet ports by said protuberances which will result in an accelleration of gas flow. As will appear clearly from Fig. 2, there is an annular chamber or gas passageway between the members 15 and 16 into which the mixture of primary air and gas flows from the tube 8, as indicated by the full line arrows. Obviously, there is considerable depth and volume to this space or passageway and substantial depth is always maintained regardless of the position of adjustment of the inner burner head 15.

The inner surface of the inner burner head 15 carries a plurality of upwardly extending spacers or ribs 17 having angled inwardly projecting feet portions 17' (see Fig. 2). The ribs 17 and their inturned feet portions 17' form spacer supports for an inner shell-like baffle member 18 which is also preferably of conical formation with a closed bottom portion which seats on the rib portions 17'. Edge portions of the ribs 17 form spacers for the baffle relative to the inner surface of burner head 15. Secondary air is intended to flow in the space between the adjacent walls of the members 15 and 18. The entire baffle 18 is arranged so as to deflect secondary air passing upwardly through the hollow supporting tube 14 and the passageways last mentioned to aerate the inner annular side of the flame. As has been suggested heretofore, gas from the supply pipe 11 enters the mixing tube 8, as does primary air flowing into the controlled enlarged end 9 of the mixing tube. The mixture of the primary air and gas flows through the mixing tube and then upwardly through the portion 12 and into the annular chamber or passageway between the burner heads and exhausts from the annular port or orifice formed between the upper peripheries of the outer and inner burner heads. The dotted line arrows in Fig. 2 indicate the flow of secondary air. Some of the secondary air flows upwardly through the supporting tube 14, as previously mentioned, and then passes upwardly through the passageways between the inner burner head 15 and the baffle 18. This flow of secondary air discharges in an annular stream so as to effectively aerate the entire inner side of the flame. Other secondary air flows in the manner shown by dotted line arrows around the exterior of the outer burner head 16 and aerates the outer side of the annular flame.

The quantity of gas which can be efficiently burned in a gas burner depends upon the area of the gas port. In the present invention the gas port referred to is the annular discharge end of the chamber or passage between the inner and outer burner heads. The present improvement permits the area of this gas port to be effectively varied or regulated through a simple manual manipulation and without disassembly of the burner head. As has been suggested heretofore, this is accomplished by raising or lowering the inner burner head 15 relative to the outer burner head 16 and in the embodiment illustrated, a varied disposition of the inner burner head is accomplished by turning the supporting tube 14 in its threads 13 to project it upwardly or downwardly. Through this simple means it is possible to readily vary the combustible fluid discharge port area to quickly adapt the burner for use with manufactured gas or with natural gas, or to otherwise adjust it for any existing or local conditions.

In view of the adjustability of the inner burner head 15 relative to the outer burner head 16, it is desirable that means be provided to insure proper spacing of the inner burner head relative to the outer burner head, to thereby insure uniformity of port area throughout the periphery of the burner head. A convenient means for accomplishing this function is shown in Figs. 1, 2 and 3 wherein threaded adjusting screws 19 are adjustably mounted at spaced intervals in tapped openings about the circumference of the outer burner head 16. Each adjusting screw 19 carries a lock nut 20, and it is obvious that as required when the inner burner head is shifted upwardly or downwardly, the adjusting screws may be turned inwardly or outwardly, to have their inner ends impinge against the inner burner head and to thus uniformly space it.

A modification of the means for spacing the inner burner head 15 relative to the outer burner head 16 is shown in Fig. 4 wherein the spacing means may take the form of rivets 19' extended through spaced portions of the outer burner head and having enlarged or burred inner head portions 21 to impinge against the inner burner head. The height or size of the rivet head 21 may be such as to insure constant spacing of the inner burner head relative to the outer burner head.

A further slight modification of the invention is shown in Fig. 5 wherein the bottom wall of the mixing tube 8 is formed, adjacent the entry to the hollow tube 14, with a depending curved or semi-circular baffle 22 positioned as shown, preferably adjacent that side of the tube 14 which is remote from the main extent of the mixing tube. Said arrangement with the baffle 22 may be desirable in insuring greater admission of secondary air to the tube 14.

From the foregoing description, it will be evident that the improved gas burner is of simple and novel construction, is susceptible of easy adjustment after initial assemblage to regulate the gas port area, and is well adapted for the purposes described.

What is claimed as the invention is:

In a gas burner construction, a mixing tube having an open outer end for the admission of

fuel and primary air, an outwardly opening hollow and outwardly flared outer burner head fixedly carried by the other end of said mixing tube, a smaller, outwardly opening and flared, hollow inner burner head spacedly nested within the outer burner head, adjacent wall portions of said heads carrying annular protuberances located at the outer extremity of the passage between the inner and outer heads to reduce a portion of the space between the walls of said heads, which space provides an annular fuel passage in communication with the mixing tube and the outer end of said passage forming an annular port, said arrangement permitting secondary air to flow exteriorily of the outer burner head to aerate the outer side of a flame emanating from said port, said outer and inner burner heads being similarly shaped and both of frusto-conical formation and outwardly flared, tubular means carrying the inner burner head and opening interiorily thereof and adjustably mounted directly on the mixing tube to vary the relative disposition of said heads and the annular protuberances to thereby regulate the port area and the volume of the space between said heads, the open outer end of the tubular supporting means communicating with the atmosphere exteriorily of the mixing tube to receive a flow of secondary air, manually adjustable stop means carried by the outer

burner head and engageable with the inner head to determine the proper minimum relative spacing of the adjacent portions of said heads, and an outwardly flared, imperforate baffle of frusto-conical formation spacedly nested within the inner head to form therewith an air passage from the outer end of which secondary air received from said tubular supporting means is emitted to aerate the inner side of a frame emanating from said port, said inner burner head being formed with spacing means engaging the nested portion of said baffle.

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