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VORTICAL FLAME GAS BURNER

2 Sheets-Sheet 1

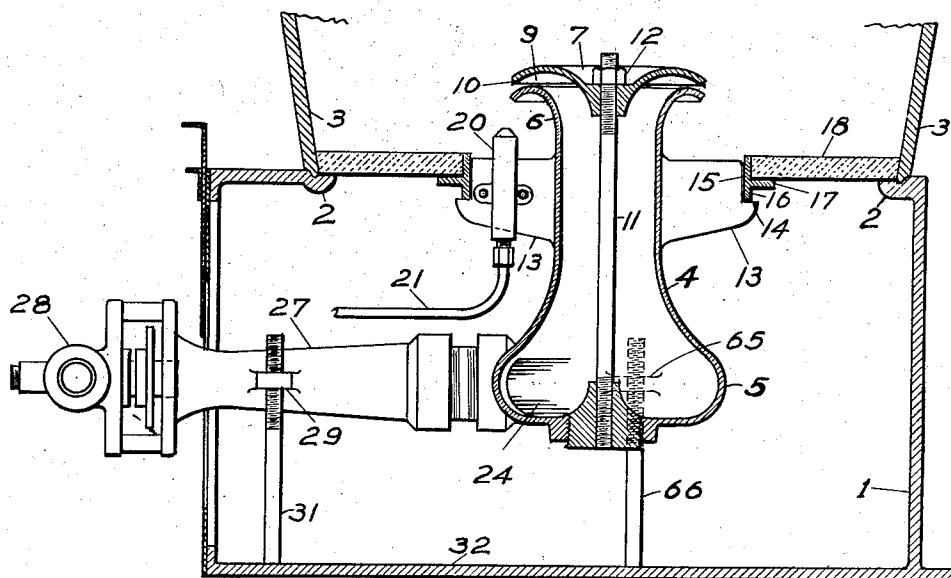
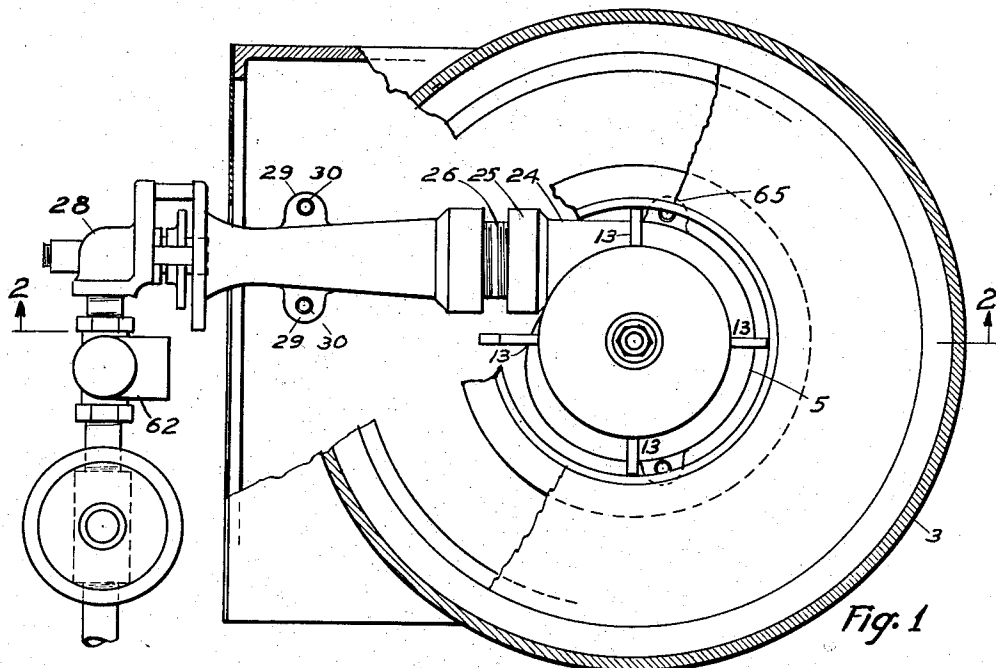


Fig. 2

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VORTICAL FLAME GAS BURNER

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2 Sheets-Sheet 2

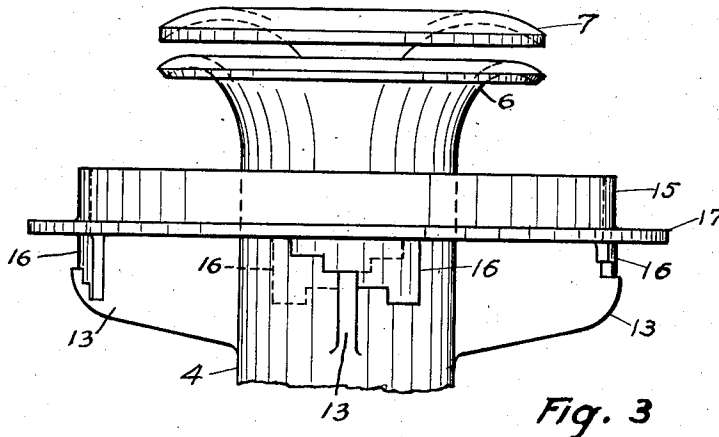


Fig. 3

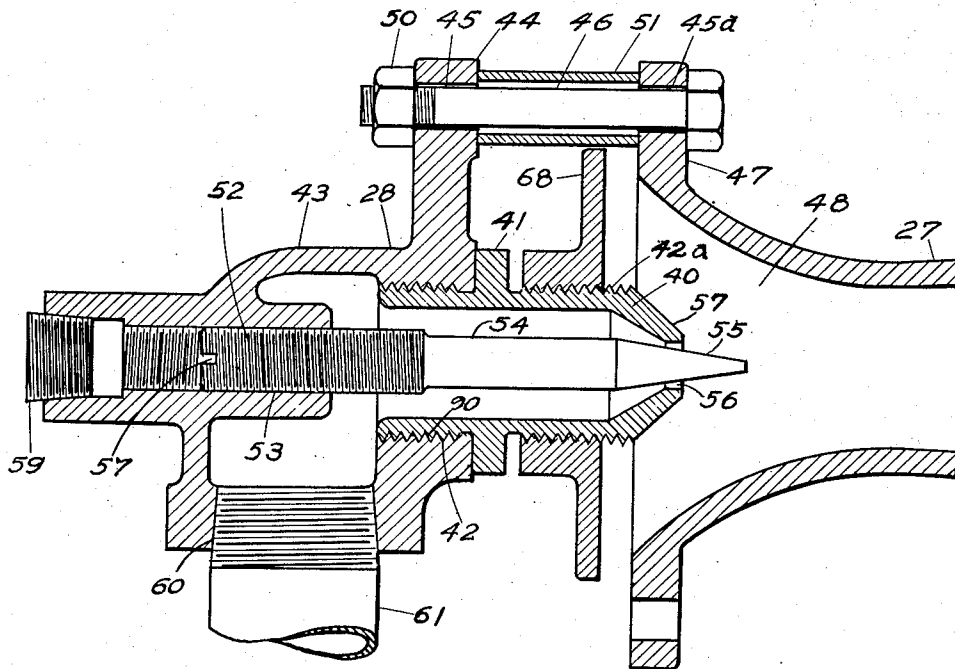


Fig. 4

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VORTICAL FLAME GAS BURNER

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4 Claims. (Cl. 158—99)

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This invention relates generally to fuel burners and it relates more particularly to a fuel burner providing rotary motion to the fuel mixture passing to the furnace.

All devices of this character made according to the teachings of the prior art, and with which I am familiar, have attempted to use various refractory baffle means to direct the flame from a burner toward the walls of the fire box or combustion chamber. These baffles have absorbed considerable of the heat energy of the flame and the flame contacted the walls of the combustion chamber a substantial distance above the burner. Incomplete combustion generally results in these prior devices. Other means have been provided such as refractory blocks lying against the side of the wall to direct the flames against the side of the combustion chamber, but these blocks have likewise been impractical in that they are very short lived, and the flame only strikes a restricted area of the heat transfer surfaces. There is no complete combustion of the fuel mixture.

It is, accordingly, an object of my invention to provide a novel fuel burner for a furnace which is simple in construction, efficient in operation, economical in cost, and easy to assemble in a furnace.

Another object of my invention is to provide a novel fuel burner for a furnace which circulates flames in a rotational movement in the furnace whereby there is better heat conduction, more economical fuel combustion and there is a cleaning of the walls of the furnace or combustion chamber thereof due to the circulating flame.

Another object of my invention is to provide means for varying the amount of secondary air passing to the fire pot of the furnace.

Another object of my invention is to provide an adjustable flanged ring below my novel burner in the fire pot of the furnace.

Another object of my invention is to provide a burner forming a flame in the form of a vortex in the combustion chamber.

Other objects of my invention will become evident from the following detailed description, taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a plan view of my novel burner disposed in a furnace with parts broken away for better illustration;

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

Fig. 3 is a fragmentary side elevational view showing particularly an adjustable flanged ring surrounding my novel burner; and

Fig. 4 is an enlarged vertical sectional view

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of the adjustable fuel valve used in conjunction with my novel burner.

Referring now to the drawings, Figs. 1, 2, 3, and 4 show the base section 1 of a conventional furnace having inwardly extending seating flanged portions 2 for seating a fire box or combustion chamber 3 thereon. My novel burner comprises a vertically extending cylindrically shaped member 4 having an enlarged volutoid lower end 5 and an open upper end 6 thereof flared outwardly and downwardly in arcuate form. An internally threaded dome shaped head 7 is arcuate in shape and spaced from the outwardly flared arcuate shaped upper end 6 to form an annular converging opening 9 directed downwardly at the outer marginal portion 10. The head 7 is threadably engaged with stud 11 and secured by a nut 12. Radially extending support members 13 extend outwardly from the cylindrically shaped member 4 and are formed integral therewith. The outwardly projecting support members 13 have cut-away portions 14 for seating a flanged ring member 15 which has stepped depending skirts 16 for vertical adjustment of the ring member 15 in relation to the outer marginal portion of the upper end 6 of the member 4. The flanged ring member 15 has an outwardly extending support portion 17 for supporting the fire brick 18 of the fire box or combustion chamber 3. A pilot burner 20 is secured to one of the support members 13 of the member 4 and is connected to a fuel line 21 connecting any suitable fuel source for providing a pilot flame adjacent the marginal portion 10 of the converging opening 9. Lower volutoid portion 5 of the cylindrical member 4 has a tangentially extending portion 24 with a threaded hub 25 for connection to a threaded nipple 26 and inspirator 27 leading to a mixing valve 28. Inspirator 27 is supported by outwardly extending ears 29 having threaded apertures 30 for receiving threaded studs 31 which extend to the floor 32 of the base section 1 of the furnace. The cylindrical member 4 has outwardly extending threaded ears 35 to which are threadably engaged threaded stud member 36 which extends to the floor 32 of the base section 1 to support the cylindrical portion 4 of my novel burner member.

The tangentially extending portion 24 is integral with the lower portion 5 of the cylindrical member 4 and merges with the contour of the volutoid portion 5 of the member 4. When the fuel mixture under pressure enters the lower volutoid portion 5 of the cylindrical member 4, it is given a rotational force so that it ascends in

a rotary motion which accelerates as it rises through the smaller diameter of member 4 to the upper converging and adjustable opening 9. The fuel mixture passes from the opening 9 to form a vortex around the outer periphery of the combustion chamber 3.

My novel mixing valve 28 comprises an externally threaded nozzle member 40 having an intermediate flanged portion 41, threaded portion 90 thereof engaging the threaded portion 42 of a fitting 43. The fitting 43 has outwardly extending connecting flanges 44 with apertures 45 for receiving bolts 46 which pass through apertures 45—a in the flanged portion 47 on the flared end 48 of the inspirator 27. Nuts 50 engage the threaded ends of the bolts 46 to secure the flanged portions 44 of the fitting 43 to the flanged portion 47 of the inspirator 27. Cylindrically shaped spacing members 51 are provided between the flanged portion 47 of the inspirator 27 and the flanged members 44 of the fitting 43. The fitting 43 has an internally threaded portion 52 for receiving the threaded end 53 of a needle 54 having a tapered end 55 adapted to engage or be spaced a predetermined distance from the aperture 56 in the tapered end 57 of the nozzle member 40. The threaded end 53 of the needle 54 is slotted at 57 for receiving the end of a screw driver or the like to move the needle 54 longitudinally. A threaded cap member 59 is disposed in the outer end of the fitting 43. The needle 54 may be adjusted to increase or decrease the area between the outer sides of the tapered end 55 of the needle 54 and the inner side of the aperture 56. The fitting 43 also has a laterally extending threaded aperture 60 for threadably engaging the threaded end of a fuel line 61. I have shown diagrammatically in Fig. 1 a thermostatically controlled member 62 in the fuel line 61 though it is not a part of my invention. It will be evident upon inspection that the fitting 43 may be rotated 360 degrees and the bolt members 46 may be disposed in any three of the four apertures 45—a in the flanged portion 47 of the inspirator 27 thereby permitting the fitting 43 to be disposed in any one of four positions 90 degrees apart. This permits the fuel line 61 to be attached to the fitting 43 in any one of four positions thereby facilitating connection of a fuel line to my novel mixing valve 28. Flange member 58 threadably engages the threaded portion 42—a of the nozzle member 40 and is adapted to be spaced from the flared end 48 of the inspirator 27 to increase or decrease the amount of air passing into the flared end 48 of the inspirator to mix with the fuel passing from the aperture 56 of the nozzle member 40.

In operation, my novel burner member is disposed in the combustion chamber of a furnace assembled as shown in Figs. 1 and 2. The flanged ring member 15 is disposed on the cutaway portions 14 of the support members 13 of the cylindrical member 4 and proper spacing between the upper end 6 of the cylindrical member 4 and the top of the flanged ring 15 is obtained by utilizing various steps of the stepped skirt 16. Connection is then made to the fuel line 21 for the pilot burner 20 and fuel line 61 is connected to fitting 43 of the mixing valve 28. The area of the opening 9 of my novel burner is adjusted, if necessary, by rotating the head 7 on the threaded stud 11 to obtain the desired opening 9 for best performance for a particular predetermined pressure in the fuel line and for a particular fuel mixture used. Although I have shown the lower enlarged volutoid portion 5 of the cylindrical member 4 in

the form of a volute curve, it will be evident that any other suitable form may be used without departing from the spirit of my invention. The height of the cylindrical member 4 and the inspirator 27 may be adjusted by rotation of the supports 31 and 66. The fitting 43 is disposed in any one of four different positions 90 degrees apart. Fuel enters the fitting 43 through fuel line 61 and passes to the aperture 56 of the nozzle 40, the open area of which is controlled by the tapered end 55 of the adjustable needle 54. Air passes through the open flared end 48 of the inspirator 27 and the amount of air entering the flared end 48 is controlled by adjustment of the flanged member 68. The air and fuel mixture passes through inspirator 27 and portion 24 and passes around the enlarged volutoid portion 5 of the cylindrical member 4 and then moves rotatively and upwardly to the converging opening 9 where it passes in an accelerated vortex form to the combustion chamber 3. Acceleration of the fuel mixture is caused by restricting the area of the central portion of the cylindrical member 4. The combustible mixture passing outwardly from the outer end 10 of the opening 9 is ignited by the pilot light 20 and the vortex flame rotates around the fire pot 3 adjacent the walls thereof, therefore obtaining more complete combustion and maximum heat conduction from the combustible mixture passing from the opening 9. Furthermore, secondary air passing upwardly through the opening between the flanged ring 15 and the cylindrical member 4 increases the efficiency of the burner in that additional air is inducted to complete the combustion of the fuel mixture passing from the opening 9 of the burner.

It will be evident from the foregoing description that I have provided a burner which provides rotational flame on the outside of the fire pot or combustion chamber which causes it to remain next to the outer walls of the fire pot or combustion chamber thereby providing more complete combustion and maximum heat conduction efficiency. I also provide adjustable means for providing secondary air for complete combustion of the fuel and air mixture. The rotational movement of the burning combustible mixture tends to draw sufficient air through the opening between the ring 15 and the cylindrical member 4 thereby insuring complete combustion of the combustible mixture. It will further be evident that I have provided a novel adjustable mixing valve which is very simple in construction and which is adapted for connection to any suitable fuel line disposed at any angle to the inspirator entering the furnace with a minimum of labor at the job site.

Various changes may be made in the specific embodiment of my invention without departing from the spirit thereof or from the scope of the appended claims.

What I claim is:

1. A fuel burner for a furnace comprising a hollow, cylindrically shaped member having the lower end thereof enlarged defining a volute shaped portion and the upper end thereof flared outwardly and downwardly in arcuate form, an inspirator entering the outer extremity of said volute portion of said cylindrical member substantially tangentially thereto supplying a combustible fuel mixture thereto, a threaded stud extending upwardly axially of said cylindrical shaped member, and axially adjustable cap having a central threaded portion for threadable engagement with the upper threaded end of said

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stud and having an annular arcuate shaped portion corresponding to the flared arcuate shaped portion on the upper end of said cylindrical shaped member defining an arcuate shaped, converging, annular, laterally extending outlet in the upper end of said cylindrical shaped member, said cap being spaced upwardly from the upper arcuate end of said cylindrical shaped member, and means for securing said cap on said stud.

2. A fuel burner as set forth in claim 1 wherein a ring member having a plurality of stepped skirt portions is supported concentric to said cylindrical shaped member on brackets on the outer side of said cylindrical shaped member, said ring member being adjustable vertically on said brackets for varying the distance between the upper side of said ring member and the flared out, arcuate shaped upper end of said cylindrical shaped member to vary the size of the opening therebetween to control the amount of air for combustion passing therethrough.

3. A fuel burner as set forth in claim 1 wherein a ring member having an outwardly projecting portion for supporting a refractory floor of a combustion chamber is supported on radially extending brackets on said cylindrical shaped member concentric with said cylindrical shaped member defining an opening between said ring member and the flared out, arcuate shaped upper end of said cylindrical shaped member to control the amount of air passing through said opening for combustion.

4. A fuel burner for a combustion chamber comprising a hollow cylindrically shaped member open at the upper end and closed at the lower end thereof having the lower end thereof enlarged to define a volute shaped portion and having the upper end thereof flared arcuately outwardly through an arc greater than ninety

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degrees, an inspirator entering the outer extremity of said volute portion of said cylindrical shaped member substantially tangentially thereto for supplying a combustible fuel mixture thereto, a threaded stud member extending vertically centrally of said cylindrically shaped member, an arcuate shaped, vertically adjustable cap member disposed on said stud member spaced upwardly from the arcuate end of said cylindrically shaped member defining an arcuate shaped, converging, annular, laterally extending outlet in the upper end of said cylindrical shaped member, and means for securing said arcuate shaped cap member on said stud member.

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