

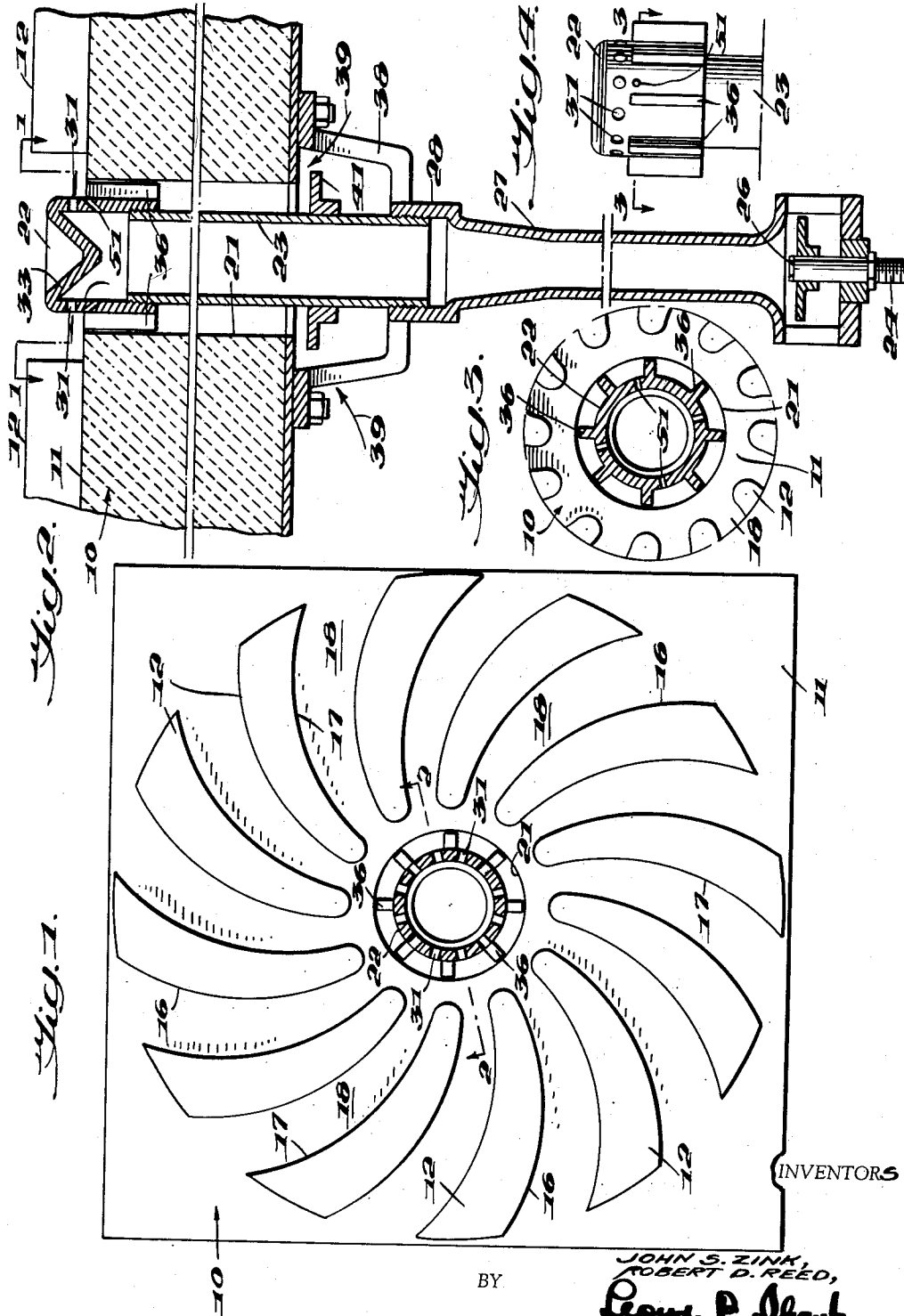
Jan. 26, 1954

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2,667,216

RADIANT GAS BURNER ASSEMBLY

Filed May 18, 1951



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2,667,216

RADIANT GAS BURNER ASSEMBLY

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Application May 18, 1951, Serial No. 227,071

5 Claims. (Cl. 158-113)

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The present invention relates to a gas burner for producing a high concentration of radiant heat in a given area. The invention more specifically pertains to a burner organization for discharging a gaseous fuel mixture along the face of a ceramic member to provide a high temperature source of radiant heat in a plane substantially parallel to the wall of the furnace in which the burner assembly is mounted.

It is known to provide for the discharge of a mixture of gas and air through a nozzle into a cup-shaped ceramic member. The curvature of the cup tends to concentrate the radiant heat so that rapid burning of the fuel produces a condition of focused radiant heat before the cup. As distinguished from such devices an object of the present invention is to provide for the discharge of the gaseous fuel mixture in a direction generally parallel to and very close to the surface of a ceramic body to be heated to provide for a dispersion of heat over the face of the ceramic member in such a manner as to avoid focusing the heat.

Another object of the invention is to provide a burner assembly wherein the gaseous fuel mixture is discharged along a face of a ceramic block and the invention further pertains to ribs on the refractory block for intercepting the streams of burning fuel so as to provide for catalytic acceleration of combustion through intimate contact of the fuel mixture with the hot ceramic body and ribs.

Other objects and features of the invention will be apparent to those skilled in the art as the present disclosure proceeds and upon consideration of the following detailed description and the accompanying drawing wherein an embodiment of the invention is disclosed.

In the drawing:

Fig. 1 is an elevational view of a burner arrangement embodying the invention showing a face of a ceramic member associated with the burner nozzle which is illustrated in section and taken on the line 1-1 of Fig. 2.

Fig. 2 is a fragmentary sectional view taken on the line 2-2 of Fig. 1.

Fig. 3 is a sectional view of the burner nozzle taken on the line 3-3 of Fig. 4 and showing a central portion of the ceramic member in elevation.

Fig. 4 is a side elevational view of the burner tip.

Referring to the drawing there is shown at 10 a block formed of refractory material provided with a flat front face 11. The ceramic body 10

is adapted to be mounted with the face 11 flush with an inner surface of a furnace wall. While the refractory element is shown as being of rectangular shape it will be appreciated that other forms may be provided having a flat front face. A plurality of ribs 12 are carried by the front face of the ceramic block. The ribs 12 may vary in number and in the embodiment illustrated twelve of such ribs are provided which project forwardly from the face 11. The ribs 12 are formed of refractory material and are integral with the refractory member 10. The ribs 12 have arcuate shaped side edges and the ribs are arranged at an angle to true radial positions. Each rib 12 is provided with a convex edge 16 and a concave edge 17. An arcuate space 18 is accordingly provided between each pair of adjacent ribs. A relatively large circular opening 21 is provided in the ceramic member 10 and it will be noted that the inner ends of the ribs 12 terminate short of the periphery of the opening 21.

A burner is mounted in the opening 21. The burner includes a nozzle 22 which is generally of cup shape and may be threaded onto a pipe 23 which is of smaller diameter than the opening 21. Gas under a relatively high pressure is supplied to the burner through a supply tube 24 having a small orifice at the inner end 26 for discharging the gas at relatively high velocity into a tubular conduit 27. The conduit 27 is connected to the pipe 23 at 28. Primary air is entrained in the gas issuing into the tubular conduit 27 for mixture with the fuel. The gas and air mixture moves forwardly into the cup shaped burner nozzle 22.

The burner nozzle is provided with a plurality of circumferentially spaced discharge orifices 31 and one of such openings is provided for discharging the fuel mixture between each pair of ribs 12 as shown in Fig. 1. An inverted conical end portion 33 is provided on the burner tip for deflecting the gaseous mixture towards the discharge orifices 31. A plurality of cooling fins 36 are provided on the periphery of the cup-shaped nozzle 22. The number of cooling fins 36 may vary and in the embodiment shown in the drawing eight of such fins are provided in equally spaced relationship around the periphery of the nozzle 22. The fins 36 are of such dimensions as to fit within the opening 21 in the ceramic block and thereby position and center the forward end of the burner structure within the refractory member.

The burner assembly includes means for ad-

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mitting secondary air to the presence of burning fuel in the event that such an air supply is necessary or desired. The burner structure may be attached to the ceramic block 10 by means of a bracket structure 38 and secondary air may enter the opening 21 in the direction of the arrows 39. A disc 41 is mounted for sliding movement on the pipe 23 so as to control the volume of secondary air that may enter the opening 21 and move to the presence of the burner tip.

In operation the burner assembly provides for the discharge of a mixture of gas and primary air from the discharge ports 31 in radial directions. The ports 31 are so disposed as to direct the fuel mixture in a common plane which is substantially parallel and quite close to the flat front face 11 of the ceramic member 10. A plurality of jets of burning fuel are thus provided which radiate from the burner nozzle 22 along the flat front surface 11. Each discharge orifice 31 is so positioned as to direct a jet of burning fuel into one of the spaces 18. The concave arcuate edges 17 of the ribs 12 intercept the streams of burning fuel. The curved shape of the passages 18 therefore force the burning gas to change direction and accordingly creating turbulence and further contact of the burning gases with the refractory surface 11 and the ribs 12. The contact of the burning fuel with the raised curved ribs sets up a condition of "surface combustion" in which the combustion reactions are accelerated catalytically through intimate contact with the raised ribs 12 and the flat surface 11. The refractory body including the ribs are thus richly heated to provide a source of radiant heat. The curved ribs 12 in association with the discharge ports 31 provide means for diverting the burning gases and accordingly for dispersion of the heat over a relatively large area of the ceramic member 10. The curved ribs also provide for the maintenance of a high temperature in the burning zone to accelerate combustion and means for the preservation of kindling of the fuel mixture as it emanates from the nozzle 22.

In some instances it may be necessary to provide additional means for maintaining kindling of the fuel mixture as it issues from the discharge ports 31. If desired the nozzle 22 may be provided with additional openings 51 and in the embodiment illustrated four of such openings are provided at spaced points around the inverted cup-shaped nozzle 22. The openings 51 converge at their outer ends towards the outer ends of some of the discharge orifices 31. The fuel mixture issuing from the openings 51 will thus intermingle with the fuel mixture escaping through some of the discharge orifices 31 to provide for increased kindling of the gaseous mixture.

While the invention has been described with reference to specific structural features it will be understood that changes may be made in the details as well as the combination of elements. Such modifications in the structure and in the general organization and others may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

What we claim and desire to secure by Letters Patent is:

1. A burner assembly for gaseous fuel comprising, a member formed of refractory material and having a flat front face, said member having an opening therethrough, a burner nozzle mounted in said opening, a plurality of spaced ribs formed of refractory material and carried on the front face of said member and arranged general-

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ly radially of said opening, said nozzle having discharge orifices therein with the axes of said orifices arranged in radial positions and in a plane substantially parallel to and closely adjacent the front face of said member, means for supplying a gaseous fuel mixture under pressure into the nozzle, each of said discharge orifices being disposed to direct the fuel mixture into a space between inner ends of adjacent ribs, and each of said ribs having an edge portion disposed at an angle to a radial position to be engaged by burning fuel issuing from said ports.

2. A burner assembly for gaseous fuel comprising, a member formed of refractory material and having a flat front face, said member having an opening therein, a burner nozzle mounted in said opening, a plurality of refractory ribs carried by the front face of said member, said ribs being disposed generally radially of said opening and each rib having a concave and a convex side edge to provide an arcuate space between adjacent ribs, said nozzle having radially disposed discharge orifices therein with the axes of said orifices arranged in a plane substantially parallel to and adjacent the front face of said member, means for supplying a gaseous fuel mixture under pressure into the nozzle, and said discharge orifices being disposed to direct the fuel mixture radially of said opening into said spaces between the ribs.

3. A burner assembly for gaseous fuel comprising, a ceramic member having a flat face, said member having an opening through a central portion thereof, a burner nozzle mounted within said opening, a plurality of ribs formed of ceramic material integral with said member on said face and extending generally radially outward from said opening, each rib having side edge portions disposed at an angle with respect to radii extending from said opening to provide a space between adjacent ribs defined by the side edges of the ribs, said burner nozzle having circumferentially spaced discharge orifices with the axes thereof in radial positions and arranged in a common plane substantially parallel to and adjacent the face of said ceramic member, means for supplying a gaseous fuel mixture into the burner nozzle, and each of said discharge orifices being disposed to direct the fuel mixture into a space between inner ends of adjacent ribs so that the fuel mixture in moving outwardly from the burner nozzle engages side edges of the ribs.

4. A burner assembly for gaseous fuel comprising, a member formed of refractory material having a flat face, said member having an opening therein, a burner nozzle mounted within said opening, means for supplying a gaseous fuel mixture into the burner nozzle, a plurality of refractory ribs carried by the face of said member extending generally radially outward from positions adjacent said opening, each of said ribs having a longitudinal concave side edge and a longitudinal convex side edge substantially parallel with the concave edge to provide an arcuate space along said face between adjacent ribs, and said burner nozzle having discharge orifices therein arranged to direct the fuel mixture radially between inner ends of adjacent ribs along the face of the refractory member between the ribs and into engagement with the concave side edges of the ribs.

5. A burner assembly for gaseous fuel comprising, a ceramic member having a flat front face, said member having an opening in a central portion thereof, a burner nozzle mounted within

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said opening, a plurality of ribs formed of ceramic material carried by said member on the front face thereof extending generally radially outward from said opening, each rib having substantially parallel side edges both disposed at an angle with respect to a true radial position to provide a space between adjacent ribs along the said front face, said burner nozzle having discharge orifices therein with the axes thereof arranged in radial positions and in a common plane substantially parallel to and adjacent the front face of said ceramic member, means for supplying a gaseous fuel mixture into the burner nozzle, each of said discharge orifices being disposed to direct the fuel mixture into a space between inner ends of adjacent ribs so that the fuel mixture in moving outwardly from the burner nozzle engages side edges of the ribs, and said burner nozzle

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having openings therein converging at their outer ends towards outer ends of some of said discharge orifices.

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