

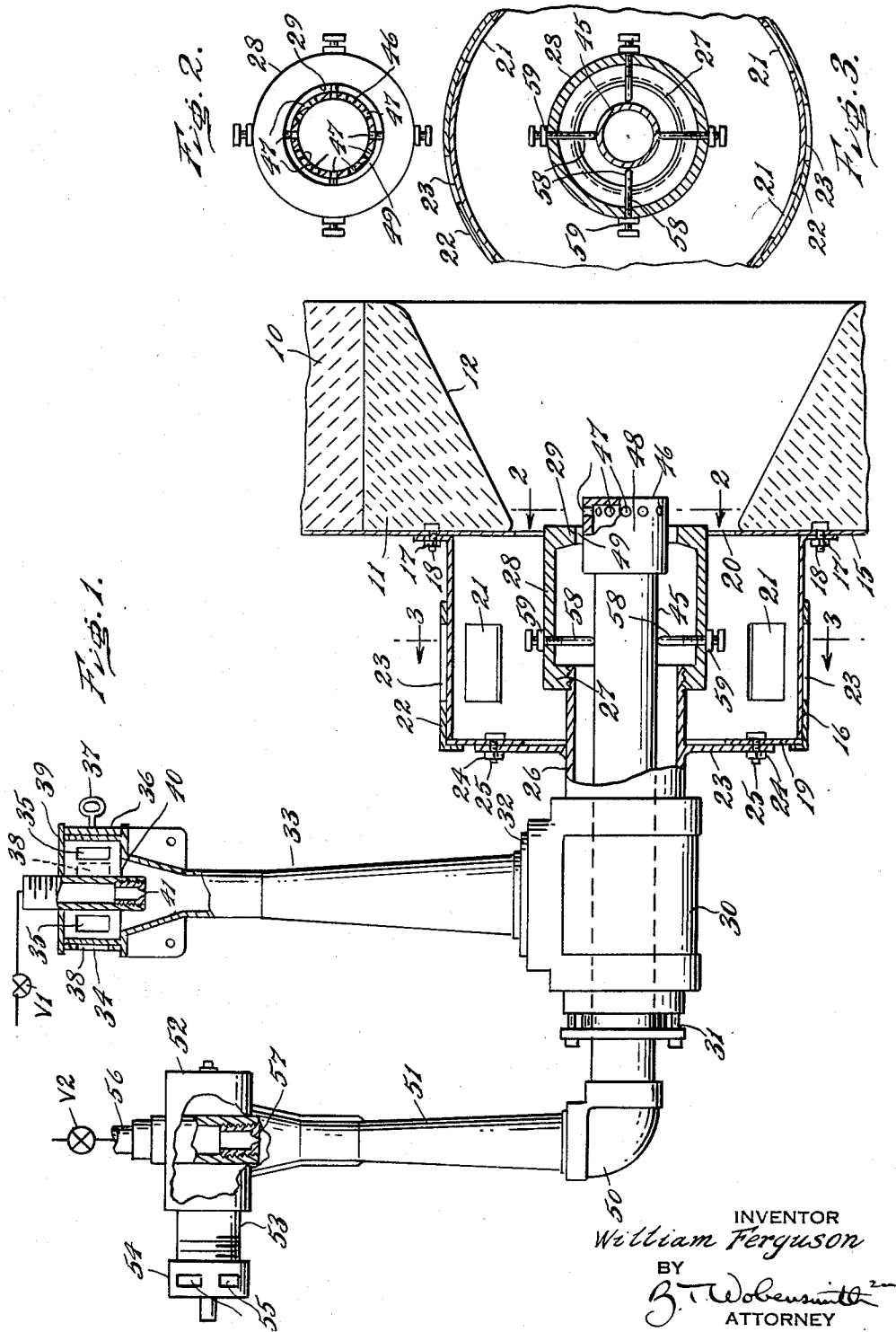
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HIGH PRESSURE GAS BURNERS

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HIGH PRESSURE GAS BURNERS

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7 Claims. (Cl. 158—106)

This invention relates to high pressure gas burners.

It has heretofore been proposed to employ high pressure inspirating gas burners in petroleum refineries, chemical and other process plants, and in steam boilers in industrial plants.

Many of the burners heretofore available for these purposes provided a long flame, visible or invisible, with a strong forward blast tending to project the gases of combustion at a high velocity and for a considerable distance into the furnace unless otherwise impeded.

With such burners a higher temperature was usually obtained at a location remote from the nozzle so that a uniform distribution of heat in the furnace or to heat absorbing tubes or other surfaces was exceedingly difficult, if not impossible, to attain. The so-called flame retention nozzle, even with the maximum obtainable included flame angle, of about 20°, was subject to the same difficulties in addition to having an inflexible flame pattern.

It is the principal object of the present invention to provide an inspirating gas burner with which the pattern of the flame can be readily varied and controlled.

It is a further object of the present invention to provide an inspirating gas burner having a plurality of delivery nozzle sections for obtaining a composite and controlled flame pattern of improved type.

It is a further object of the present invention to provide a gas burner having two separate and relatively longitudinal adjustable delivery nozzle sections.

It is a further object of the present invention to provide a gas burner having two separate and relatively diametrically adjustable delivery nozzle sections.

It is a further object of the present invention to provide a gas burner having two separate delivery nozzle sections, one of which is interiorly disposed with respect to the other, and in which the interiorly disposed section can be readily removed for inspection or replacement without dismantling the exteriorly disposed section.

It is a further object of the present invention to provide a gas burner mounted in a refractory block so that the block can be heated by the flame from the burner nozzle and the burner block can, in turn, radiate heat into the front portion of the furnace.

Other objects and advantageous features of the invention will be apparent from the description and claims.

The nature and characteristic features of the invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming part thereof, in which:

Figure 1 is a vertical sectional view taken through the front wall of a furnace having the burner assembly in accordance with the invention mounted therein;

Fig. 2 is a transverse vertical section taken approximately on the line 2—2 of Fig. 1; and

Fig. 3 is a transverse vertical section taken approximately on the line 3—3 of Fig. 1.

It should, of course, be understood that the description and drawings herein are illustrative merely, and that

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various modifications and changes can be made in the structure disclosed without departing from the spirit of the invention.

Like numerals refer to like parts throughout the several views.

Referring now more particularly to the drawings, the vertical front wall of a furnace is shown at 10 having a refractory burner block 11 mounted therein. The block 11 can be made of any desired material, preferably ceramic, capable of withstanding the temperatures to which it is subjected. The block 11 has a frusto-conical opening 12 therethrough, the flare of the opening 12 being determined by the flame angle desired.

A metal mounting plate 15, connected to the block 11 preferably has a substantially hollow cylindrical housing 16 secured thereto by nuts 17 on bolts 18. The housing 16 is closed at its outer end by a vertical plate 19. The plate 15 has a central port or opening 20 with a diameter corresponding to that of the inner end of the block opening 12. The housing 16 is provided with a plurality of circumferentially spaced holes 21 therethrough. Rotatably mounted on the housing 16, a secondary air register 22 of cylindrical shape is provided, having circumferentially spaced holes 23 therethrough which, by their placement in partial or completely overlapped relation to the holes 21, determine the quantity of air inspired, and available to pass through the central port or opening 20, as secondary air.

The vertical plate 19 has a nozzle plate 23 removably secured thereto by nuts 24 on bolts 25.

The nozzle plate 23 has a burner tube 26 welded or otherwise secured thereto. The tube 26 on the innermost end thereof has the inwardly extending rim 27 of a hollow cylindrical nozzle 28 connected thereto. The nozzle 28, at its inner end, has an inwardly extending flange 29 of predetermined internal diameter.

On the outer end of the tube 26, a T-fitting 30 is provided, with a stuffing box 31 mounted therein opposite the tube 26 and with a bushing 32 mounted in the side thereof from which a venturi tube 33 extends. At the outer end of the venturi tube 33, a cylindrical air control housing 34 is provided having circumferentially spaced holes 35 therethrough. The housing 34 has a cylindrical air register 36 mounted thereon, movable by a handle 37, and is provided with circumferentially spaced holes 38 for partial or complete overlapping relation to the holes 35, thereby to determine the air entering by inspiration at this location. The end of the housing 34 is closed by an end plate 39. A gas pipe 40 having an orifice 41 therein of predetermined size is carried by the plate 39 in axial alignment with the venturi tube 33.

The pipe 40 is connected to any suitable supply of combustible fuel gas, at a high pressure which can be from 5 to 60 p.s.i.g., or higher, and a valve V1 is provided for regulating the flow therethrough.

The stuffing box 31 has a tube or pipe 45 extending therethrough. The pipe 45 extends inwardly in concentric relation to the tube 26 and the nozzle 28 and has a discharge control member end fitting 46 mounted thereon. The end fitting 46 is closed at its outer end and has a plurality of radially extending burner ports or openings 47 therethrough which are disposed beyond the inner end of the nozzle 28 to provide a "side shot" nozzle, as hereinafter explained.

The outer cylindrical surface 48 of the end fitting 46 in spaced relation to the inner surface of the flange 29 provides a nozzle opening 49 for a "straight shot" nozzle, as hereinafter explained.

The pipe 45, on the outer end thereof, has an elbow 50 connected thereto.

On the other end of the elbow 50 a venturi tube 51 is connected. The venturi tube 51 is provided on its

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outer end with an air control housing 52 having a primary air inlet pipe 53 extending thereto. The pipe 53 has a cap 54 threaded thereon with side ports 55 which by their spaced or overlapped relation to the end of the pipe 53 determine the air entering by inspiration at this location.

The housing 52 is provided in axial alignment with the venturi tube 51, with a gas pipe 56 having an orifice 57 therein of predetermined size, and preferably the same as the orifice 41, and a valve V2 is provided for regulating the flow through the pipe 56.

The nozzle 28 has a plurality of centering screws 58 threaded therein, four equally or quadrantally spaced being preferred, for centering or otherwise positioning the end fitting 46 in the flange 29. Lock nuts 59 can be provided on the screws 58 for locking the same at the desired position of adjustment.

The mode of operation will now be pointed out.

Fuel gas under pressure, and preferably from the same source or of the same characteristics is supplied under high pressure, of the order of 5 to 60 p.s.i.g., or higher, to the gas pipes 40 and 56. Gas should not be supplied to the pipe 56 unless it is also supplied to the pipe 40.

The gas from the pipe 40 passes through the orifice 41 and into the venturi tube 33 and entrains primary air into the housing 34. The quantity of primary air inspired into the housing 34 is determined by the setting of the register 36. The fuel gas and air, mixed in the venturi tube 33, passes into the tube 26, exteriorly of the pipe 45 and into the nozzle 28 for discharge around the exterior of the end fitting 46. The gas-air mixture, ignited at this location, would provide by itself a long flame but this is not desired.

The fuel gas from the pipe 56 passes through the orifice 57 and into the venturi tube 51 and entrains primary air into the housing 52. The quantity of primary air inspired into the housing 52 is determined by the setting of the cap 54 to regulate the effective size of the openings 55. The fuel gas and air, mixed in the venturi tube 51, passes into and through the tube 45 and is discharged radially through the ports 47.

The gas-air mixture, ignited at this location would provide by itself a flame having the appearance of the spokes of a wheel.

With both burner sections operating simultaneously, and with the gas pressure, nozzle port areas and other characteristics equal, the blast or discharge from each burner section will be equal so that a composite or resultant flame will have an included angle of approximately 90°, with some outer fringe, and will approach a hollow cone in cross section with some outer fringe. The flame fringes will stabilize ignition.

The composite flame will be shorter, wider and more dispersed with a lower forward velocity. The interior surface 12 of the burner block 11 will be heated and heat will be radiated from the block 11 into the furnace.

Secondary air induced through the opening 20 and controlled by the setting of the register 22 is supplied around the composite or resultant flame from the burner assembly and through the burner block opening 12.

While the combined fuel capacity of the burner can be varied, for average typical installations the combined fuel capacity of the burner assembly is preferably about one and one half times the heat duty required and each burner section will supply up to about three quarters of the total heat.

It will be noted that the center tube 45 and its fitting 46 can be readily retracted and changed, if desired, by separation of the stuffing box 31 and without dismantling the outer nozzle components, and that the center tube 45 can be adjusted longitudinally to position the openings 47 longitudinally as desired.

The nozzle opening 49 can also be readily adjusted, and the fitting 46 centered as required, by the screws 58.

I claim:

1. A high pressure gas burner comprising an air inspi-

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rating tube having an air inlet end and a discharge end, said inlet end having variable air inlet openings, a gas delivery connection for the delivery of gas under pressure to the inlet end of said tube, a burner tube connected to the discharge end of said inspiring tube, a discharge control member on the end of said burner tube having an outer cylindrical surface and a plurality of burner ports radially disposed with respect to the longitudinal axis of said burner tube and terminating at said surface, a second air inspiring tube having an air inlet end and a discharge end, said air inlet end having variable air inlet openings, a second gas delivery connection for the simultaneous delivery of gas under pressure to the inlet end of said second inspiring tube, a second burner tube, a connecting member interposed between said second burner tube and the discharge end of said second inspiring tube, said connecting member having a stuffing box through which said first burner tube extends, said second burner tube being concentrically disposed with respect to said first burner tube and in longitudinally axially movable relation thereto and having a nozzle member thereon with an inwardly extending flange in spaced relation to said discharge control member surface to provide therewith an annular burner port in intersecting relation to said radial burner ports.

2. A gas burner as defined in claim 1 in which a housing is provided having an outer wall through which said second burner tube extends and an inner wall in spaced relation to said second burner tube to provide therewith a secondary air inlet.

3. A gas burner as defined in claim 1 in which a housing is provided having an outer wall through which said second burner tube extends and an inner wall in spaced relation to said second burner tube to provide therewith a secondary air inlet, and said housing has variable air inlet openings in communication with the interior thereof.

4. A gas burner as defined in claim 1 in which said second burner tube has radially inwardly disposed adjusting members carried thereby in engagement with said first burner tube for adjusting said annular burner port.

5. A high pressure gas burner comprising an air inspiring tube having an air inlet end and a discharge end, said inlet end having variable air inlet openings, a gas delivery connection for the delivery of gas under pressure to the inlet end of said tube, a burner tube connected to the discharge end of said inspiring tube, a discharge control member on the end of said burner tube having an outer cylindrical surface and a plurality of burner ports radially disposed with respect to the longitudinal axis of said burner tube and terminating at said surface, a second air inspiring tube having an air inlet end and a discharge end, said air inlet end having variable air inlet openings, a second gas delivery connection for the simultaneous delivery of gas under pressure to the inlet end of said second inspiring tube, a second burner tube, a connecting member interposed between said second burner tube and the discharge end of said second inspiring tube, said connecting member having a sealing device through which said first burner tube extends, said second burner tube being exteriorly concentrically disposed with respect to said first burner tube and in longitudinally axially adjustable relation thereto and having a nozzle member thereon with an inwardly extending flange in spaced relation to said discharge control member surface to provide therewith an annular burner port in intersecting relation to said radial burner ports.

6. A high pressure gas burner comprising an air inspiring tube having an air inlet end and a discharge end, said inlet end having variable air inlet openings, a gas delivery connection for the delivery of combustible gas under pressure to the inlet end of said tube, a burner tube connected to the discharge end of said inspiring tube, a discharge control member on the end of said burner tube having an outer cylindrical surface and a plurality of burner ports radially disposed with respect

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to the longitudinal axis of said burner tube and terminating at said surface, a second air inspirating tube having an air inlet end and a discharge end, said air inlet end having variable air inlet openings, a second gas delivery connection for the simultaneous delivery of combustible gas under pressure to the inlet end of said second inspirating tube, a second burner tube, a connecting member interposed between said second burner tube and the discharge end of said second inspirating tube, said second burner tube being exteriorly concentrically disposed with respect to said first burner tube and providing therewith a delivery passageway for combustible gas and air in contacting relation to said first burner tube, said second burner tube having a nozzle member thereon with an inwardly extending flange in spaced relation to said discharge control member surface to provide therewith at the outer end of said delivery passageway an annular burner port in intersecting relation to said radial burner ports, the gas-air discharge from said radially disposed

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burner ports and from said annular burner port providing a resultant controlled flame pattern.

7. A high pressure gas burner as defined in claim 6 in which said connecting member has a wall portion through which said first burner tube extends.

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