

[54] SIDE-FIRED BURNER FOR HEATERS

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[52] **U.S. Cl.**..... **431/189; 431/186**

[51] **Int. Cl.²** **F23C 5/06**

[58] **Field of Search** 431/180, 188, 189, 186

[56] **References Cited**

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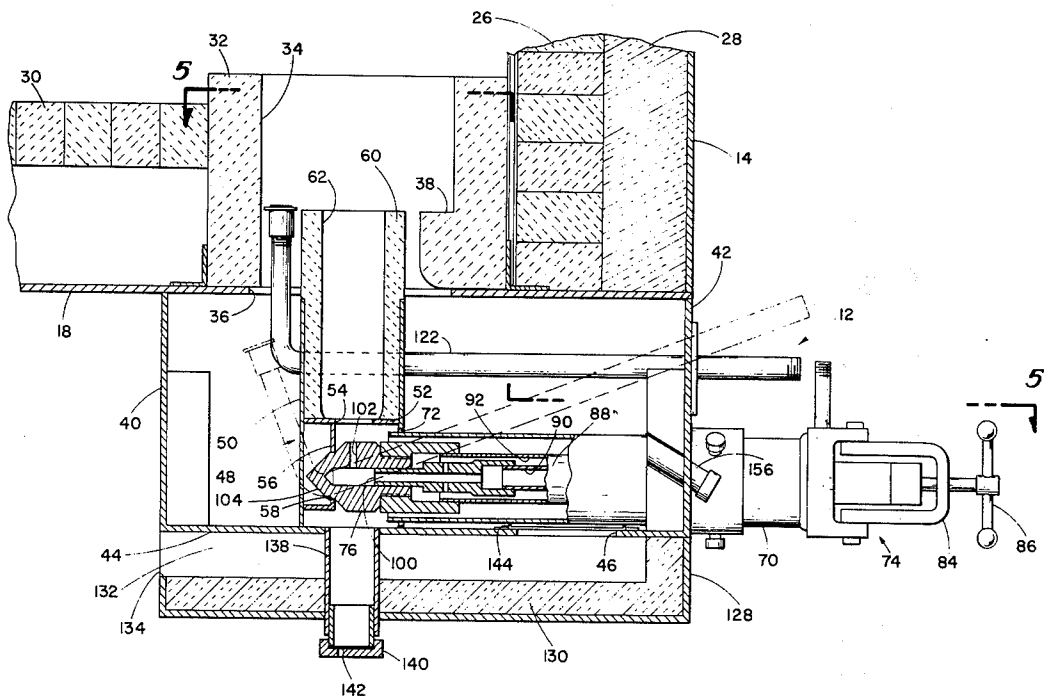
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Primary Examiner—Edward G. Favors

[57] **ABSTRACT**

A side fired heater assembly wherein multiple fuel burners are designed for side installation and operation with respect to the heater assembly, the burner firing guns being easily and quickly removable from the side of the assembly and wherein an air induction register for providing combustion air for said burners is completely operable from the side of the assembly. Further, the heater assembly is provided with an interior wall which is constructed from a refractory material for heat radiation wherein the plurality of side fired burners are positioned with respect to said refractory wall to provide heat for subsequent radiation by said wall.

7 Claims, 5 Drawing Figures



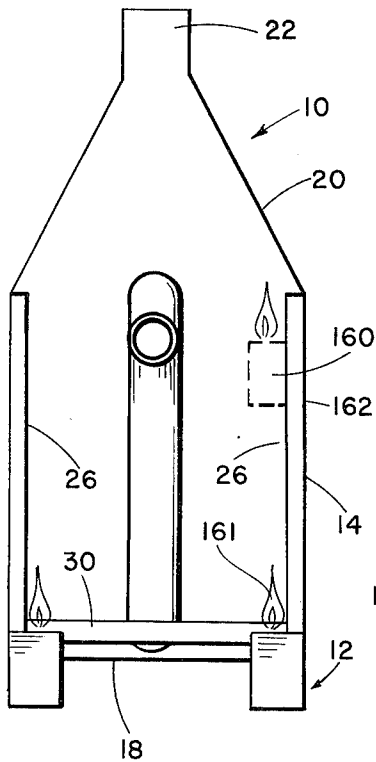


Fig. 1

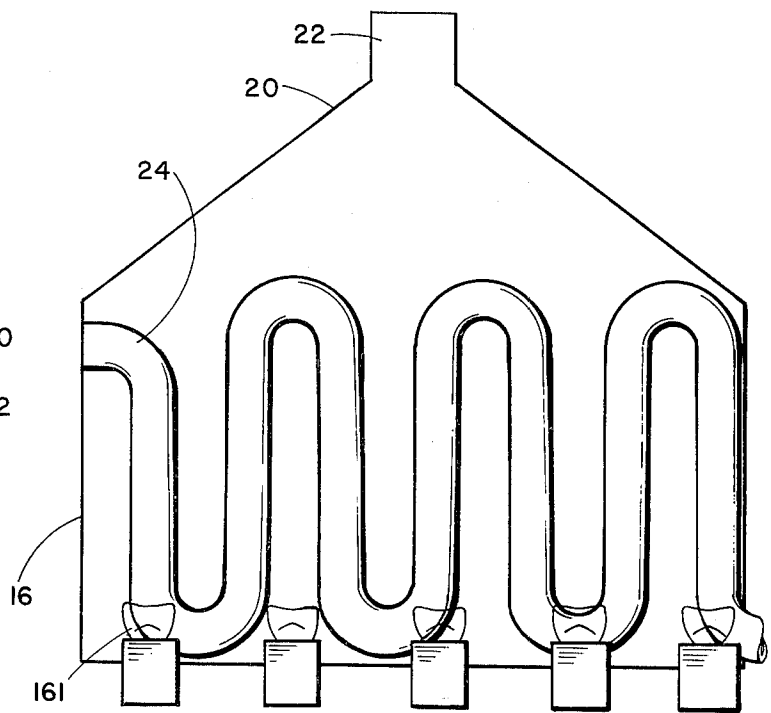


Fig. 2

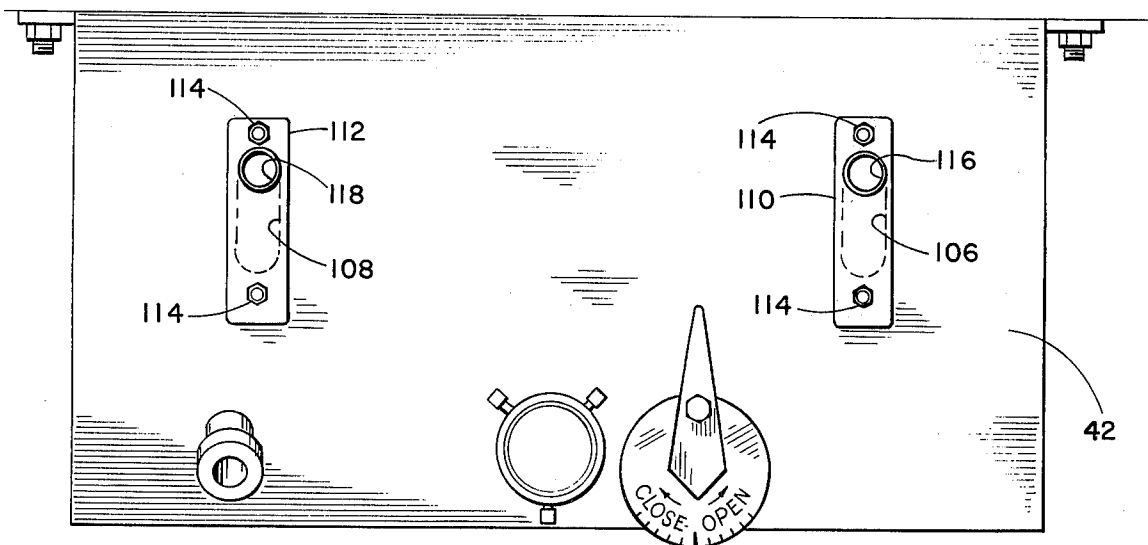
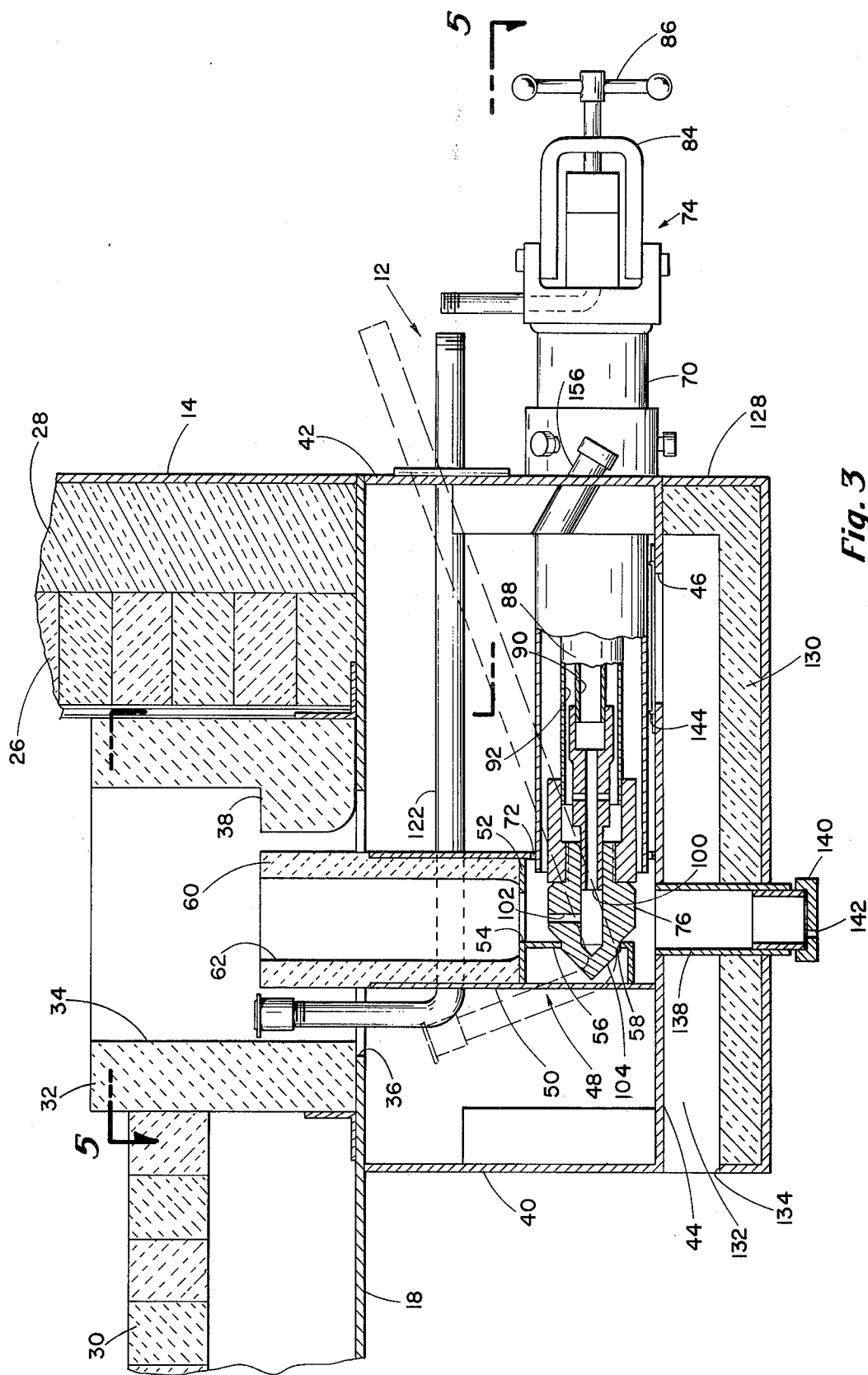


Fig. 4



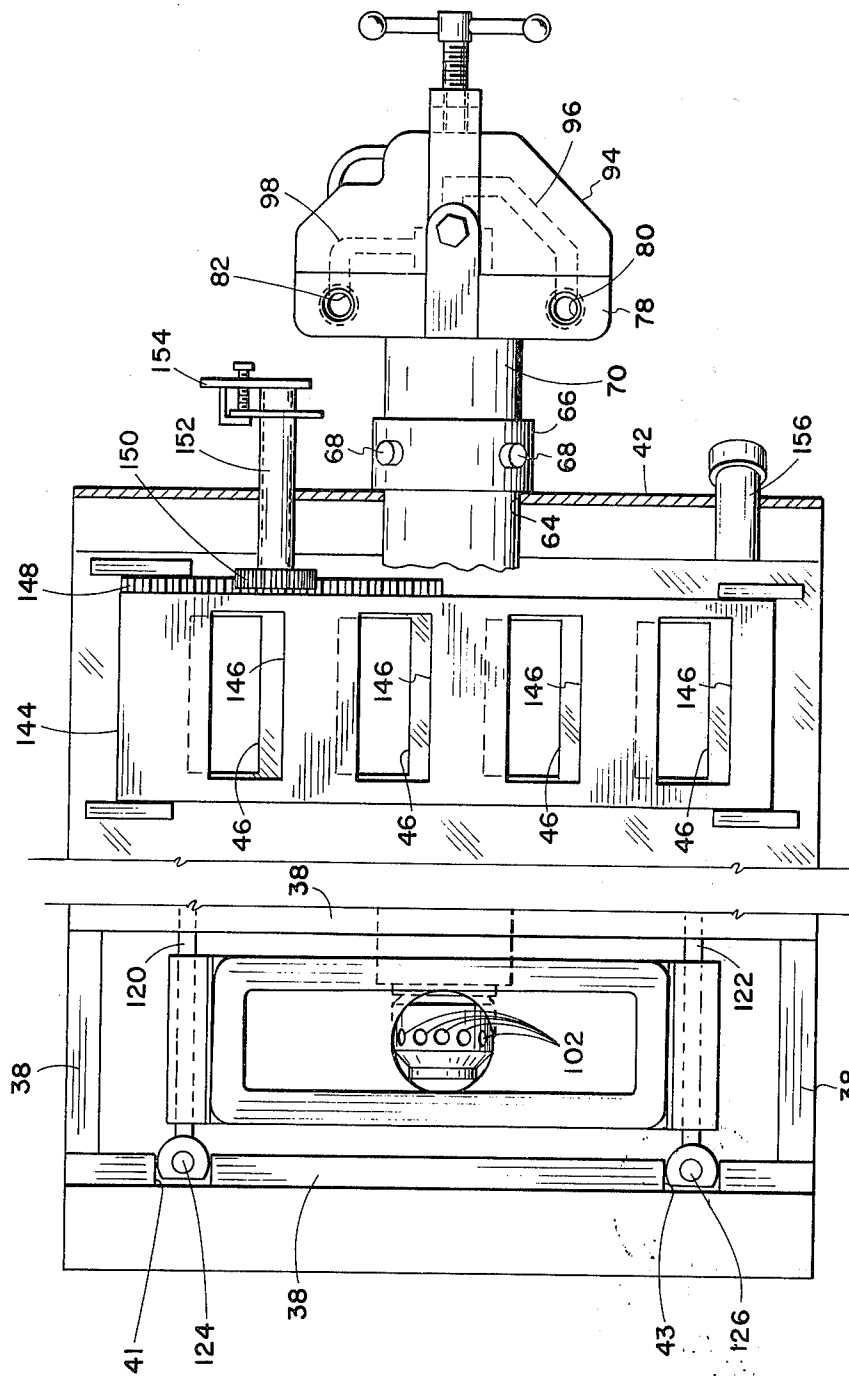


Fig. 5

SIDE-FIRED BURNER FOR HEATERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to heater assemblies utilizing multi-fuel burners and more particularly, but not by way of limitation, to a side fired burner for heaters, heat exchangers and the like wherein the burner elements may be maintained and operated from the side of the heater assembly rather than from the bottom.

2. Description of the Prior Art

Heretofore, in the manufacture of burners for heat exchangers heater assemblies and the like, and particularly, multiple fuel burners, the burners were designed for mounting directly to the bottom of the heater assembly. This design was the most expeditious since the flame was to be directed upwardly and the state of the art for such multiple fuel burners was not advanced at that time.

The patent to Zink, Jr., et al. U.S. Pat. No. 2,851,093, issued Sept. 9, 1958, and entitled "MULTIPLE FUEL BURNER" is representative of the typical bottom installation of such burners whereby the central nozzle 48 sprays a conical pattern of liquid fuel upwardly into and through a cylindrical shroud member 41 for burning within the cylindrical chamber of refractory material 12. This design permitted air to be introduced by the register at 43 around the central fuel nozzle 48 and provided for the removal and replacement of the nozzle 48 and gun assembly 47 straight downwardly from the support cylinders 46. Other maintenance and adjustment also had to be accomplished from beneath the heater assembly necessitating the mounting of said assembly above the ground for providing a space for operation and maintenance thereof. The aforementioned Zink et al. burner represented a major improvement of the art by creating high burn capacity in a small amount of space due to particular arrangement of the nozzles with respect to the specially constructed shroud and refractory member. Auxiliary gas tips 51 were also installed from beneath the assembly and were provided with separate air induction registers.

Further, the hot environment, the dripping of oil and the like made maintenance very unpleasant, difficult and presented a high chance of injury to the worker.

It became apparent through customer feedback and increased safety requirements that it would be necessary to devise a burner and burner assembly which would perform with the efficiency of the prior art burners but substantially eliminate the necessity to maintain and operate said burners from the underside of the heater assembly. This presented a distinct problem due to the critical shape and relationship of the shroud member, the refractory member and nozzle.

SUMMARY OF THE INVENTION

The present invention provides a side fired burner for use in a heater assembly which maintains the high degree of efficiency of the prior art burners and which permits removal of the working parts, maintenance and operation of the burner from the side of the heater assembly rather than from the bottom.

In order to prevent any drastic modification of the fuel gun which was a proven item, the nozzle of the fuel gun is provided with ports directed upwardly in a

fanned shaped pattern as opposed to the conical shape pattern heretofore described. It has been found desirable that the shroud member shape correspond with the pattern of the fuel. The shroud member of the present invention is provided with a rectangular cross sectional shape conforming to the fan shape spray pattern of the fuel gun nozzle.

Since the shroud member is oriented in the vertical position and the gun nozzle is inserted horizontally, it is necessary that the nozzle be positioned accurately with respect to the shroud. A nozzle positioning means is provided adjacent to the shroud to properly position the nozzle upon installation of the fuel gun.

A single air register means is disposed beneath the burner for providing air supply both around the nozzle and the auxiliary gas tips, with remote control of the register being provided at the side of the heater assembly.

A plurality of the side fired burners may thus be installed in a heater assembly, each burner being disposed adjacent to a refractory heat radiation wall to provide the necessary heat requirements for the heater assembly.

Further, the new nozzle design and associated shroud provide the capability of substantially completely burning the fuel which can be a low grade fuel oil mixed with steam for smokeless burning.

DESCRIPTION OF THE DRAWINGS

Other and further advantageous features of the present invention will more fully appear in connection with a detailed description of the drawings in which:

FIG. 1 is an end elevational view of a heater assembly employing a plurality of burners and a burner arrangement embodying the present invention.

FIG. 2 is a side elevational view of the heater assembly of FIG. 1.

FIG. 3 is an elevational sectional view of a burner embodying the present invention.

FIG. 4 is an elevational view of the installation and control panel over the burner of FIG. 3.

FIG. 5 is a top sectional view of the burner taken along the broken lines 5-5 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in detail, reference character 10 generally indicates a heater assembly employing side fired burners 12 embodying the present invention.

The heater assembly 10 generally comprises a housing having vertically disposed side walls 14 being closed by end walls 16 and being provided with a floor member 18. The upper end of the heater assembly is provided with a roof member 20 which is attached to the upper end of the side walls 14 and end walls 16, the upper end of the roof member 20 being provided with a suitable exhaust stack 22.

The heater assembly 10 is also normally provided with a heat exchange tube or the like 24 extending through the heater assembly in any well known manner. This heat exchanger may be of the plate type, tube type, as shown, or may be provided with any desired configuration or pattern conforming to the interior of the heater assembly 10. The heater assembly 10 naturally may be configured to be cylindrical, rectangular as shown in FIGS. 1 and 2, or any other convenient configuration having substantially vertical side walls.

The interior surface of the side walls 14 of the heater are provided with walls 26 which are made of a refractory material for efficiently radiating heat applied thereto by means of the side fired burners 12.

Referring to FIG. 3, reference character 28 depicts insulation packing which is provided between the refractory walls 26 and the interior surface of the heater side wall 14. Further, the heater assembly floor member 18 is provided with an interior floor 30 which is made of fire bricks or the like and is spaced from the floor member 18.

The burner assembly 12 generally comprises a fire wall member 32 having a vertical disposed opening 34 therethrough, said opening 34 being of rectangular cross sectional shape. The lower end of the fire wall 32 sits directly on the heater floor member 18 and is in direct alignment with a rectangular opening 36 provided in said heater floor 18. The interior opening 34 of the fire wall 32 is provided with an inwardly extending flanged shoulder member 38 which extends around the inner surface 34 of said firewall 32. The shoulder 38 on one side of the fire wall 32 is provided with a pair of spaced openings 41 and 43 therein for a purpose that will be hereinafter set forth.

The burner 12 also comprises a burner housing 40 having an open top therein, said burner housing 40 being attached directly to the bottom surface of the floor 18 of the heater assembly surrounding the opening 36 therein. The housing 40 also comprises an outer housing wall 42 which is secured substantially directly below the sidewall 14 of the heater assembly 10. The burner housing 40 also comprises a bottom plate member 44 which is provided with a plurality of spaced aligned apertures 46 therein for a purpose that will be hereinafter set forth.

A vertically disposed rectangular shaped shroud support member 48 is secured within the burner housing 40 directly below the opening 36 in the heater assembly floor 18. The support member 48 is secured to the bottom plate 44 of the burner housing and the side plates [not shown] thereof. The support member 48 is also provided with a horizontally disposed intermediate cross plate 52 having an opening 54 therein. A vertically disposed stop plate 56 is also secured to the support member 48 adjacent the opening 54, the plane of said plate being substantially parallel to the burner housing wall 42 and is provided with an opening 58 therein for a purpose that will be hereinafter set forth.

Multi-fuel burner 12 further comprises a shroud member 60 having a rectangular shaped vertically disposed opening 62 therethrough, said shroud member 62 being mounted within the shroud support member 48, the bottom end thereof resting directly on the cross plate 52. The opening 62 of the shroud member 60 is in substantial alignment with the opening 54 in the said cross plate 52. The upper end of the shroud member 60 extends into the opening 34 of the refractory member 32 adjacent the shoulder 38.

The outside burner housing wall 42 is provided with a substantially centrally disposed circular opening 64 therethrough. A cylindrical sleeve member 66 is secured to the outer surface of the wall 42 with the opening of said sleeve member 66 being in alignment with the opening 64 in wall 42. The sleeve 66 is provided with a plurality of radially spaced set screws 68 around the outer periphery thereof. An elongated horizontally disposed cylindrical guide tube 70 is slidably disposed

through the sleeve member 66, the opening 64 and a separate opening 68 provided in the shroud support member 48 adjacent to the bottom of the shroud member 60. This guide tube 70 is supported entirely by the sleeve 66 and associated set screws 68. The opening 72 in the shroud support member 48 is larger than the guide tube 70 thereby providing an annular space therebetween for a purpose that will be hereinafter set forth.

An elongated multi-fuel or liquid fuel gun generally indicated by reference character 74 is slidably disposed within the guide tube 70, said gun having a nozzle member 76 on one end thereof which when fully inserted through the guide tube is positioned directly below and in alignment with the opening 62 in the shroud member 60.

The gun assembly 74 generally comprises an oil and steam receiver member 78 which is secured directly to the outer end of the guidance tube 70. The receiver member 78 is provided with a pair of oppositely disposed oil and steam inlet ports 80 and 82, respectively. The oil and steam receiver member is also provided with a U-shaped pivotally mounted tightening yoke 84 with a tightening set screw 86 provided in the outer end thereof for a purpose that will be hereinafter set forth.

The removable gun 74 comprises an elongated gun tube 88 having an elongated centrally disposed oil passageway 90 therein, said oil passageway 90 being surrounded by a steam passageway 92. The outer end of the gun tube 88 is provided with a manifold member 94 secured thereto, said manifold 94 having an oil passageway 96 and a steam passageway 98 provided therein, one end of each said passageway being connected to the oil and steam inlet ports 80 and 82, respectively. The oil passageway 96 in effect connects the oil inlet port 80 with the elongated oil passageway 90 in the gun tube. Likewise the steam passageway 98 connects the steam inlet port 82 with the steam passageway 92 of the elongated gun tube.

The opposite end of the gun tube 88 is provided with the nozzle member 76 as hereinbefore set forth. The steam passageway 92 is connected with the oil passageway 90 adjacent the nozzle 76 to provide a mixture of steam and oil within one central nozzle chamber 100. The nozzle 76 is substantially cylindrical in shape and is provided with a plurality of radially extending nozzle apertures 102 around the upper portion thereof. The outer end of the nozzle 76 is closed and tapers to a substantial conical shape point 104. It is noted that the opening 58 in the stop plate 56 is sized to receive the point 54 of the nozzle 76 thereby accurately positioning said nozzle 76 with respect to the vertical opening 62 of the shroud member 60.

The outer wall 42 of the heater housing 40 is provided with a pair of spaced vertically disposed elongated slot or enlarged openings 106 and 108 therein. Each of the openings 106 and 108 is covered by an elongated removable plate member 110 and 112, respectively, said plates being held in position by a plurality of screw members 114. The plates 110 and 112 are each provided with circular openings 116 and 118 respectively for a purpose that will be hereinafter set forth. A pair of substantially L-shaped gas tubes 120 and 122 and disposed within the burner housing 40, the horizontal portion of the tubes 120 and 122 extending through the openings 116 and 118 of the plates 110 and 112, respectively. The vertical portion of the tubes 120

and 122 extend upwardly through the opening 36 in the heater floor 18 and in alignment with the openings 41 and 43 in the firewall shoulder 38. The upper ends of the gas tubes 120 and 122 are provided with gas nozzle tips 124 and 126 respectively.

It is noted that the gas nozzle tips 124 and 126, the upper end of the shroud member 60 and the firewall shoulder 38 lie in a substantially horizontal plane.

An air register housing 128 is secured to the bottom plate 44 of the burner housing 40 and the interior surface thereof is coated with insulation 130. A space 132 is provided within the air register housing 128 between the insulation 130 and the bottom plate 44 of the burner housing. This opening 132 is in open communication with the plurality of spaced aligned apertures 46 in the said bottom plate 44. The open space 132 is provided with an elongated opening 134 beneath the heater assembly 18 and at the opposite end of the space 132 from that of the apertures 46.

A vertically disposed lighting tube 138 is secured to the bottom plate 44 of the burner housing 40 and extends downwardly through the register housing 128 and is provided with a closing cap 140 thereon. The closing cap 140 is provided with an oil drain hole 142. The tube 138 is disposed directly below the nozzle 76 for the purpose of initially lighting the burner.

A movable air register plate 144 is slidably disposed on the top surface of the bottom plate 44 and is provided with a plurality of spaced apertures 146 therein which correspond to the apertures 46 in the bottom plate 44. One edge of the slidable plate 144 is provided with a toothed rack 148. A pinion gear 150 is rotatably secured to the outside wall 42 of the burner housing 40 by means of an operator rod 152 with adjustment handle 154 secured to the outer end thereof.

A cylindrical sighting tube 156 is secured to the outer wall 42 of the burner housing 40 and is provided with a bore therethrough, said bore being in alignment with the interior 34 of one side of the firewall or refractory member 32 for a purpose that will be hereinafter set forth.

In operation, the gas tubes 120 and 122 may be installed into place shown in FIG. 3 through the elongated or enlarged openings 106 and 108 in the outside wall 42 of the burner housing 40. Once the burner tips 124 and 126 are in place adjacent to the shoulder 38, the supporting plates 110 and 112 are secured into place as shown in FIG. 4 and tightened by means of the screws 114. The outer end of the gas tubes 122 are then connected to a gas supply line [not shown]. The gun assembly 74 is then installed into place within the guidance tube 70 with the nozzle 76 of said gun being forced into contact within the stop means aperture 58 of the stopping plate 56. The oil and steam inlet ports 80 and 82 of the oil and steam receiver 78 are then attached to oil and steam lines [not shown]. The oil and steam manifold 94 is then disposed in contact with the receiver member 78 in order to properly connect the oil and steam manifold passageways 96 and 98 to the elongated gun tube 88. The U-shaped locking yoke 84 is then pulled over the manifold 94 and tightened into place by means of the set screw 86.

The cap 140 is then removed from the lighting tube 138 and a flame source is provided through the said tube 138 in and around the nozzle, a combination of steam and oil is then forced through the nozzle 76 and out the nozzle apertures 102. The steam will serve to

break up the oil particles and suspend said oil particles in the air to enhance combustion thereof. The air register may then be adjusted by means of the rack and pinion 148 and 150 to provide air in and around the nozzle member 76 to support combustion of the oil and steam mixture emitted therefrom. This air is introduced through the opening 72 in the shroud support member 48 around the guide tube 70. After ignition of the oil and steam mixture in and above the shroud member 60, gas may be applied through the gas tubes 120 and 122 thereby causing ignition thereof. It is further readily seen that air introduced through the air register apertures 46 also surrounds the shroud member 60 and provides further air to support combustion within the firewall opening 34 of the firewall 32. Shoulders 38 within the opening 34 create a swirling effect thereby providing for more complete combustion of the oil and gas mixtures therein and which reduces exhaust smoke and pollution. The fan shaped flames 161 from the burner will then be established adjacent to the refractory sidewalls 26 of the heater assembly thereby heating the said sidewalls to a point whereby heat is radiated therefrom toward and against the heat exchanger 24. It is further noted that air introduced through the air register passes through the space 132, the register 46, the space 72 and around the nozzle 76.

When it is necessary to remove or perform maintenance on the oil and steam gun 74 or the gas tubes 120 and 122, they can be removed and maintained or replaced in a reverse manner to that described for installing same. The sighting tube 156 is used throughout the operation to visually or electronically monitor the interior of the firewall 34 to insure the presence of a flame.

From the foregoing it is apparent that the present invention provides a side fired burner for use with heater assemblies whereby the burner can be substantially maintained and operated from the side of the heater assembly as opposed to the requirement for operating the same from the bottom.

Whereas, the present invention has been described in particular relation to the drawings attached hereto, it is obvious that other and further modifications, apart from those shown or suggested herein, may be made within the spirit and scope of this invention. For example, referring back to FIG. 1, a second set of burners 160 may be installed well above the burners 12 to provide further heating capabilities within the heater. In the burner 160, however, the air register opening 132 will of necessity be located at the outside base portion of the burner 160 at the area designated by 162.

What is claimed is:

1. A side-fired heater assembly comprising a housing having a bottom floor member, outside wall therearound, exhaust means secured to the upper portion thereof, said outside walls being lined with an inside wall of refractory material, at least one liquid fuel burner secured to an opening provided in the floor member adjacent the outside wall and extending through said floor member to the interior of the housing, each said burner comprising nozzle means extending horizontally below the floor member to an area directly below the floor opening for directing fuel under pressure therethrough to produce flame, means for directing the flame upwardly adjacent the interior surface of the inside wall, which comprises a refractory member interior of the housing adjacent the inside wall and secured to the floor surrounding the opening

therein, said refractory member having a vertically disposed opening therethrough, said opening having a rectangular cross sectional shape, a plurality of spaced inwardly extending shoulder segments surrounding the lower inside surface of the refractory member, a vertically disposed shroud member of rectangular cross-sectional shape centrally disposed in the floor opening, the upper end thereof being in substantial alignment with the shoulder segments of the refractory member, the outside circumference of the shroud member being less than the inside circumference of the shoulder segments thereby providing a passageway therebetween, the lower end of the shroud member extending below the floor opening, air register disposed below the means for directing the flame for introducing air therethrough, control means exterior of the outside wall and operably connected to the air register for controlling the volume of air admitted therethrough, means for removal of the nozzle means horizontally from the outside wall of the housing.

2. A side fired heater as set forth in claim 1 wherein the nozzle means comprises at least one horizontally disposed gas inlet line extending below the floor member, an upwardly extending vertical section secured to the inner end thereof, a gas tip secured to the upper end of the vertical section and disposed in each space between adjacent shoulder segments of the refractory member, and a horizontally disposed liquid fuel gun extending below the heater floor to a point directly below the shroud member, a liquid fuel nozzle secured to the end of the gun and being disposed directly below the opening in the shroud member, said nozzle having spray means for spraying liquid fuel upwardly through the shroud member into the refractory member in a pattern generally conforming to the rectangular cross sectional shape of the shroud member and refractory member.

3. A side fired heater as set forth in claim 2, and including means carried by the burner and cooperating with the liquid fuel nozzle for positioning said liquid fuel nozzle with respect to the shroud member.

4. A side fired heater as set forth in claim 2 wherein the burner is enclosed within a burner housing secured to the floor of the heater housing, the upper end of said burner housing being open and surrounding the opening in the heater housing floor, said burner housing having a stationary bottom plate disposed below the nozzle means, and wherein said air register comprises a plurality of spaced openings in said stationary bottom plate, a second movable plate having a similar set of openings therein horizontally movably secured to the stationary bottom plate, the openings in said movable

plate being adjustable with respect to the openings in said stationary plate and wherein said control means is for moving the movable plate with respect to the stationary plate.

5. A side fired heater as set forth in claim 4 wherein the control means comprises an elongated toothed rack secured to the movable plate, a pinion gear rotatably secured to the burner housing and in meshing engagement with the tooth rack, and operator means exterior of said burner housing for rotating the pinion gear.

6. A side fired heater as set forth in claim 4 wherein the means for removal of the nozzle means comprises a large slot in the burner housing adjacent to the outside wall thereof for each gas inlet line whereby each said gas inlet line with associated vertical section and gas tip may be removed through said slot and wherein a horizontally disposed guidance sleeve is secured to the side of the burner housing, the inner end thereof terminating adjacent to the bottom of the shroud member for reciprocally receiving the liquid fuel gun therein.

7. A side fired burner comprising:

1. a closed burner housing having an opening at the upper end thereof;

2. a refractory member attached to the top of said housing and having an opening therein in communication with the opening in the said housing, inwardly extending shoulder means secured around the inside periphery of said refractory member;

3. shroud member extending through said housing opening, the upper end thereof being in substantially horizontal alignment with the shoulder means and the lower end thereof extending into the burner housing;

4. gas nozzle means provided between the refractory member and the shroud member, gas nozzle tip secured to one end of the gas nozzle means, said tip being disposed in substantial horizontal alignment with the shoulder means, opposite end of gas nozzle means extending through one side of burner housing;

5. liquid fuel nozzle means horizontally extending through said housing, fuel nozzle secured to one end thereof and disposed directly beneath the opening in the shroud member, said liquid fuel nozzle having apertures in the upper portion thereof for directing liquid fuel upwardly through the shroud member into the refractory member;

6. air register means carried by the burner housing for introducing air for combustion into the shroud member and the refractory member.

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