

Nov. 25, 1952

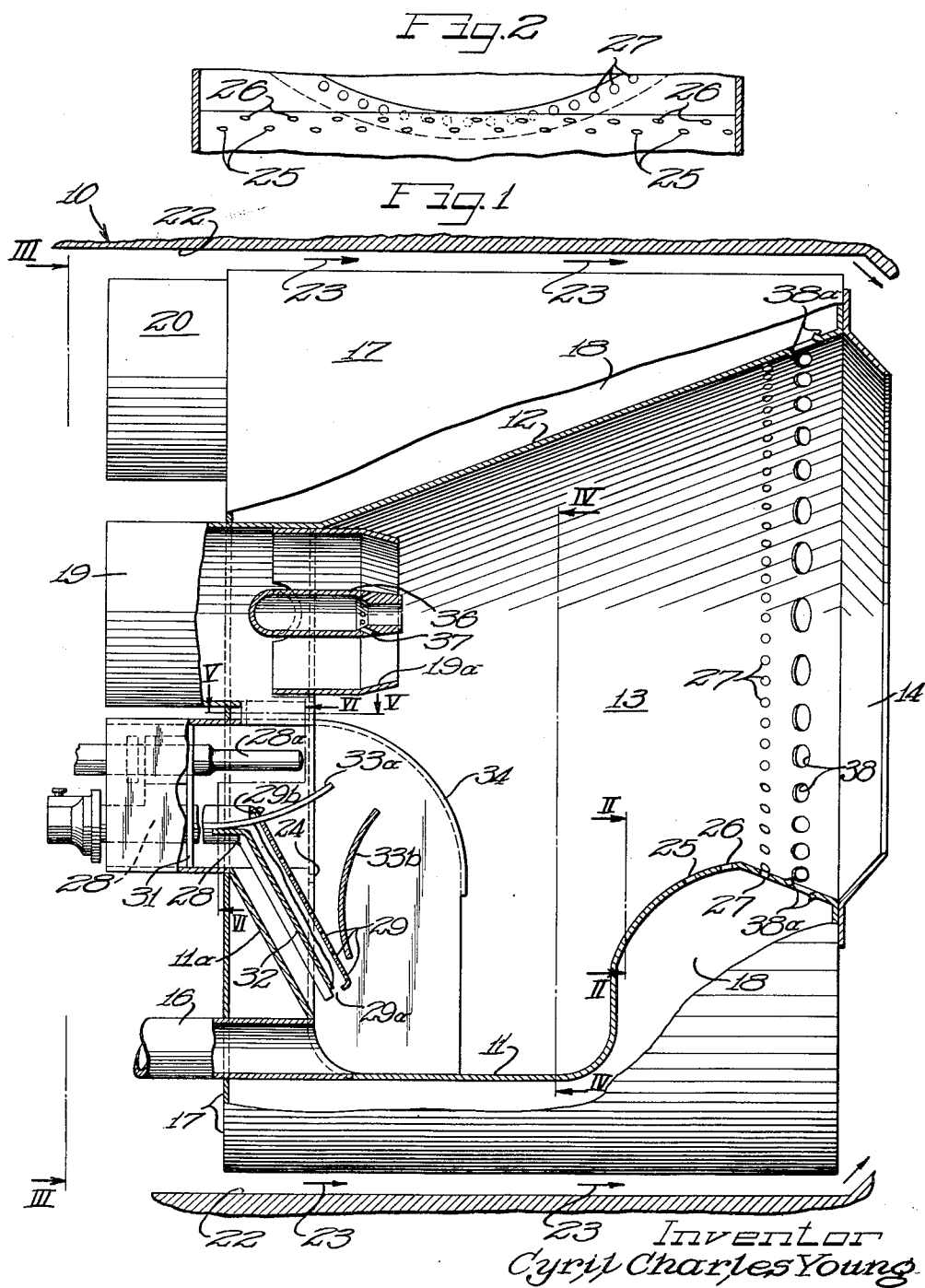
C. C. YOUNG

2,619,159

HORIZONTALLY FIRED GAS-OIL BURNER

Filed Sept. 28, 1949

3 Sheets-Sheet 1



By The Firm of Charles Mills Attys

Nov. 25, 1952

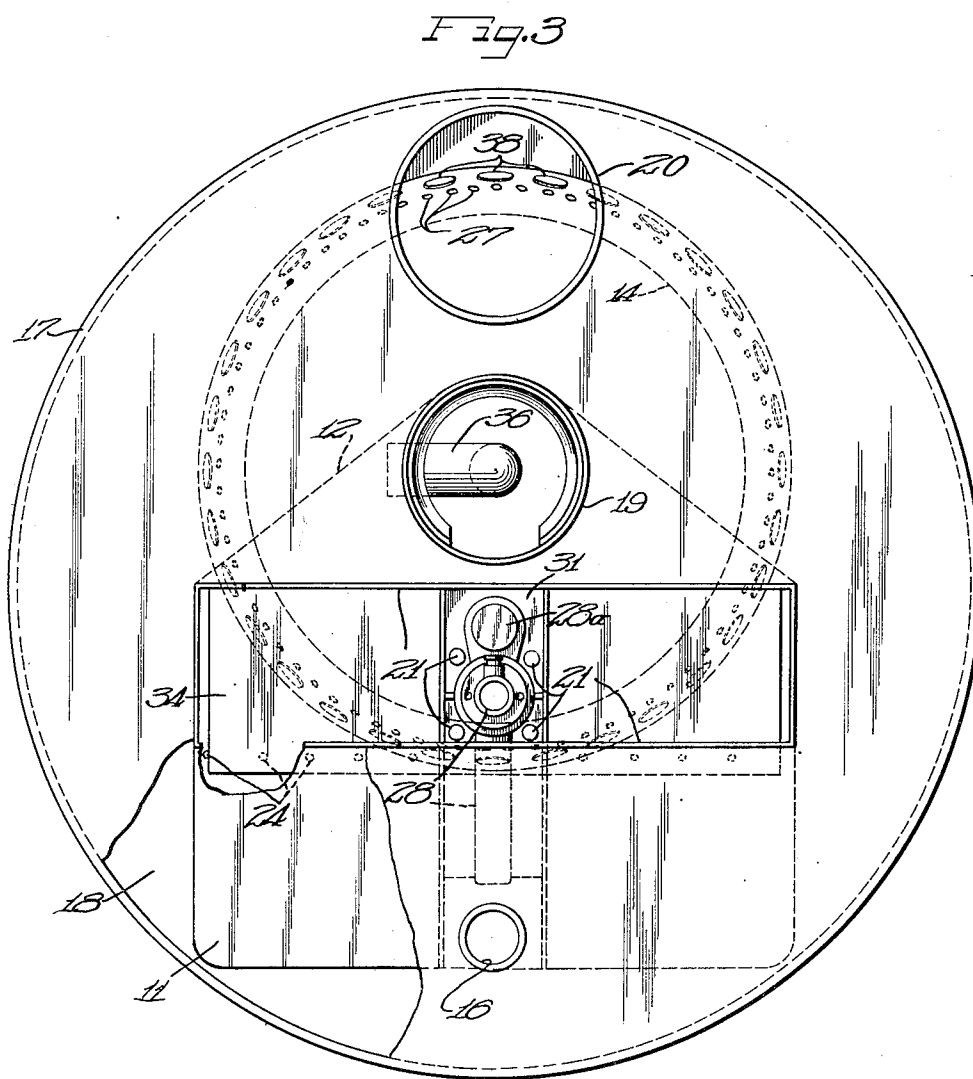
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HORIZONTALLY FIRED GAS-OIL BURNER

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3 Sheets-Sheet 2



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Nov. 25, 1952

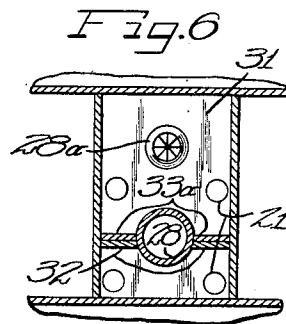
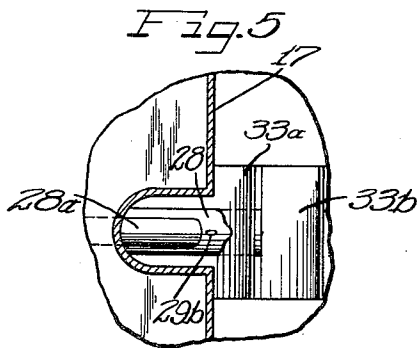
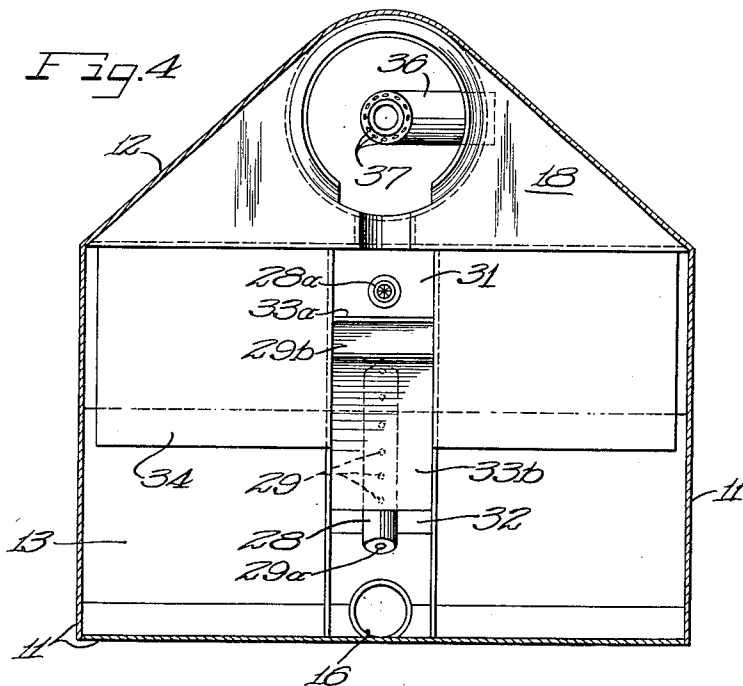
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HORIZONTALLY FIRED GAS-OIL BURNER

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,619,159

HORIZONTALLY FIRED GAS-OIL BURNER

Cyril Charles Young, Kansas City, Mo.

Application September 28, 1949, Serial No. 118,243

11 Claims. (Cl. 158—11)

1

This invention relates generally to a burner unit of a heating structure and more particularly to a combination gas and oil burner unit which may be fired in a horizontal position.

Burner units have been devised in the past which normally operate on a gaseous fuel but which are capable of conversion to operation on an oil fuel in periods of extreme cold weather or reduced gas supply. The majority of combination gas and oil burners of this type have been developed for adaptation in conventional heating structures and have, therefore, frequently required that the burner unit be constructed for use in a generally vertical position.

Furthermore, most of the burner units heretofore developed have relied upon an atomization or spraying of the fuel oil to effect the necessary break-up and mixing of fuel oil with an air stream for combustion purposes. Consequently, such units have usually required that the oil be supplied to a nozzle under pressure or that the oil be sprayed against a grate by a spray head rotating at a high velocity. Of course, such requirement entails the provision of cumbersome and complicated atomization units.

According to the general features of the present invention, a simplified combustion system for the burning of gas and oil, in combination, is provided which incorporates a burner unit wherein oil fuel is vaporized prior to combustion by heat and which is capable of being fired in a horizontal position, thus making the combustion system suitable for use in suspended unit heaters and other types of equipment in which it is desirable to use a minimum of head room.

It is, therefore, an object of this invention to provide an improved burner unit for a combination gas and oil burner which is capable of being fired in a horizontal position.

Another object of the present invention is to provide a simplified compact combustion system suitable for use in suspended unit heaters and other types of equipment where it is necessary to minimize the amount of head room required.

Yet another object of the present invention is to provide a combination gas and oil burner unit wherein the fuel oil is converted into a combustible vapor by the employment of heat and the fuel oil vapors are thoroughly intermixed with combustion supporting air and burned by virtue of induced flow of air through the burner unit.

The specific nature of the invention as well as many other advantages and additional ob-

2

jects thereof will become manifest to those versed in the art upon making reference to the detailed description which follows and the annexed sheets of drawings in which a specific embodiment of the invention is shown by way of preferred example.

On the drawings:

Figure 1 is a cross-sectional view with parts broken away and with parts shown in elevation showing a horizontally fired combination gas-oil burner unit according to the present invention.

Figure 2 is a fragmentary detail view taken on line II—II of Figure 1;

Figure 3 is a cross-sectional view with parts broken away and parts shown in elevation taken on line III—III of Figure 1;

Figure 4 is a cross-sectional view with parts in elevation taken on line IV—IV of Figure 1;

Figure 5 is a fragmentary detail view taken on line V—V of Figure 1; and

Figure 6 is a fragmentary detail view taken on line VI—VI of Figure 1.

As shown on the drawings:

The burner assembly of the present invention is indicated generally by the reference numeral 10 and includes a vaporizer pan or tray 11 of general rectangular configuration and covered by a top or roof 12 which, together with the pan or tray 11, defines a vaporizer compartment 13 with a burner port 14 at one end thereof generally disposed on a horizontally aligned axis.

An oil inlet 16 is connected at the front bottom central section of the vaporizer pan or tray 11 and extends through the front wall of the vaporizer pan or tray 11 as well as the front wall of an outer shell or casing 17 which forms an annular air chamber 18 in surrounding relationship to the vaporizer compartment 13.

A gas burner mixer tube 19 is located above the vaporizer pan or tray 11 and discharges through the central section of the vaporizer compartment 13 in the general direction of the burner port 14.

A supply of air may be forced under pressure through an air conduit 20 into the annular air chamber 18 between the casing 17 and the vaporizer compartment 13.

In order to operate the burner assembly 10 on a gas fuel, the gas fuel and primary air may be supplied in a conventional manner by means of the gas burner mixer tube 19. As will be noted upon the drawings, the gas burner mixer tube 19 is provided with a burner outlet as at 19a

so that the supply of gas and primary combustion supporting air will be thoroughly intermixed before entering the vaporizer compartment 13.

Secondary air for supporting combustion will enter the vaporizer compartment under a natural draft through apertures 21 (Figures 3 and 6) formed in the forward wall and tertiary air will be supplied around the outside of the casing 17 but within the passage of a duct 22 defined in a heat exchanger in which the combustion unit or burner assembly 10 may be installed. The flow of the tertiary air is indicated by the arrows identified by the reference character 23.

A limited amount of secondary air may also be admitted into the vaporizer compartment 13 during operation of the burner assembly 10 on gas fuel by supplying air under atmospheric pressure through the air conduit 20 into the annular air chamber 18 and through apertures 24, apertures 25, apertures 26 and apertures 27 (Figures 1 and 3). It will be evident that the problem of supplying air to support combustion is actually of more significance in connection with the operation of the burner assembly 10 on an oil cycle which will be explained presently.

A pilot burner 28 is employed in the burner assembly 10 for the purpose of igniting the gas and oil fuels employed therein. The pilot burner 28 is preferably located in a central position relative to the apertures 21 and may comprise a burner mixer of a conventional design so as to supply a combustible mixture of gas to a plurality of pilot burner ports 29. The ports 29 are so arranged that the ignition of the gas emanating from any one port will ignite the gas emanating from the remaining ports.

The pilot burner 28 is preferably provided with two enlarged ports, a bottom port 29a which lies over the bottom of the oil vaporizer pan or tray 11 at the mouth of the oil inlet conduit 16 and a top port 29b which is directed generally towards the mouth of the gas burner mixer tube 19 for igniting the main gas burner.

A plurality of baffles indicated by the reference numerals 31 and 32 control the supply of combustion supporting air to the pilot burner ports. A baffle 33a and a baffle 33b protect the pilot burner flames from excessive air velocity and gases which might interfere with a continuous combustion thereof.

A segment of the forward wall of the vaporizer pan or tray 11 is set back on an angle as indicated by reference numeral 11a (Figure 1) to accommodate the pilot burner 28, the pilot burner taking the configuration of a modified L. The pilot burner 28 may also be equipped with the usual heat sensitive element 28a for the purpose of cutting out the fuel supply thereto in the event of the failure of the pilot flame which emanates from the pilot burner ports.

When operating the burner assembly 10 on an oil cycle, oil may be delivered to the vaporizer pan or tray 11 through the oil inlet conduit 16 by conventional means, the details of which are not believed necessary to the understanding of the present invention. It may be noted, however, that it is contemplated that the burner assembly of the present invention may be incorporated in a control system for a combination gas and oil burner unit, the principles of which are disclosed and claimed in my copending application, Serial No. 47,319, filed September 11, 1948.

Oil entering the vaporizer pan or tray 11 will

be instantly ignited by the flame emanating from the pilot port 29a of the pilot burner 28. Combustion supporting air will be simultaneously made available by the starting of a blower (not shown) connected to the combustion head through the air conduit 20 so that air under pressure will pass through the air conduit 20 into the annular air chamber 18 and then through the apertures 24 and the apertures 25 and 26 defined by the vaporizer pan or tray 11, as well as the apertures 27, into the vaporizer compartment 13.

As will be evident from Figures 1 and 3, the apertures 24 may be spaced across the entire front wall portion of the vaporizer pan or tray 11 and the opposite wall of the pan or tray 11 may be curved upwardly so as to define a throat for the burner port 14 with the apertures 25 and the apertures 26 disposed in staggered array across the entire width of the pan or tray 11.

By virtue of the spacing arrangement of the apertures 24, 25, 26 and 27, an adequate amount of combustion supporting air will enter the vaporizer compartment 13 and sufficient heat will be generated within the vaporizer compartment 13 to supply heat of vaporization to the oil fuel which will tend to collect in the vaporizer pan or tray 11.

Additional combustion supporting air will enter the vaporizer compartment 13 through the apertures 21 and will be deflected and distributed by the baffles 34. Some air will be supplied to the vaporizer compartment 13 through the gas burner mixer tube 19.

Tertiary air will be supplied through the combustion chamber burner box as indicated by the arrows 23 into the fire box (not shown) wherein any deficiencies in the quantity of combustion supporting air necessary to promote full combustion of the oil fuel will be supplied.

It will also be noted that the present invention contemplates the provision of a central inspirating nozzle indicated by the reference numeral 36 and located at the center of the gas burner mixer tube 19. The inspirating nozzle 36 may conveniently take the form of a right angle L open at both ends so as to establish communication with the annular air chamber 18. The inspirating nozzle 36 does not greatly restrict the mouth of the gas burner mixer tube 19 and effectively directs a stream of combustion supporting air in the form of a jet through the center of the vaporizer compartment 13 in the general direction of the burner port 14 so as to help in the breaking up of any core of oil vapor which may possibly form in the vaporizer compartment.

In order to burn any oil vapors which may possibly be sucked in around the inspirating nozzle 36 by the vacuum created as a result of the air velocity, a ring of small orifices 37 is defined by the inspirating nozzle 36 and arranged so as to direct a plurality of air jets outwardly just clear of the forward edge of the main gas outlet defined by the Venturi section 19a.

The present invention further contemplates the provision of a ring of jets at the main burner outlet or burner port 14, such provision being best illustrated in Figures 1 and 3. Reference to these figures will show a plurality of large ports 38 formed with flared edges as at 38a so that air passing therethrough from the annular chamber 18 will be directed inwardly toward the center of the burner port 14. The ports 38 are spaced from the apertures 27 so as to form a double row of air ports. By employing such a

double row, the large ports 38 will operate not only to furnish air streams to entrain oil vapor and break up any possible vapor core formation, but the row of small ports or apertures 27 will, at the same time, supply sufficient air to avoid carbon deposits around the edges of the large ports 38.

It will be evident that I have described a novel and improved horizontally fired combination gas and oil burner unit which is ideally suited for adaptation in a combustion system requiring a minimization of head room.

It will be understood, of course, that a person skilled in the art might suggest various minor modifications to the preferred embodiment herein described by way of illustrative example only, however, I do not propose to be limited to the precise details set out for the sake of clarity but wish to embrace within the scope of this patent all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A horizontally-fired combination oil and gas burner unit comprising, in combination, an oil vaporizer tray, a casing means forming with the tray a vaporizer compartment with a generally horizontally disposed burner port and having a forward wall opposite the burner port, a gas-burner-mixer tube spaced above the tray and projecting through the forward wall to fire through the central section of the vaporizer compartment towards the burner port, an oil inlet conduit for the vaporizer tray extending through the forward wall and a casing forming an air chamber around the vaporizer compartment, said casing means having a plurality of spaced apertures to admit combustion supporting air from the air chamber to the vaporizer compartment.

2. In a horizontally fired combination oil and gas burner, a tray, means to supply oil fuel to said tray, spaced walls forming together with said tray a vaporizer compartment with a generally horizontally disposed burner port and an annular air chamber surrounding the vaporizer compartment, a gas-burner-mixer tube spaced above the tray and projecting through the air chamber into the vaporizer compartment to fire toward the burner port, and an inspirator nozzle at the center of the gas-burner-mixer tube and communicating with the annular air chamber to direct a jet of combustion supporting air into the vaporizer compartment to help break up any vapor core forming therein.

3. In a combination oil and gas burner, inner and outer casings defining a generally annular air chamber therebetween, the inner casing providing a vaporizer chamber having a lower dished portion for containing oil and having a generally horizontally directed main burner port, means to supply a quantity of oil to said lower dished portion and nozzle means extending through said casings to project a gas fuel into said vaporizer chamber toward said burner port, a pilot burner having a port for directing a flame toward said dished portion to ignite said oil and having auxiliary ports for directing flames into said vaporizer chamber to ignite said gas fuel and means for introducing air under pressure into said annular chamber, said inner casing being provided with apertures surrounding and adjacent said main burner port for the admission of air from said annular chamber into said vaporizer chamber in the direction of said main burner port.

4. In an oil burner, inner and outer casings defining a vaporizer compartment with a generally annular air chamber surrounding the vaporizer compartment, the inner casing having a lower dished portion for containing oil and for forming the floor of the vaporizer compartment, means for supplying oil to said lower dished portion, a generally horizontally directed main burner port defined by both the inner and outer casings, means for introducing pressurized air into the air chamber, said inner casing having a plurality of openings to admit air from the air chamber into the vaporizer compartment and an inspirating nozzle connecting the vaporizer compartment and the air chamber arranged to direct a jet of air across the vaporizer compartment towards said burner port to help break up any vapor core forming therein.

5. A horizontally-fired combination oil and gas burner unit comprising, in combination, an oil vaporizer tray, a casing means forming with the tray a vaporizer compartment with a generally horizontally disposed burner port and having a forward wall opposite the burner port, a gas-burner-mixer tube spaced above the tray and projecting through the forward wall to fire through the central section of the vaporizer compartment towards the burner port, an oil inlet conduit for the vaporizer tray extending through the forward wall, a casing forming an air chamber around the vaporizer compartment, said casing means having a plurality of spaced apertures to admit combustion supporting air from the air chamber to the vaporizer compartment and a pilot burner extending through said forward wall and having a first opening arranged to direct an ignition flame toward said tray to ignite the oil therein and a second opening arranged to direct an ignition flame toward said gas burner mixer tube to ignite the gas fuel emanating therefrom.

6. A burner unit as defined in claim 5 and baffle means carried by the forward wall and arranged to lie between said vaporizer compartment and said pilot burner to shield the pilot burner.

7. A horizontally-fired combination oil and gas burner unit comprising, in combination, an oil vaporizer tray, a casing means forming with the tray a vaporizer compartment with a generally horizontally disposed burner port and having a forward wall opposite the burner port, a gas-burner-mixer tube spaced above the tray and projecting through the forward wall to fire through the central section of the vaporizer compartment towards the burner port, an oil inlet conduit for the vaporizer tray extending through the forward wall and a casing forming an air chamber around the vaporizer compartment, said casing means having a plurality of spaced apertures to admit combustion supporting air from the air chamber to the vaporizer compartment, said spaced apertures including a double row of spaced apertures adjacent the burner port, the apertures in the row nearer the burner port being of proportionally larger size and each of said larger apertures having the edges thereof angularly offset so as to direct air from the air chamber in a jet fashion toward the center of the burner port.

8. In a horizontally-fired combination oil and gas burner, a tray, means to supply oil fuel to said tray, spaced walls forming together with said tray, a vaporizer compartment with a generally horizontally disposed burner port and an annular air chamber surrounding the vaporizer

7

compartment, a gas-burner-mixer tube spaced above the tray and projecting through the air chamber into the vaporizer compartment to fire towards the burner port, and an inspirator nozzle at the center of the gas-burner-mixer tube and communicating with the annular air chamber to direct a jet of combustion-supporting air into the vaporizer compartment to help break up any vapor core forming therein, the innermost of said spaced walls having a plurality of openings therein to admit additional combustion-supporting air from the air chamber into the vaporizer compartment.

9. In a horizontally-fired combination oil and gas burner, a tray, means to supply oil fuel to said tray, spaced walls forming together with said tray, a vaporizer compartment with a generally horizontally disposed burner port and an annular air chamber surrounding the vaporizer compartment, a gas-burner-mixer tube spaced above the tray and projecting through the air chamber into the vaporizer compartment to fire towards the burner port, and an inspirator nozzle at the center of the gas-burner-mixer tube and communicating with the annular air chamber to direct a jet of combustion supporting air into the vaporizer compartment to help break up any vapor core forming therein, said inspirator nozzle having a plurality of orifices near the end thereof arranged to direct a plurality of air jets outwardly towards the end of the gas-burner-mixer tube.

10. A horizontally-fired combination oil and gas burner unit comprising, in combination, an oil vaporizer tray, a cover superjacent the tray and forming therewith a vaporizer compartment with a generally horizontally disposed burner port, a forward wall opposite the burner port and cooperating with the cover and tray to bound the vaporizer compartment, a gas-burner-mixer tube spaced above the tray and projecting through the forward wall to fire through the central section of the vaporizer compartment towards the burner port, an oil inlet conduit for the vaporizer tray extending through the forward wall, a casing forming an air chamber around the vaporizer compartment, said cover having a plurality of spaced apertures to admit combustion supporting

8

air from the air chamber to the vaporizer compartment and means defining with said casing, a duct around the burner unit assembly through which additional combustion supporting air may flow towards the burner port.

11. In a horizontally fired fuel burner unit, a vaporizer tray, means to supply a vaporizable fuel to said tray, walls forming together with said tray a vaporizer compartment with a generally horizontally disposed burner port, and a casing surrounding the vaporizer compartment to provide an air chamber therefor, the walls of said vaporizer compartment having a plurality of apertures including two annular rows of spaced apertures adjacent said burner port, the apertures in the one of said two rows positioned nearer the burner port being of larger size than the apertures in the other of said two rows of spaced apertures and having the edges thereof angularly offset so as to direct air from the air chamber in a jet fashion centrally and outwardly of the burner port, the smaller apertures in said other row being aligned relative to said one row of spaced apertures and disposed inwardly thereof to introduce air centrally of the burner port ahead of the centrally and outwardly directed air from said one row of apertures to minimize the formation of carbon at the edges of the larger apertures.

CYRIL CHARLES YOUNG.

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