Dec. 12, 1950 A. CLARKSON 2,534,160

OIL BURNER WITH RADIAL FUEL NOZZLES

Filed Nov. 28, 1947 2 Sheets-Sheet 1

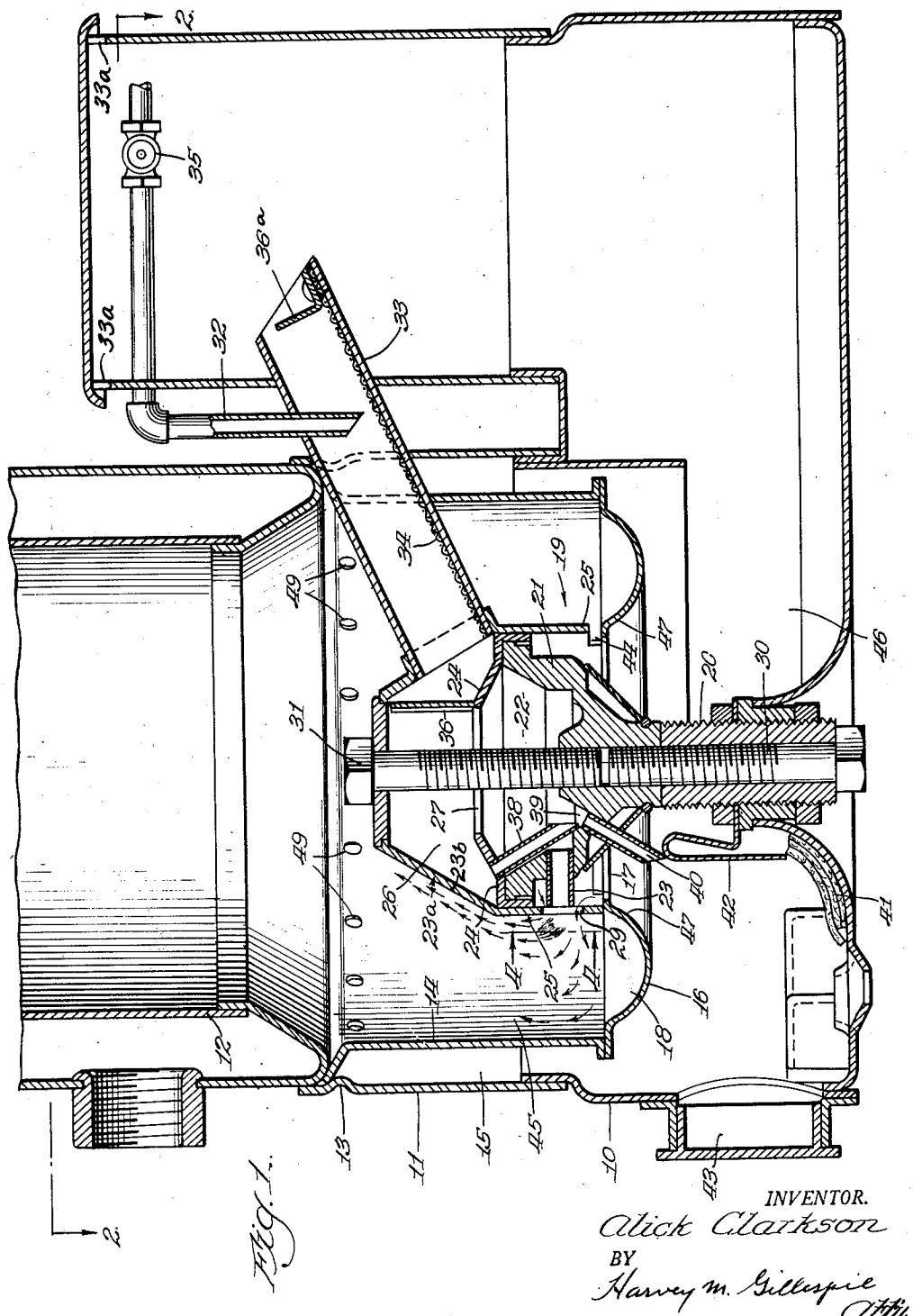


Fig. 1.

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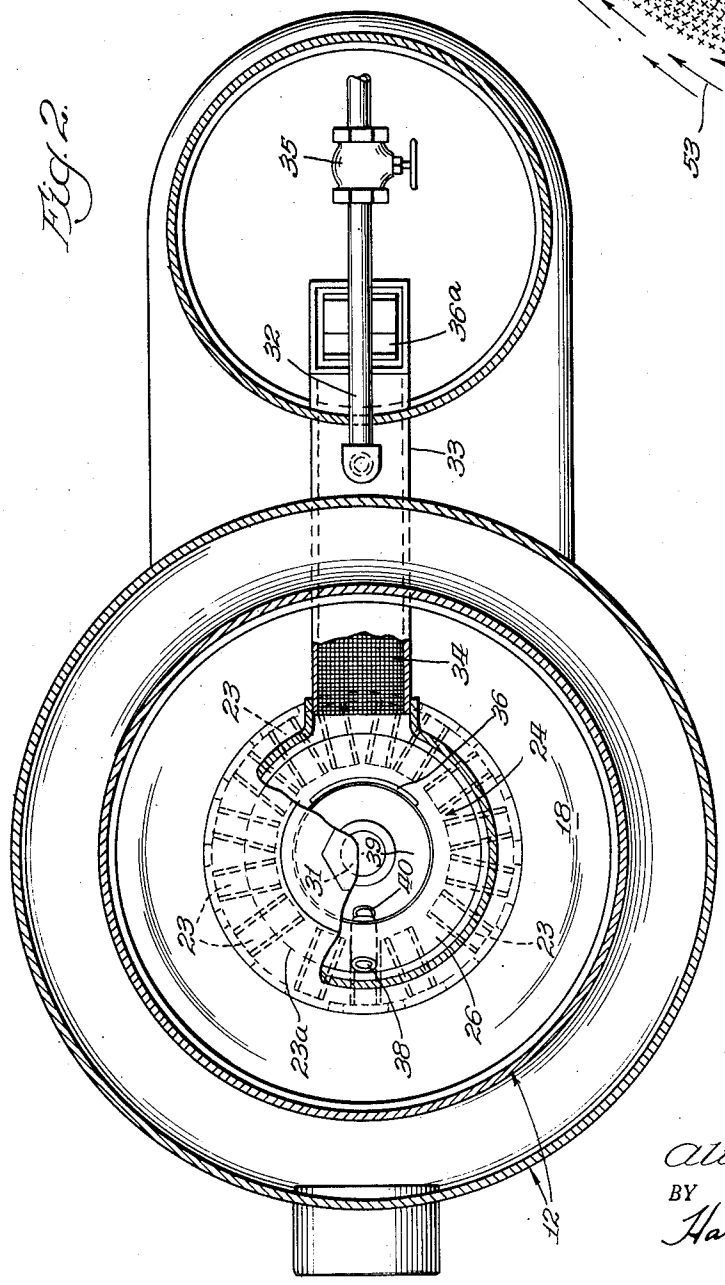


Fig. 2.

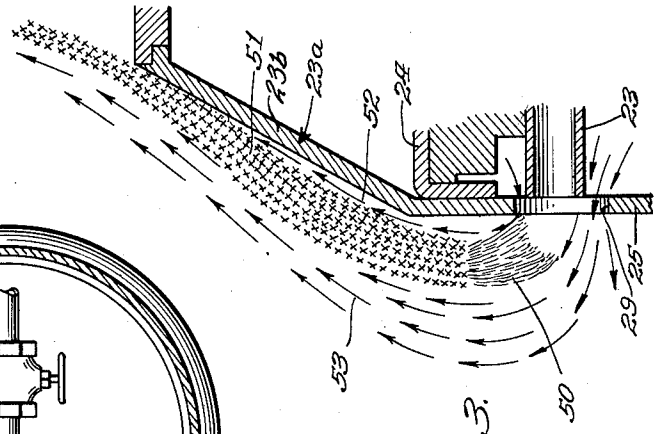


Fig. 3.

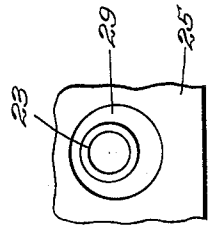


Fig. 4.

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UNITED STATES PATENT OFFICE

2,534,160

OIL BURNER WITH RADIAL FUEL NOZZLES

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9 Claims. (Cl. 158—53)

1

This invention relates to certain new and useful improvements in oil burners of the general class disclosed in my Patent 2,445,302, granted July 13, 1948, on my co-pending application Serial No. 515,555, filed December 24, 1943, and in my Patent 2,398,883, granted April 23, 1946, on application Serial No. 525,207. In my patents above identified, a retort for vaporizing a liquid fuel is positioned above a burner member so as to be heated by the flames from the burner.

In the present improvement, a retort in which a liquid fuel is vaporized is similarly located above a burner so as to be heated by the flames therefrom, but the present invention distinguishes from said prior inventions in various ways and particularly by the provision of an improved arrangement of burner nozzles.

One of the principal objects of the present invention is to provide a liquid fuel burner of the above general character in which the burner nozzles thereof are so arranged as to provide improved heating of the retort member both during high and low flame operation of the burner. In this connection the invention contemplates, as one specific arrangement for accomplishing the above object, positioning the nozzles so that they extend radially outwardly from the burner structure with the discharge orifices of each nozzle being positioned eccentric to an air supply orifice surrounding the nozzle. With this arrangement the horizontal position of the fuel nozzles projects the flames outwardly from the burner during the high flame operation thereof, when higher velocity air is used, and therefore avoids overheating the retort during such high flame operation. Due to the eccentric arrangement of the fuel nozzles in the air passages, a larger volume of air is delivered into the combustion chamber at the lower portion of the nozzles than is delivered above the nozzles. Consequently there is greater air pressure beneath the flames. This feature, however, is particularly advantageous during the low flame operation of the burner, since the flame, in such case is normally a small cone-like cap which burns at a short distance away from the fuel nozzle. The larger volume of air, therefore, functions to bend the low flame upwardly around the retort so as to utilize the full heating effect of the low flames.

Another object of the invention is to provide various improved arrangements and constructions for improving the distribution of auxiliary air and to provide improved and simplified means for preheating the burner structure.

The invention is illustrated in the accompanying drawings wherein:

2

Fig. 1 is a vertical section through the lower portion of a heater casing showing an oil burner of the present invention positioned therein.

Fig. 2 is a sectional plan view taken substantially on lines 2—2 of Fig. 1 and also showing parts of the retort broken away.

Fig. 3 is a fragmentary sectional view illustrating the manner in which the flame turns upwardly to direct its heat upwardly along the walls of the retort during low flame operation of the burner.

Fig. 4 is a fragmentary view, in side elevation, illustrating the eccentric position of one fuel nozzle in an orifice through which combustion air is delivered into the combustion chamber.

The oil burner of the present invention is suitable for use in many situations. However, for the purpose of illustrating one situation in which it may be used the burner as shown herein is enclosed in the lower portion of an ordinary heater casing. The heater casing is composed of a base structure 10, a central section 11, and an upper section 12 which may be removably connected in any suitable manner.

The upper marginal portion of the intermediate section 11 is formed with an inwardly pressed corrugation 13 which serves as a support for a fire pot 14 and the said upper section 12 of the heater. The fire pot is preferably of cylindrical configuration and is spaced from the intermediate section 11 so as to provide a cooling air space 15 between them. The bottom portion 16 of the fire pot is provided with a central opening 17 and the portion intermediate the said central opening and the side wall of the pot is bowed downwardly to provide a circular trough 18 which is concentric with the axis of the central opening 17.

The burner structure is designated generally by the reference numeral 19 and is supported from the bottom of the base structure 10 by means of a central support 20. The burner structure extends upwardly into the fire pot through the central opening 17 in the bottom 16 thereof. The said burner structure comprises a casting 21 having a fuel distributing chamber 22 which chamber communicates with a series of radially arranged discharge nozzles 23. A ring member 24 seated on the top of the casting provides an upwardly cone-shaped flange which partially closes the upper end of the distributing chamber 22. A hood member 23*a*, the upper portion of which has conical side walls 23*b*, fits over the upper portion of the casting 21 and ring 24 to form a closed vaporizing chamber 26. The lower portion of the hood is in the form of a cylindrical apron 25 which fits over the outer edges of the

said ring 24. The chamber 26 communicates with the fuel distributing chamber 22 through a central orifice 27 provided by the upwardly extending cone-shaped flange 24. The apron portion 25 of the hood 23a forms a vertical inner wall for the fire pot 14 and is provided with a series of circular apertures 29 which are arranged eccentric to the axis of the discharge nozzles so that the area of the air delivery space above each fuel nozzle is substantially less than the area of the said space beneath the nozzle, whereby a larger volume of combustion air is supplied to the flame at a location beneath each burner nozzle than is supplied at the top thereof. The burner casting 21 is secured to the support 20 by means of a bolt 30 threaded into a central opening of the casting. The hood 23a is retained in position by means of a bolt 31 which extends through a removable cap 32 of the hood and into the central threaded opening of the casting 21.

Liquid fuel is delivered in controlled amounts through a delivery pipe 32 which directs the fuel into a downwardly inclined passage 33 leading into the vaporizing chamber 26. The bottom wall of the inclined passage is preferably provided with a retarding surface 34 which receives the liquid fuel delivered and prevents the drops or beads of liquid from dancing about on the heated surface. The retarding surface 34 is preferably in the form of a screen positioned on the bottom surface of the inclined passage 33 so as to form a series of pockets which tend to retain small pools of the liquid fuel. The volume of liquid fuel supplied may be controlled by means of a hand valve 35 or by means of any of the various automatic controls now known. A baffle 36 extends upwardly from the inner edge of the ring member 24 at a location opposite the entrance of the inclined passage 33 into the vaporizing chamber 26. The upper end of the inclined passage 33 is open to the atmosphere, by virtue of openings 33a leading into an air chamber 46, so that a small quantity of air may flow into the vaporizing chamber 26 and mix with the vaporized fuel to provide a rich gaseous mixture. The amount of air entering the vaporizer is determined by a flange member 36a secured in the upper end of the passage 33.

When starting the burner, the liquid fuel delivered into the vaporizing chamber 26 will flow along the horizontal portion of the ring 24 to a down spout 38. At this point the liquid passes through the spout into a circular groove 39 formed in the bottom portion of the burner casting 21 and thence through a second down spout 40 to an asbestos mat 41 secured to the floor portion of the base 10. A flow controlling strip 42 is supported on the central support member 20 and extends upwardly and then downwardly. The strip 42 receives the liquid fuel discharged from the spout 40 and directs it onto the asbestos mat 41 without undue splashing. A normally closed door 43 is formed in the base 10 through which a torch may be extended to ignite the fuel saturated mat 41. This fuel when ignited serves to heat the bottom wall 16 of the fire pot. The heat will also pass through the several orifices 29 and through elongated passages 44 formed in the lower edge of the apron 25 of the hood to heat the walls 23b of the vaporizing chamber 26. When these walls become sufficiently hot to vaporize the liquid fuel, the fuel vapor mixes with the small volume of air entering the vaporizing chamber through passage 33 to form a rich gaseous mixture. This rich mixture passes downwardly through the central opening 27 in the ring 24 into the distributing chamber 22 of the burner and is discharged through the radially disposed nozzles 23 into the combustion chamber 45 of the fire pot 14. As the temperature of the burner and vaporizing chamber increases, all of the liquid fuel delivered into the vaporizing chamber will be vaporized and the pilot flame will burn itself out for the want of additional fuel. It will be seen, therefore, that the operation of the burner will go from the preheating stage into the normal operating stage automatically. The combustion air passes from the air chamber 46 beneath the fire pot 14 through the orifices 29 surrounding the several fuel nozzles and through the elongated passages 44, preferably in the form of recesses in the lower edge of the apron 25. The circular trough 18 formed in the bottom portion 16 of the fire pot provides adequate space beneath the nozzles 23 for the expansion of the combustion air and also provides a cone-shaped surface 47 leading upwardly along the bottom of the fire pot to the eccentric passages 29 and to the elongated passages 44. The said bottom wall of the fire pot, therefore, serves to preheat the combustion air introduced into the fire pot. A portion of the air from the chamber 46 passes upwardly in the passage 15 between the wall of the fire pot and the outer wall of the heater casing. This air serves to prevent overheating of the fire pot and provides secondary combustion air which enters the fire pot through openings 49 in the side wall near the upper edge thereof.

The arrangement of the fuel nozzles in a position eccentric to the axis of the circular air openings 29 provides for a greater supply of combustion air around the lower portion of the fuel nozzles 23 than is supplied around the upper portion thereof. This larger volume of combustion air therefore serves to turn the flame upwardly and inwardly along the outer surfaces of the hood 23a defining the outer wall of the vaporizing chamber 26. The eccentric arrangement of the fuel nozzles 23 relative to the air delivery openings 29 is especially important for low flame operation of the burner. During such operation the supply of fuel is normally such as to provide only a flame cap 50 such as illustrated in Fig. 3. Such flame cap and likewise the normal heating flame burns a short distance away from the edge of the nozzle 23. The portion of the flame cap 50 near the lower portion of the nozzle, being subjected to greater air force, will burn at a greater distance from the nozzle than at the upper portion thereof, but there is no danger of blowing the flame out, since the rate of propagation of the flame along the upper portion of the fuel nozzle, where it is supplied with a smaller volume of combustion air, is substantially slower than the rate of propagation along the lower portion of the nozzle. The flame, during the low flame operation, can be maintained very small without danger of going out and at the same time direct the heat from the small flame upwardly around the vaporizing chamber substantially as shown in Fig. 3. In this figure of the drawing the flame cap is indicated by the numeral 50 and the path of the hot products of combustion is shown at 51. The numeral 52 indicates the inner sheet of combustion air which enters through the restricted space above one of the nozzles 23 and 53 indicates the larger amount of air which enters through the passage 29 at a location below the flame.

I claim:

1. In apparatus for burning gaseous fuel, means defining a combustion chamber, a burner element positioned in the combustion chamber and provided with a plurality of nozzles for delivering gaseous fuel into said chamber and arranged with their long axes radiating from a common vertical axis, means defining separate air passages surrounding the discharge ends of the several fuel nozzles for admitting into the combustion chamber streams of air in the form of envelopes surrounding the several streams of gaseous fuel discharged from the nozzles; each of the said air passages being arranged in a vertically eccentric position relative to the discharge end of its associated nozzle and with the greatest spacing between the nozzle and the walls of the air passage being located beneath the nozzle, whereby the volume of air supplied to the lower portion of the gaseous stream discharged from said nozzle is greater than the volume of air supplied to the upper portion thereof and thereby turns the flame upwardly.

2. In apparatus for burning gaseous fuel, means defining a combustion chamber having side and bottom walls, a burner element positioned in the combustion chamber and provided with a plurality of radially disposed horizontal nozzles for delivering gaseous fuel into said chamber, means defining separate air passages surrounding the discharge ends of the several fuel nozzles for admitting into the combustion chamber streams of air in the form of envelopes surrounding the several streams of gaseous fuel discharged from the nozzles; each of the said air passages being arranged in a vertically eccentric position relative to the discharge end of its associated nozzle and with the greatest spacing between the nozzle and the walls of the air passage being located beneath the nozzle, whereby a volume of air substantially larger than the volume introduced above the gaseous stream is introduced into the combustion chamber between the stream of gaseous fuel and the bottom and side walls of the combustion chamber so as to turn the stream of gaseous fuel upwardly and provide a blanket of air between the ignited fuel and the side walls of the combustion chamber.

3. In apparatus for burning gaseous fuel, means defining a combustion chamber, a burner element positioned in the combustion chamber and provided with a plurality of radially disposed horizontal nozzles for delivering gaseous fuel into said chamber, means for supplying said nozzles with gaseous fuel comprising a retort positioned above the burner element so as to be heated by the flames therefrom, and means for supplying air to said fuel streams in the form of envelopes surrounding the separate streams of fuel to support combustion and for turning the flames of the ignited fuel upwardly around the walls of said retort comprising a vertical plate formed with openings therein arranged adjacent the ends of the nozzles with the horizontal axes of the openings positioned below the horizontal axes of the said nozzles, whereby the amount of air admitted through the lower portion of said passages into the combustion chamber beneath the stream of gaseous fuel is greater than the amount introduced into the chamber above said gaseous streams and thereby turns the flames upwardly around the retort.

4. In apparatus for burning gaseous fuel, means defining a combustion chamber having side and bottom walls, a burner element positioned in the chamber near the bottom wall and provided with a plurality of radially disposed horizontal nozzles for delivering streams of gaseous fuel into said chamber, means for supplying said nozzles with gaseous fuel comprising a retort positioned above the burner element so as to be heated by the flames therefrom and having direct communication with the burner element, means for delivering into the retort a controlled volume of liquid fuel and a quantity of air insufficient to support combustion, whereby the fuel is vaporized and mixed with said air to provide a rich gaseous mixture, and means for supplying air to said streams of gaseous fuel in the form of envelopes surrounding the separate streams of gaseous fuel to support combustion and for turning the flames of the ignited fuel upwardly around the walls of said retort comprising a vertical plate formed with openings therein arranged adjacent the end of the nozzles with the horizontal axes of the openings positioned below the horizontal axes of said nozzles, whereby a larger volume of air is introduced into the combustion chamber between the streams of fuel and the bottom wall of the combustion chamber than is introduced above said streams.

5. A liquid fuel burner comprising, in combination, means defining an air supply chamber, means defining a combustion chamber located in the air supply chamber and having side and bottom walls spaced from the side and bottom walls of the air supply chamber and also having openings defining air passages leading from the air supply chamber into the combustion chamber, a combined retort and burner structure extending into the combustion chamber through an air passage opening in the bottom wall of the combustion chamber, said burner structure including a burner element having a chambered body and a plurality of radially disposed horizontal nozzles extending outwardly from said body for directing streams of gaseous fuel into the combustion chamber, a retort positioned above the burner element to be heated thereby and adapted to receive and vaporize a quantity of liquid fuel to provide said gaseous fuel, and means for restricting the passage of air through the opening in the bottom wall of the combustion chamber comprising a vertical wall extending around the burner structure and having its lower edge recessed at spaced locations and seated on said bottom wall of the combustion chamber, the said vertical wall being also formed with openings therein defining separate air passages surrounding the discharge ends of the several nozzles, each of said air passages being arranged in a vertically eccentric position relative to its associated nozzle with the horizontal axes of said opening below the axes of its associated nozzle so that a larger volume of air is introduced into the combustion chamber through the lower portions of said openings than through the upper portions thereof.

6. A liquid fuel burner comprising, in combination, means defining an air supply chamber, means defining a combustion chamber located in the air supply chamber and having side and bottom walls spaced from the side and bottom walls of the air supply chamber and also having openings through the side walls of the combustion chamber near the upper edge thereof and a central opening in the bottom wall defining air passages leading from the air supply chamber into the combustion chamber, a combined retort and burner structure extending into the combustion chamber through an air passage opening in the

bottom wall of the combustion chamber, said burner structure including a burner element having a chambered body and a plurality of nozzles arranged to radiate from a common vertical axis and extending outwardly from said body for directing streams of gaseous fuel into the combustion chamber, a retort positioned above the burner element to be heated thereby and adapted to receive and vaporize a quantity of liquid fuel to provide said gaseous fuel, and means for restricting the passage of air through the opening in the bottom wall of the combustion chamber comprising a vertical wall extending around the burner structure and having its lower edge recessed at spaced locations and seated on said bottom wall of the combustion chamber, the said vertical wall being also formed with openings therein defining separate air passages surrounding the discharge ends of the several nozzles, each of said air passages being arranged in a vertically eccentric position relative to its associated nozzle with the horizontal axes of said opening being arranged below the axes of its associated nozzle so that a larger volume of air is introduced into the combustion chamber through the lower portions of said openings than through the upper portions thereof.

7. A liquid fuel burner comprising, in combination, means defining an air supply chamber, means defining a combustion chamber located in the air supply chamber and having side and bottom walls spaced from the side and bottom walls of the air supply chamber and also having openings through the side walls of the combustion chamber near the upper edge thereof and a central opening in the bottom wall defining an air passage leading from the air supply chamber into the combustion chamber, a burner structure extending into the combustion chamber through said central opening in said bottom wall and provided with a plurality of radially disposed nozzles for directing streams of gaseous fuel into said combustion chamber, and means for restricting the passage of air through said central opening in said bottom wall of the combustion chamber comprising a vertical wall extending around the burner structure and seated on said bottom wall of the combustion chamber, the said vertical wall being formed with openings therein, each opening defining an air passage of the desired area surrounding the discharge orifice of a nozzle.

8. A liquid fuel burner comprising, in combination, means defining an air supply chamber, means comprising side and vertical walls defining a combustion chamber, means defining a central air passage leading from the air supply chamber into the combustion chamber, a burner structure extending into the combustion chamber through said central air passage and comprising a burner element having a plurality of radially extending fuel discharge nozzles and a retort positioned above said burner element to be heated thereby and adapted to receive and vaporize a quantity of liquid fuel to provide said gaseous fuel, and means for restricting the passage of air through said central air passage into the combustion chamber comprising a hood element for the retort formed with a vertical wall extending downwardly from said retort and around the burner element and seated on the bottom wall of the combustion chamber adjacent said central opening, there being air openings in said vertical wall surrounding the discharge end of each of said nozzles to admit into the combustion chamber streams of air in the form of envelopes surrounding the streams of gaseous fuel discharged from said nozzles.

9. A liquid fuel burner comprising, in combination, means defining a combustion chamber having side and bottom walls and formed in said bottom wall with an opening defining a central air passage, a burner structure extending into said combustion chamber through said central air passage and including a burner element having a chambered body and nozzle means for directing gaseous fuel into the combustion chamber and a retort positioned above the burner element to be heated thereby and adapted to receive and vaporize a quantity of liquid fuel to provide said gaseous fuel, and means for preheating portions of the combustion chamber and burner structure comprising an absorbent body positioned below the bottom wall of said combustion chamber, and means for delivering a controlled volume of liquid fuel into said retort, and means for directing said liquid fuel from said retort into the chambered body of the burner element and thereafter to said absorbent body, whereby the combustion of the fuel received by said absorbent body from the chambered body of the burner element applies heat to the walls of the combustion chamber, the burner element and the retort, and whereby the heating of the retort vaporizes the liquid fuel therein and thereby interrupts the delivery of liquid fuel into said chambered body of the burner and to said absorbent body.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
546,644	Huber	Sept. 17, 1895
811,429	McKnight	Jan. 30, 1906
1,011,456	Ludlow	Dec. 12, 1911
1,282,998	Walker	Oct. 29, 1918
1,364,678	Barnes	Jan. 4, 1921
1,529,885	Handley et al.	Mar. 17, 1925
2,367,038	Martin	Jan. 9, 1945
2,398,883	Clarkson	Apr. 23, 1946
2,409,981	Livar	Oct. 22, 1946
2,445,302	Clarkson	July 13, 1948