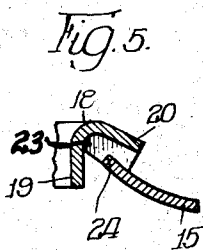
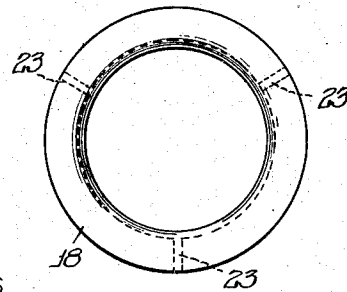
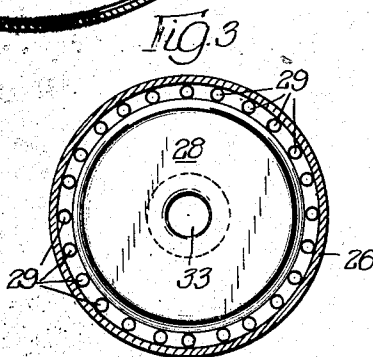
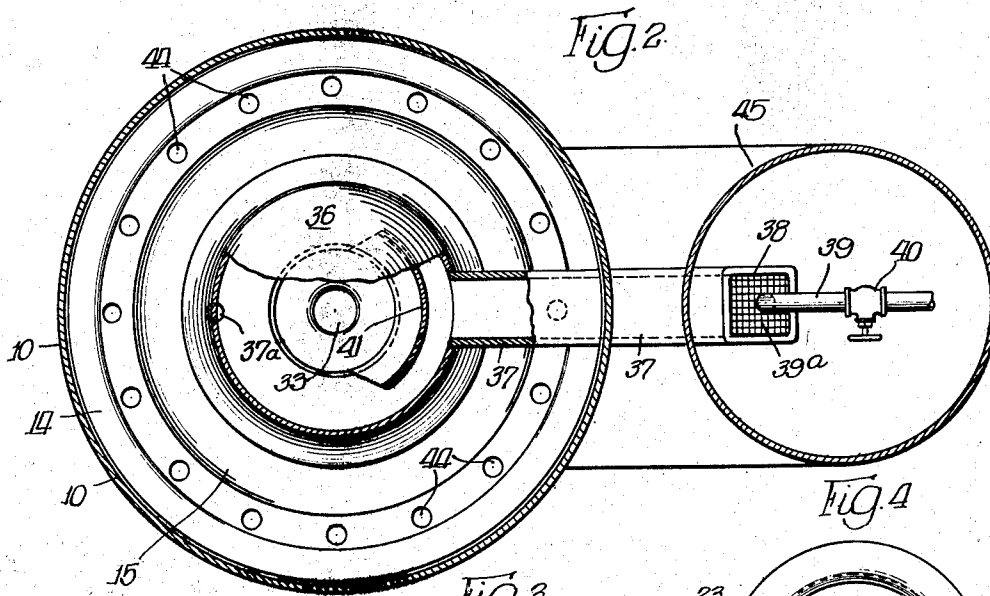
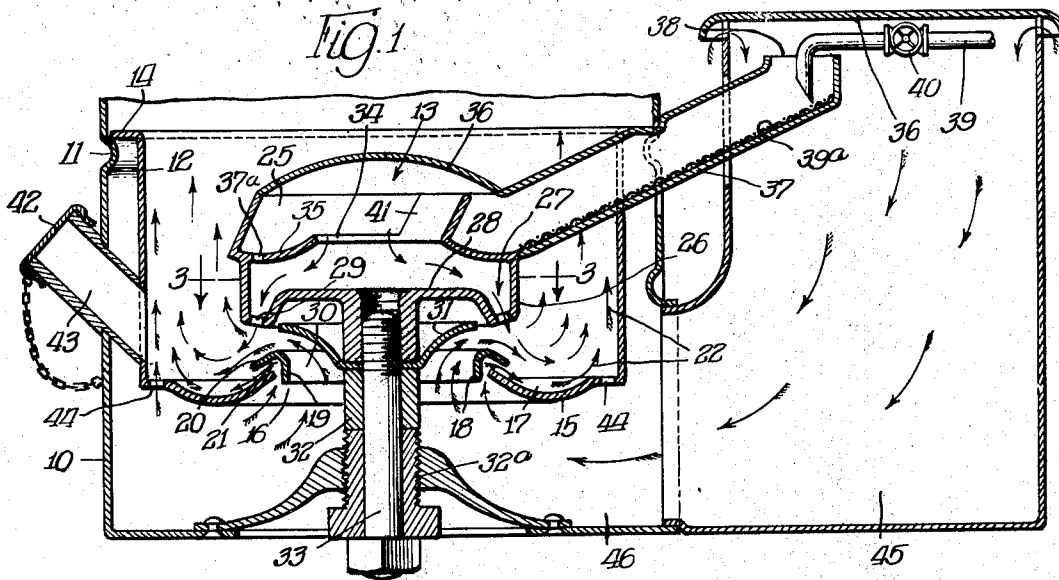


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A. CLARKSON
LIQUID FUEL BURNER
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INVENTOR.
Allick Clarkson,
BY
Barnett & Truman
attys.

UNITED STATES PATENT OFFICE

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LIQUID FUEL BURNER

Alick Clarkson, Bloomington Township, DuPage
County, Ill.

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9 Claims. (Cl. 158-65)

This invention relates to certain new and useful improvements in liquid fuel burners and particularly burners embodying the principles disclosed in my copending application, Serial No. 515,555, filed December 24, 1943.

In my said copending application a liquid fuel burner is illustrated in which a liquid fuel is vaporized at atmospheric pressure in a retort and simultaneously mixed with a quantity of air insufficient to support combustion. The rich gaseous mixture, thus produced, passes into the distributing chamber of a burner member from which it is discharged in upwardly directed jets into a combustion chamber. The combustion air is supplied to the jets of rich gaseous mixture through annular ports each of which provides a concentric envelope of air for a jet of gas.

The present invention includes the basic principles disclosed in the said copending application, but provides different arrangements and constructions whereby a blue quality flame and greater efficiency is obtained.

In the present apparatus the liquid fuel is vaporized in a retort in the presence of insufficient air to support combustion. The rich gaseous mixture is then passed into a distributing chamber of an inverted burner. The gaseous mixture is directed downwardly toward the bottom of a combustion chamber so as to cut through the path of travel of the combustion air being supplied to the combustion chamber. In this way the gaseous fuel and combustion air are thoroughly mixed so as to burn as a blue flame. The bottom of the combustion chamber serves as a baffle against which the ignited jets of gas impinge and are diverted upwardly. The flame from the burner heats the baffle so that the baffle, in addition to deflecting the flame upwardly, serves also as a hot plate to preheat the combustion air before the latter comes into contact with the vaporized fuel. It will be observed, by inspection of the drawing, that the said hot baffle is so arranged that the incoming combustion air makes direct contact with the lower surface thereof before entering the combustion chamber. This minimizes the possibility of the condensation of fuel in the zone where the rich gaseous mixture comes into contact with the combustion air. The movement of the flame and hot gases of combustion in a downward and then in an upward path causes a relatively thin blanket of combustion air to be drawn into the chamber and flow along the hot upper surface of the bottom wall of the chamber. This blanket of hot air serves to mix with and raise the temperature of the outer portion or strata of the

combustion mixture as it dips near or impinges against the said bottom of the chamber.

A principal object of the present invention is to provide a liquid fuel burner of improved construction which will operate to thoroughly vaporize the liquid fuel and to heat the combustion air both preliminary to and during the mixing operation so that the burner will function efficiently at all times.

Another object is to provide in a liquid fuel burner improved constructions whereby the liquid fuel, after vaporization, is directed against or caused to move in close relation to a hot baffle so as to effect efficient mixing thereof with the combustion air.

A further object is to provide in an apparatus of the above character improved arrangements and simplified constructions whereby the combustion air for the burner may be thoroughly heated and mixed with the gaseous mixture at locations which prevent the incoming air from cooling the burner member and the retort sufficiently to cause condensation of the vaporized fuel.

The invention is illustrated in the accompanying drawing wherein:

Fig. 1 is a vertical section through the lower portion of a heater casing showing the burner structure of this invention installed therein.

Fig. 2 is a plan view of the structure illustrated in Fig. 1.

Fig. 3 is a sectional view taken through the burner member on line 3-3 of Fig. 1 to illustrate the ring of fuel discharge openings.

Fig. 4 is a plan view of an air deflector embodied in the structure shown in Fig. 1, and

Fig. 5 is a fragmentary sectional view illustrating the manner in which the baffle of Fig. 4 is supported on the bottom of the combustion chamber of the burner.

The burner of the present invention is suitable for use in many situations. However, for the purpose of simplifying the present disclosure, the said burner is shown enclosed in the lower portion of an ordinary heater casing. The heater casing is designated by the reference numeral 10 and is formed at a suitable distance from the bottom thereof with a corrugation 11 or other form of inwardly extending projection which serves to support a fire pot 12. The fire pot 12 is preferably cylindrical in construction and constitutes the combustion chamber of the present embodiment. The burner structure is designated generally by the reference numeral 13 and is located within the combustion chamber so that it will be enveloped and heated by the flame and

the hot gases of combustion. Preferably the fire pot 12 is made of sheet metal and is formed at its upper end with an outturned flange 14 which seats on the corrugation 11 of the heater casing 10.

When the burner structure is employed in situations where it is subject to substantial vibrations, for example on an automotive truck or other vehicle, the flange 14 may be spot-welded or otherwise suitably secured to the heater casing 10 so that the bottom portion of the fire pot will be maintained in a fixed position relative to the burner member. The bottom 15 of the fire pot is formed with a large, central opening 16 for the admission of combustion air into the combustion chamber. The adjacent portion of the bottom is formed with a downwardly pressed annular groove 17 which is concentric with the central opening and with the vertical walls of the combustion chamber. An air baffle ring 18, having vertical and lateral flanges 19 and 20, is positioned in said central opening 16 with the latter lateral flanges of the ring overlying the top face of the bottom 15 of the combustion chamber. The vertical and lateral flanges of said ring, however, are spaced from the adjacent surfaces of the bottom wall 15 of the combustion chamber so as to provide a narrow circular passage 21 through which air is admitted into the combustion chamber and caused to flow radially outward in close relation to the top face of the bottom wall of the combustion chamber. This current of air is shown by the feathered arrows indicated by the reference numeral 22. The baffle ring 18 may be supported on the bottom wall 15 of the combustion chamber by any suitable means, for example, by annular lugs 23 fixed to the baffle ring and engaging the edge 24 of the central opening 16 together with the adjacent top surface of the bottom wall 15 of the combustion chamber. The annular lugs 23 may, if desired, be brazed to the bottom wall 15 of the combustion chamber so as to prevent the possibility of accidental displacement.

The burner member 13 and the retort are preferably, though not necessarily formed as an integral structure having upper and lower chambers. The upper chamber 25 constitutes the retort in which the fuel is vaporized. The lower chamber 26 constitutes the distributing chamber of the burner. This portion of the burner is circular in plan section, as indicated in Fig. 3, and is formed adjacent its outer wall with an annular channel 27 which extends a substantial distance below the bottom wall 28 of the distributing chamber. At the bottom of the channel 27 is formed a ring of discharge openings 29, through which the vaporized fuel is discharged in the form of downwardly extending jets into the combustion chamber. These jets of gaseous fuel, being directed downwardly toward the bottom wall 15 of the combustion chamber are caused to cut across the path of the main stream of combustion air admitted through the air supply passage 30. In order to direct this main supply of air outwardly and away from the burner so as to minimize its cooling effect on the lower wall of the burner member, an upwardly flared deflector disc 31 is interposed between the said air supply opening 16 and the bottom surface of the burner. The deflector 31 is clamped in position between the burner member and a spacing sleeve 32 by means of a bolt 33, forming part of the central supporting structure of the burner member. The bolt 33 extends through an ad-

justable sleeve 32^a which may be adjusted to raise and lower the burner so as to vary the size of the air supply passage 30 and thereby control the volume of combustion air. The distributing chamber of the burner member communicates through a central opening 34 with the retort 25. The bottom surface 35 of the retort is curved to provide an annular groove extending around the chamber and curves upwardly toward the center so that the central opening 34 therein is above the lower portion of the groove. The top of the retort is closed by means of a cap 36 which may be brazed or otherwise suitably fixed to the main portion of the burner casing. A fuel and air supply duct is designated by the reference numeral 37. This duct is open to the atmosphere at its upper end 38, and inclines downwardly and communicates with the retort chamber 25. A fuel supply conduit 39 delivers liquid fuel in controlled volume onto a retarding surface 39^a arranged in the supply duct 37 so as to prevent the drops or beads of liquid fuel from dancing about on the heated surface. While the invention preferably utilizes a screen for this purpose so as to form a series of pockets which tend to retain small pools of fuel, similar results may be obtained by providing absorbent surfaces, for example rock wool, cemented in position or by providing roughened surfaces made of granular material. The volume of fuel may be controlled by means of a hand valve 40 or by means of any of the various automatic controls now known. A baffle 41 is positioned opposite the lower end of the supply duct 37, so that the air entering the retort through the duct 37 will be deflected away from the opening 34 until it has traversed a portion of the retort and become thoroughly mixed with the vaporized fuel.

In operation the burner is preheated by permitting a quantity of liquid fuel to flow into the combustion chamber. This fuel, when the burner is cold, will drip from the small opening 37^a downwardly through the discharge openings 29 of the burner and into the channel portion 17 of the combustion chamber. When a suitable quantity of liquid fuel has collected in the said channel portion 17 a torch (not shown) may be inserted through the ignition duct 43. When the fuel is ignited, the removable cap 42 is again positioned on the ignition duct so as to prevent drafts of air from entering at this place. When the burner structure is sufficiently heated to vaporize the liquid fuel, the vaporized fuel mixes with the small quantity of air admitted into the retort through the supply duct 37. This air may be drawn into the retort by the stack or thermal drafts developed during the operation of the burner, or this air, together with the supply of combustion air, may be forced into the heater by a suitable blower (not shown). This rich gaseous mixture is passed from the retort 25 through the central opening 34 into the burner distributing chamber 26. From this chamber it is discharged into the combustion chamber through the ring of openings 29. The gas is directed downwardly in the form of separate streams or jets. These streams are deflected upwardly by the curved portion of the bottom wall of the combustion chamber and by the streams of combustion air drawn or forced into the combustion chamber through the passages 30 and 21. Additional combustion air is admitted into the combustion chamber through a ring of ports 44 positioned adjacent the vertical wall of the chamber. This air, while it func-

tions as auxiliary combustion air, also provides an air blanket along the inner face of the combustion chamber wall so as to hold the flame and combustible products out of actual contact with the wall.

The combustion air entering the combustion chamber is first caused to pass into the space 45 and thence into the space 46 beneath the burner. In traversing this space a large portion of the air is caused to flow along the hot lower face of the combustion chamber bottom 15. The said air is thereby preheated before it enters the combustion chamber. The upwardly moving flame and hot gases of combustion maintain the burner member and the retort associated therewith at a relatively high temperature so as to insure complete vaporization of the liquid fuel and prevent any likelihood of subsequent condensation thereof. By the arrangement herein shown a thorough mixture of hot gas and hot air is effected in the proper proportions to provide a blue flame.

While the invention is illustrated herein in connection with certain specific structures, it will be obvious to persons familiar with this art that these various structures may be altered in form and arrangement without departure from the purpose intended for the constructions shown. It is to be understood, therefore, that the invention contemplates all such changes in structure as come within the terms of the appended claims.

I claim:

1. A liquid fuel burner comprising, in combination, a combustion chamber having an opening for admitting a quantity of combustion air, a retort arranged in the combustion chamber to be heated during the operation of the burner, 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 a burner member including an air deflector arranged above said combustion air opening so as to deflect the said air laterally and the burner member having an open top communicating with said retort to receive said gaseous mixture and formed with parts positioned to discharge said mixture in a downward direction into said combustion chamber and across the flow path of said combustion air.

2. A liquid fuel burner comprising, in combination, a combustion chamber having an opening in a bottom wall thereof for admitting a quantity of combustion air, a retort arranged in the combustion chamber to be heated during the operation of the burner, 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, a burner member comprising a chamber having an open top communicating with said retort to receive said gaseous mixture and formed with spaced discharge openings positioned for discharging said gaseous mixture downwardly toward the bottom of the combustion chamber, and a deflector positioned above the said opening in said bottom wall of the combustion chamber for directing said combustion air laterally into the downward flow path of said gaseous mixture, whereby the flame and hot gases of combustion are turned upwardly by a blanket of air near the bottom of said combustion chamber.

3. A liquid fuel burner comprising, in combination, a combustion chamber having an opening

in a bottom wall thereof for admitting a quantity of combustion air, a retort arranged in the combustion chamber to be heated during the operation of the burner, 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, a burner member comprising a chamber having an open top communicating with said retort to receive said gaseous mixture and formed with spaced discharge openings positioned for discharging said gaseous mixture downwardly toward the bottom of the combustion chamber, whereby the said bottom is heated and a deflector having a lateral flange for directing said combustion air into the downward flow path of said gaseous mixture, the bottom wall of the combustion chamber being positioned in close relation to the said discharge openings and formed with a dished configuration which deflects the flame and hot gases of combustion upwardly in said chamber and the outer surface of said bottom wall being curved upwardly toward said combustion air opening so that air adjacent said outer surface is heated before it enters the combustion space.

4. A liquid fuel burner comprising, in combination, a combustion chamber having a bottom and side walls and having a central opening in its bottom wall for admitting combustion air, a retort arranged in the combustion chamber to be heated during the operation of the burner, means for delivering into the retort quantities of fuel and air to provide a rich gaseous mixture, a burner member positioned in said combustion chamber above said combustion air opening and formed to receive said rich gaseous mixture from said retort and deliver it downwardly into the combustion chamber, a deflector for directing the combustion air outwardly across the downward flow path of said gaseous mixture; the bottom of the combustion chamber being formed with a curved upper surface heated by the flame and adapted to deflect the flame upwardly and formed with a lower surface which curves upwardly toward the combustion air opening, whereby air adjacent said lower surface is heated and directed toward said combustion air opening.

5. A liquid fuel burner comprising, in combination, a combustion chamber having bottom and vertical walls and having a central opening in its bottom wall for admitting the main supply of combustion air and having a ring of openings for supplying a blanket of air adjacent the vertical walls of the chamber, a retort and a burner member positioned in said combustion chamber above said central opening and adapted to vaporize the liquid fuel and deliver the vapor downwardly into said combustion chamber, the said burner member being formed with a ring of discharge openings from which said vaporized fuel is discharged, and a deflector positioned above said central opening to prevent the incoming combustion air from cooling the major portion of the burner member and to direct said air outwardly across the flow path of said vaporized fuel.

6. A liquid fuel burner comprising, in combination, a combustion chamber, a retort in said chamber having an inclined entrance passage, means for delivering into the entrance passage of the retort a controlled quantity of fuel to be vaporized and a quantity of air insufficient to support combustion, a burner member positioned underneath the retort and below the inclined entrance passage so as to heat said passage, means

comprising a reticular surface in said entrance passage for providing a plurality of pockets for retarding the movement of the liquid fuel and for retaining small quantities of said liquid fuel.

7. A liquid fuel burner comprising, in combination, a combustion chamber having a bottom wall, a retort in said chamber, means for delivering into the retort a controlled quantity of fuel to be vaporized and a quantity of air insufficient to support combustion so that the vaporized fuel and air form a rich gaseous mixture, a burner member positioned below the retort adapted to receive vaporized fuel from said retort and deliver it downwardly into the combustion chamber in close relation with said bottom wall, the bottom wall being formed with an opening for admitting combustion air into the combustion chamber, and a deflector ring positioned in said opening and having a lateral flange overlying but spaced from the said bottom wall for directing a portion of said air along the top surface thereof.

8. In a heater of the character described, a casing provided on its inner surface with means for supporting a fire pot in spaced relation to the bottom of the casing, a cylindrical fire pot formed at its upper edge with an outturned flange engaging said supporting means and formed with a bottom wall provided with a central opening therein

for admitting combustion air into the fire pot and a burner member positioned in the fire pot and provided with supporting means extending through the said central opening in said bottom wall of the fire pot to the bottom of the casing.

9. A liquid fuel burner comprising, in combination, a combustion chamber having a bottom wall, a retort in said chamber, means for delivering into the retort a controlled quantity of fuel to be vaporized and a quantity of air insufficient to support combustion so that the vaporized fuel and air form a rich gaseous mixture, a burner member positioned below the retort adapted to receive said gaseous mixture from said retort and deliver it downwardly into the combustion chamber in close relation with said bottom wall, and means for admitting a stream of combustion air into the combustion chamber at a location beneath the burner adjacent the upper surface of said bottom wall and for directing a portion of said air stream into the flow path of said rich gaseous mixture and another portion of said air stream along said upper surface of the said bottom wall to form a moving air blanket for preventing the flame from impinging against the said bottom wall.

ALICK CLARKSON.