

March 28, 1950

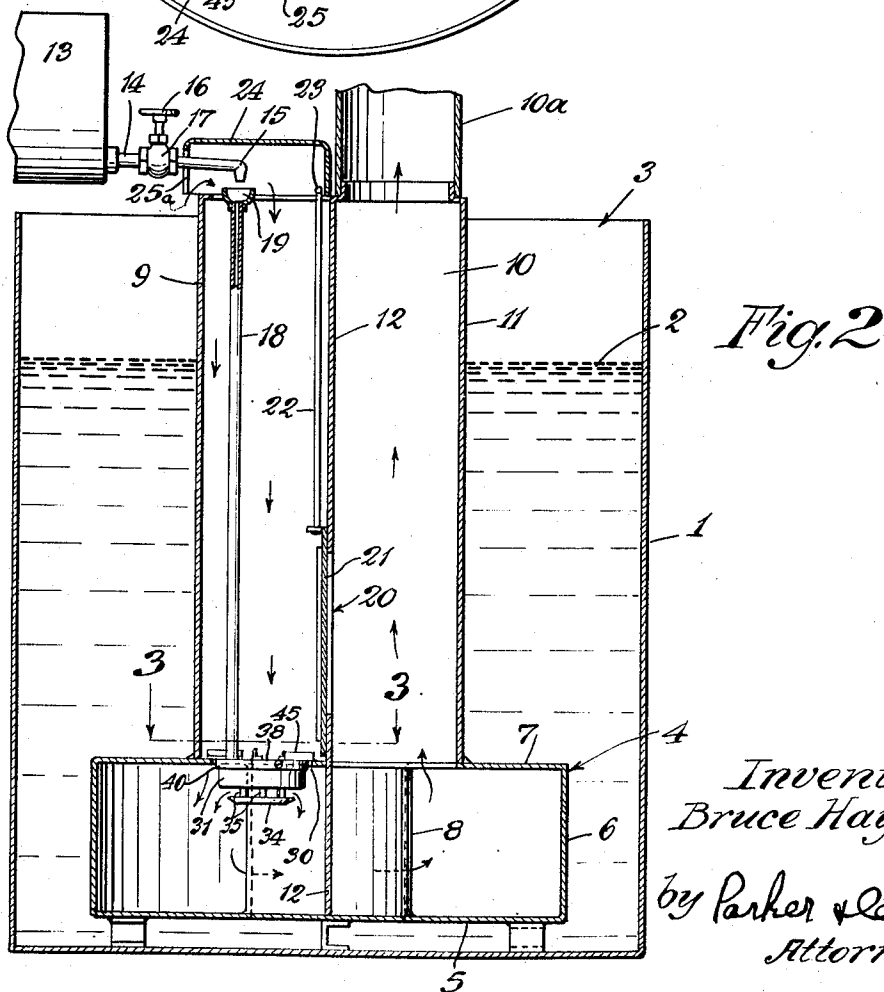
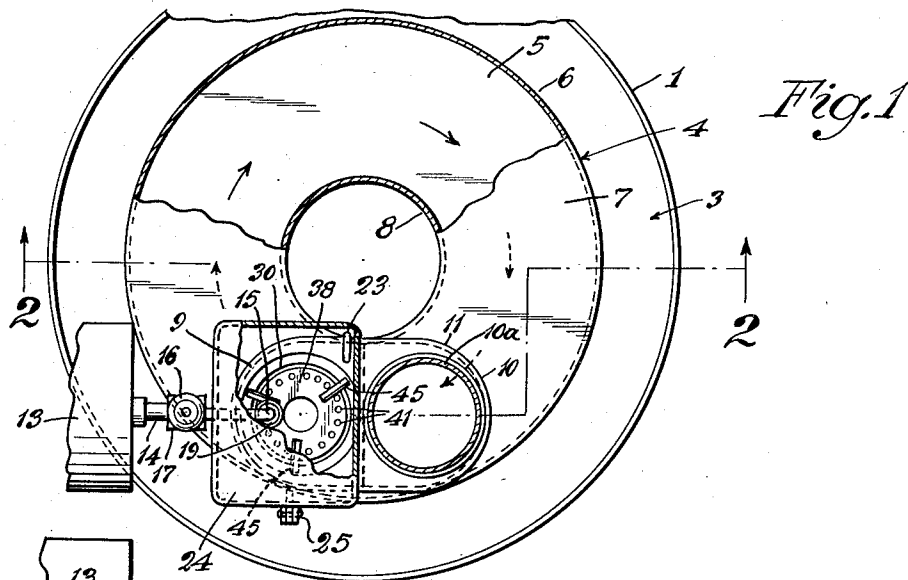
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2,501,847

LIQUID FUEL VAPORIZING BURNER

Filed Dec. 9, 1946

3 Sheets-Sheet 1



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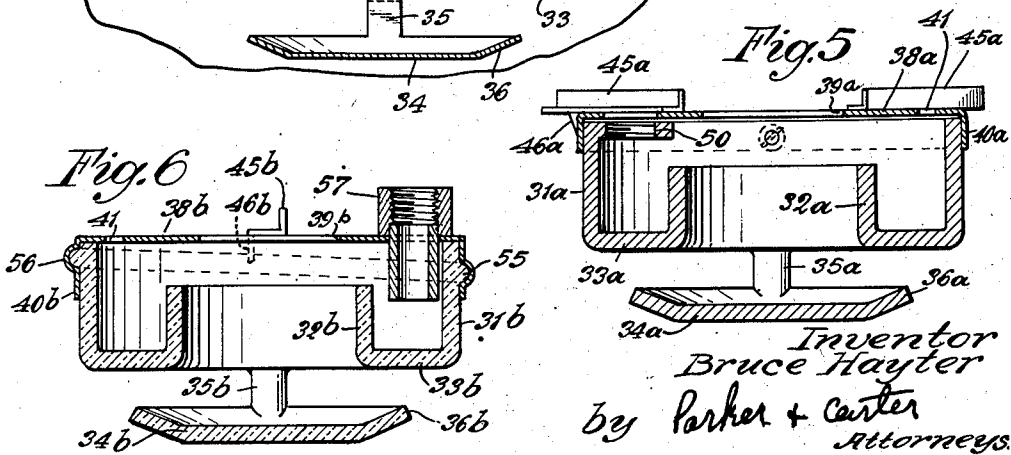
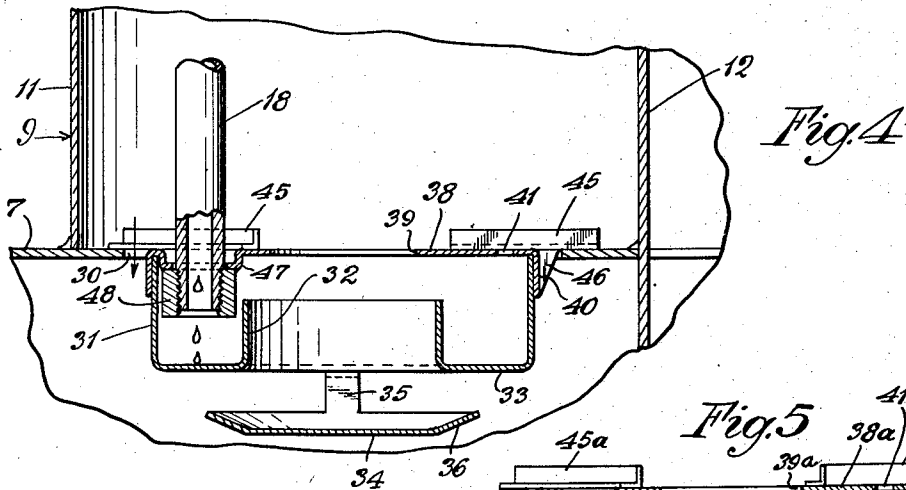
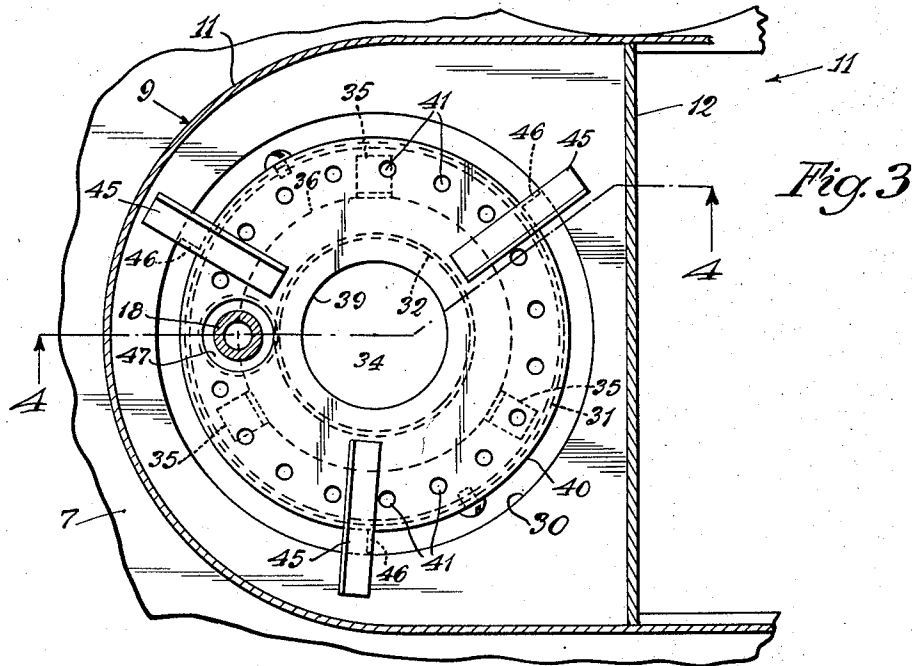
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3 Sheets-Sheet 2



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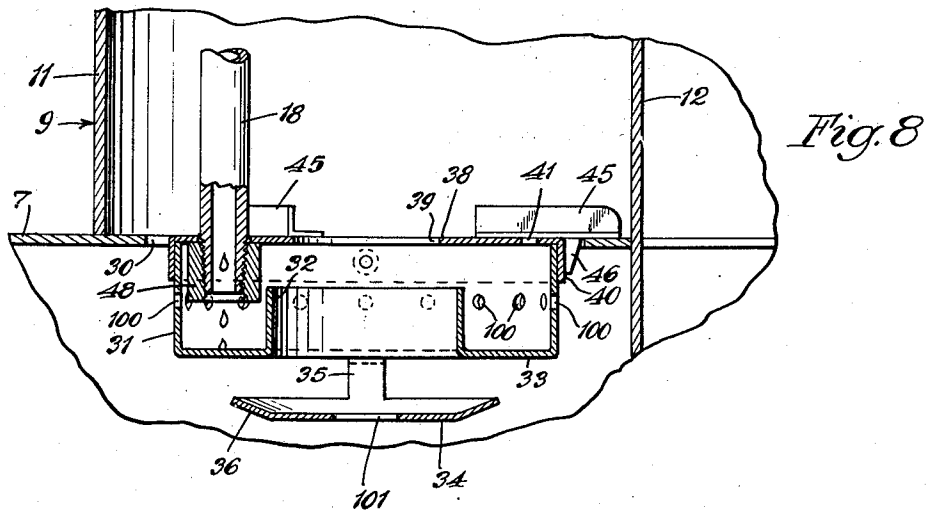
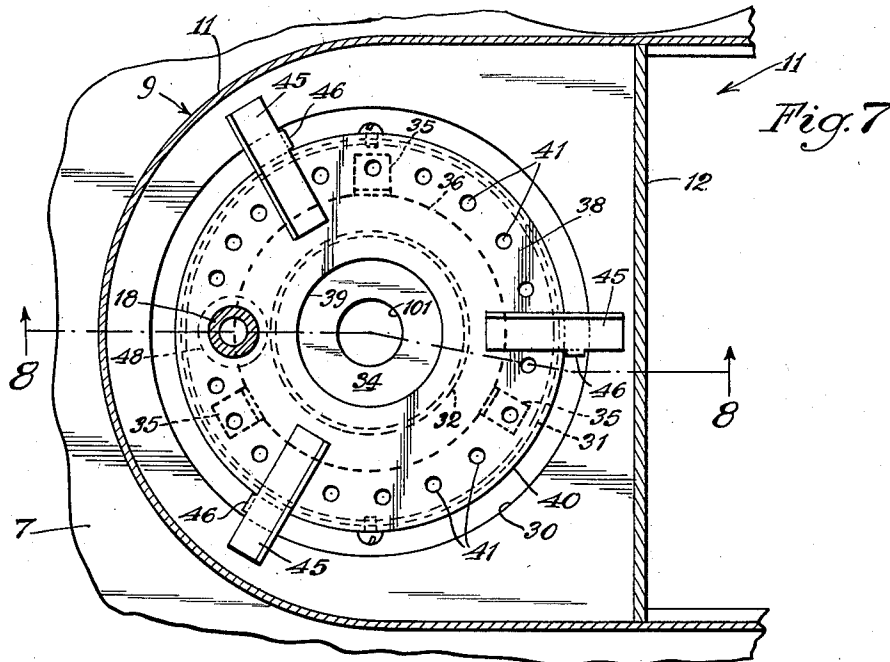
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UNITED STATES PATENT OFFICE

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LIQUID FUEL VAPORIZING BURNER

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mesne assignments, to Breese Burners, Inc.,
Santa Fe, N. Mex., a corporation of Delaware

Application December 9, 1946, Serial No. 715,008

7 Claims. (Cl. 158—91)

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My invention relates to an improvement in liquid fuel vaporizing burners.

One purpose is to provide an improved burner in which a liquid fuel is vaporized and burned.

Another purpose is to provide a liquid fuel burner of the hydroxylating type.

Another purpose is to provide a liquid fuel burner adapted for use in an immersion heater.

Another purpose is to provide an improved means for vaporizing and burning a liquid fuel.

Another purpose is to provide a burner having a minimum liquid fuel consumption.

Another purpose is to provide an improved burner adapted to maintain a primary flame effective to heat the burner in readiness for high stage combustion.

Another purpose is to provide a liquid fuel burner in which there is a minimum of tarring or coking or deposit or gathering of solids.

Other purposes will appear from time to time in the course of the specification.

The present application is a continuation in part of my application Serial No. 606,096 filed in the United States Patent Office on July 20, 1945, now abandoned, for Burner for immersion heaters.

I illustrate the invention more or less diagrammatically in the accompanying drawings wherein:

Figure 1 is a plan view with parts broken away;
Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a section on an enlarged scale on the line 3—3 of Figure 2;

Figure 4 is a section on the line 4—4 of Figure 3;

Figure 5 is a vertical section through a variant form of the device;

Figure 6 is a vertical section through a variant form of the device;

Figure 7 is a view similar to Figure 3 of a variant form of the device; and

Figure 8 is a section on the line 8—8 of Figure 7.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring to the drawings, I illustrate my invention as used with an immersion heater. It will be understood that the immersion heater per se does not form the subject matter of the present invention. The burner shown herein may be employed with other heaters and for other purposes. Referring specifically to the drawings, I generally indicates a tank adapted to receive a liquid 2 and having an open top 3.

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Positioned within the tank is the immersion heater assembly shown as including a generally cylindrical housing 4 having a bottom wall 5, a circumferential generally cylindrical side wall 6, a top wall 7, and an inner wall 8. 9 generally indicates a tubular air inlet extending downwardly to the top wall 7. 10 generally indicates a tubular outlet. The inlet and the outlet may be formed by a circumferential wall 11 with a central partition 12. I thus provide an air inlet passage through which air may flow downwardly, and an outlet passage through which the by-products of combustion may flow upwardly to any suitable flue or chimney 10a. 13 is any suitable source of liquid fuel, herein shown as a storage tank. Liquid fuel may flow therefrom along a passage 14 to the discharge nozzle 15. The rate of flow may be controlled in any suitable manner but I illustrate any suitable valve controlling handle 16 for controlling a valve within the valve housing 17. 18 is a liquid fuel delivery pipe vertically aligned with the nozzle 15 and provided with a top funnel or cup 19. It will be understood that the pipe or duct 18 extends downwardly to the below described burner structure. 20 is an aperture between the passages 9 and 10, which may be closed by the movable gate 21 controlled by the actuating rod 22 with its exterior handle portion 23. 24 is any suitable cover having a hinge 25, and adapted to overlie the upper end of the inlet passage 9, while leaving an air entry 25a, through which air may flow in the direction of the arrows indicated in Fig. 2.

The burner proper is centered within an aperture 30 in the top wall 7. It includes the circumferentially extending trough having an outside wall 31 and a shorter inside wall 32, connected by a bottom wall 33. The wall 32 defines an open space which may have aligned with it any suitable baffle 34 having supporting portions 35 and, in the form herein shown, an upwardly inclined peripheral portion 36, the upper outer edge of which underlies the bottom wall 33 and defines, with it, a passage for air and vaporized liquid fuel. 38 is a top cover herein shown as having a central aperture 39. It may have an outer flange 40 secured to the upper portion of the outer wall 31. It is shown as having a plurality of air inlet apertures 41 spaced circumferentially thereabout, as shown in Fig. 3. The burner structure may be conveniently spaced or centered within the aperture 30 by the supporting arms 45 with their downwardly extending centering cams 46. Thus the burner, when dropped into the aperture 30, centers itself by the action of the cams 46, and is sup-

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ported by the arms 45, with an air space surrounding the exterior of the burner, through which air may downwardly flow about the closed outer wall 31. The lower end of the tube 18 is positioned to deliver liquid fuel to the interior of the trough formed by the walls 31, 32 and 33. It may for example extend through a seating depression 47 in the top wall 38 and be secured by an internal nut 48. However, any other suitable means for delivering liquid fuel to the interior of the trough may be provided.

Referring to the form of Fig. 5, I illustrate substantially the same burner structure, formed of cast metal, for example iron, the structure of Fig. 4 being indicated as of sheet metal. The same numbers are applied to the parts, with the addition of the letter *a*.

Figure 6 illustrates substantially the same structure in ceramic material or glass or other suitable material. So far as the same elements appear they are indicated by the same numbers as in Fig. 4, with the addition of the letter *b*.

In the form of Fig. 5 the trough 31*a*, 32*a* and 33*a* is formed of one piece or casting, with the integral nut or inwardly screw threaded lug 50 adapted to receive the lower end of any suitable fuel delivering tube. The cover 38*a* is advantageously formed of sheet metal and has secured to it the supporting arms 45*a* with the centering cams 46*a*. The baffle 34*a* is supported by the integral connections 35*a*, it being practical to cast the trough and baffle as a single part.

In the structure of Fig. 6, since the cover 38*b* cannot be welded to the outer wall 31*b*, I provide an exterior projection 55 over which the flange 40*b* of the cover 38*b* may be snapped, the side flange being channeled as at 56 to accommodate the projection 55. In this form I illustrate an inwardly screw threaded nut 57 as welded or otherwise secured to the top of the plate 38*b*.

Referring to Figures 7 and 8, the structure is identical with that of Figures 3 and 4, except for the addition of a circumferential row of apertures 100 in the cylindrical side wall 31 of the burner, and the employment of an axial aperture 101 in the member 34. Since all of the parts are otherwise identical, the same reference numerals are employed in Figures 7 and 8 as in Figures 3 and 4.

With respect to all forms of the burner herein shown it is seen that I provide a circumferential trough which surrounds a central air passage. Air may flow downwardly through the central aperture 39, 39*a* or 39*b* of the cover plate 38, 38*a* or 38*b* and downwardly through the space surrounded by the inner wall 32, 32*a* or 32*b*. Air also flows downwardly about the exterior of the preferably closed outside wall 31, 31*a* or 31*b*. The liquid fuel which is delivered to the interior of the trough and is vaporized therein by the heat of previously initiated combustion can escape over the upper edge of the inner wall 32, 32*a* or 32*b*. A primary air supply to provide an initial and only partly combustible mixture is provided by the primary air inlets 41. The mixture of vaporized liquid fuel and primary air, as it flows inwardly over the upper edge of the inside trough wall, meets the downdraft of air which flows downwardly through the space surrounded by the inner wall. The vaporized liquid fuel, with this additional air mixture, thereafter receives the additional or final secondary air supply which flows downwardly about the burner through the outside gap between the burner and the top wall 7. In the forms of the device herein shown the baffles

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34, 34*a* or 34*b* direct the mixture of vaporized fuel and primary air outwardly into the path of down-flowing outside air. Combustion takes place generally in the space between the outer edge of the baffle and the bottom of the trough, when liquid fuel is being supplied at the normal rate, beginning in the space surrounded by the inner wall of the trough.

It will be observed that the combustible gas is in effect sandwiched in between two layers of air, one flowing downwardly through the aperture 39 and the space surrounded by the wall 32 and the other flowing downwardly through the circular opening 30. Whereas the combined air supply admitted through the apertures 41 and the central aperture 39 may be sufficient to support substantially complete combustion in the space between the outer edge of the baffle 34 and the bottom 33 of the trough, the additional outside supply, flowing downwardly about the burner, assures complete combustion.

The baffle 34 is shown with an upturned edge 36. It is desirable to maintain the opening between the baffle and the trough within certain limits, in order to maintain the desired velocity of movement of the mixed air and vaporized fuel. This can be accomplished by establishing a proper clearance between the outer edge of the baffle 36 and the bottom 33 of the trough.

A certain amount of combustion has to be maintained within the tubular inner wall 32, and between the baffle 34 and the bottom 33 of the evaporator trough. In practice, and at a normal rate of fuel flow, some combustion takes place and the flame flows downwardly and outwardly, the outer edge of the baffle 34 serving as a spreader, the flame so spread being positioned to receive additional air from the flow through the aperture 30, for complete combustion of the vaporized fuel.

It will be realized that, whereas, I have described and illustrated a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of my invention. I therefore wish my description and drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting me to my precise showing.

For example whereas I have illustrated my burner as employed in a natural draft heater, it will be understood that it may be employed with forced draft. Whereas I illustrate it as employed in connection with a vertically axised heater structure, it will be further understood that it may be employed in connection with horizontally extending heater structures. Whereas I show a circumferentially extending trough surrounding a central aperture, it will be understood that the trough need not be circular and may, if desired, be rectilinear or shaped otherwise than as herein shown.

The use and operation of my invention are as follows:

In the particular heater shown I illustrate an immersion heater adapted to be removably positioned below the surface of a liquid to be heated. Such a receptacle may be a stock watering tank or a large cooking vessel. Air under natural draft flows down the passage 9 and supplies the above described burner structure. As a matter of convenience the fuel supply may be delivered through the same passage 9, as by the tube 18. The flame and products of combustion flow downwardly from the burner and pass in the direction of the arrows in Figs. 1 and 2 until they escape

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upwardly through the passage 10. It will be noted that the partition 12 extends downwardly to the bottom wall 5 and therefore the flame and heated gases of combustion must travel circumferentially about the inner wall 8 before they can escape upwardly through the passage 10 to the flue 10a. The flue or chimney 10a may be of any suitable height in order to maintain the desired natural draft.

The liquid fuel in the trough formed by the inner, outer and bottom walls is vaporized by the heat of combustion already under way. When starting the burner, a supply of liquid fuel is delivered to the trough bottom 33 and may be started by any suitable means such as a blow torch, a bundle of burning waste or paper. Once combustion has been established, the later supplied liquid fuel is vaporized by the heat of such combustion. The apertures 41 are so proportioned and spaced as to supply an adequate initial or primary air supply. The mixture of vaporized fuel and air then flows upwardly and inwardly over the upper edge of the inner walls 32, 32a or 32b, and receives and is mixed with the supply of air flowing downwardly through the center of the burner trough. The tendency of the vaporized fuel is to hug the inner face of the walls 32, 32a or 32b in a relatively thin layer surrounding the downflowing central stream of air. Some combustion will take place within the space surrounded by the inner trough wall. Full combustion begins generally in the area between the outer edge of the baffle 34, 34a or 34b on the bottom wall of the trough. The baffle is effective to direct the mixture outwardly. The burning mixture is thus surrounded by and spaced between an inner flowing layer of air and an outer sheath of downflowing air. Thus an ample supply of air is provided for complete combustion, and there is a minimum of carbon deposit.

I find the form of Figures 7 and 8 preferable and the employment of the apertures 100 and 101 advantageous. The apertures 100 admit jets of air which are directed radially inwardly toward the center of the burner. The axial aperture 101 converts the deflector 34 into an annular member. The baffle is effective to direct the mixture outwardly, but also admits of axial flow.

I claim:

1. In a liquid fuel burner, a circumferentially extending vaporizing trough including an outer wall, an inner wall and a connecting bottom, the outer wall being of greater height than the inner wall, a cover for the trough, overlying the trough and extending inwardly from said outer wall, said cover having a generally central aperture in line with the central space surrounded by the inner wall of said trough and being provided with additional air inlet apertures overlying the space within the trough and arranged circumferentially about said cover, the upper edge of the inner wall of the trough being spaced from said cover, means for delivering liquid fuel, for vaporization, to the interior of said trough, means for directing air downwardly about the exterior of the trough, for mixture with air and vaporized fuel flowing downwardly through the space surrounded by the inner trough wall, and a guiding baffle positioned below and aligned with said central space, and adapted to deflect outwardly the mixture flowing downwardly through said space.

2. In a liquid fuel burner, a vaporizing trough having an outer wall, an inner wall and a connecting bottom, the inner wall surrounding and defining a passage, a cover for said trough, aper-

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tured to admit a supply of air to the space within the trough, means for delivering liquid fuel, for vaporization, to the trough, the cover and inner wall being formed and arranged to permit mixed air and vaporized fuel to flow from the interior of the trough to the passage surrounded by the inner wall of the trough, and a baffle aligned with said passage and adapted to direct the mixed air and vaporized fuel outwardly beneath the bottom of the trough.

3. In a liquid fuel burner, a vaporizing trough having an outer wall, an inner wall and a connecting bottom, the inner wall surrounding and defining a passage, a cover for said trough, apertured to admit a supply of air to the space within the trough, means for delivering liquid fuel, for vaporization, to the trough, the cover and inner wall being formed and arranged to permit mixed air and vaporized fuel to flow from the interior of the trough to the passage surrounded by the inner wall of the trough, means for directing air downwardly about the exterior of the outer wall and a baffle aligned with said passage and adapted to direct the mixed air and vaporized fuel outwardly beneath the bottom of the trough.

4. In a liquid fuel burner, an annular trough having an outer wall, a bottom and an inner wall the upper edge of which is substantially below the upper edge of the outer wall, a cover for said trough, extending inwardly from said outer wall and having a central aperture aligned with the space surrounded by said inner wall, said cover being spaced from the upper edge of the inner wall, and having a plurality of air inlet apertures adapted to direct air into the space between said inner and outer walls, means for delivering liquid fuel to the space within said walls, a housing, means for supporting said trough within said housing, and providing an air gap about the exterior of said trough, whereby air may flow downwardly about the outer face of said outer wall, and means for directing outwardly beneath said trough air and vaporized fuel flowing downwardly through the space defined by the inner wall of the trough.

5. In a liquid fuel burner, an annular trough having an outer wall, a bottom and an inner wall the upper edge of which is substantially below the upper edge of the outer wall, a cover for said trough, extending inwardly from said outer wall and having a central aperture aligned with the space surrounded by said inner wall, said cover being spaced from the upper edge of the inner wall, and having a plurality of air inlet apertures adapted to direct air into the space between said inner and outer walls, means for delivering liquid fuel to the space within said walls, a housing, means for supporting said trough within said housing, and providing an air gap about the exterior of said trough, whereby air may flow downwardly about the face of said outer wall, and means for directing outwardly beneath said trough air and vaporized fuel flowing downwardly through the space defined by the inner wall of the trough, including a plate having a circumferential edge underlying and spaced downwardly from the bottom wall of the trough.

6. In a liquid fuel burner, an annular trough having an outer wall, a bottom and an inner wall, a cover extending inwardly from the upper edge of the outer wall and having a generally central aperture aligned with the space surrounded by the inner wall, said cover and the upper edge of said inner wall being spaced apart, said cover having an aperture adjacent said outer wall to

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admit air into the space within said trough, means for delivering a liquid fuel, for vaporization, to the interior of said trough, a housing surrounding said burner, means for supporting said trough in said housing, with a circumferential air gap about said trough, and a deflector, located below the trough and defining, with the trough, a gap through which air and vaporized liquid fuel may flow outwardly beneath the bottom of the trough.

7. In a liquid fuel burner, a vaporizing trough having an outer wall, an inner wall and a connecting bottom, the inner wall surrounding and defining a passage, a cover for said trough, apertured to admit a supply of air to the space within the trough, means for delivering liquid fuel, for vaporization, to the trough, the cover and inner wall being separated by a gap adapted to permit mixed air and vaporized fuel to flow from the interior of the trough to the passage surrounded by the inner wall of the trough, means for direct-

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ing air downwardly about the exterior of the outer wall and a baffle located below the trough, aligned with said passage and adapted to direct the mixed air and vaporized fuel outwardly beneath the bottom of the trough, said baffle having a central aperture generally aligned with the space surrounded by said trough.

BRUCE HAYTER.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
536,779	Cornell	Apr. 2, 1895

FOREIGN PATENTS

Number	Country	Date
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