June 16, 1953 J. L. BREESE 2,642,129

BURNER FOR IMMERSION HEATERS

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Fig. 1

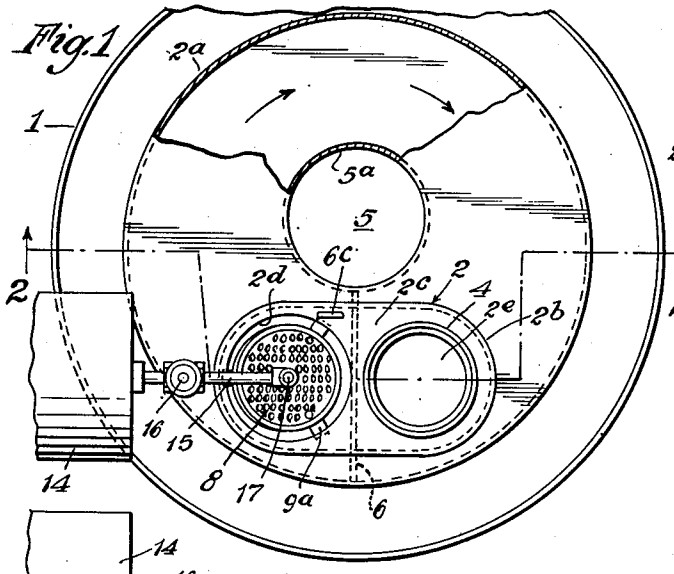


Fig. 5

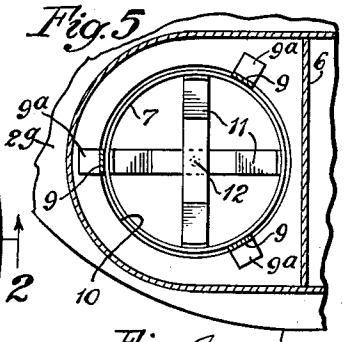


Fig. 4

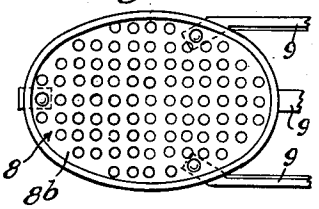


Fig. 2

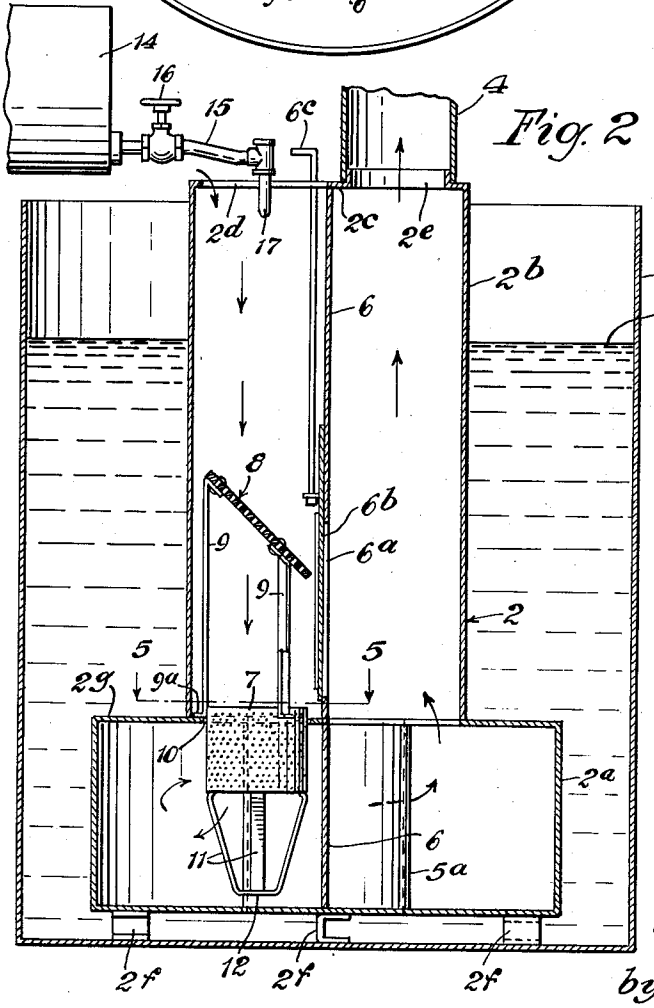
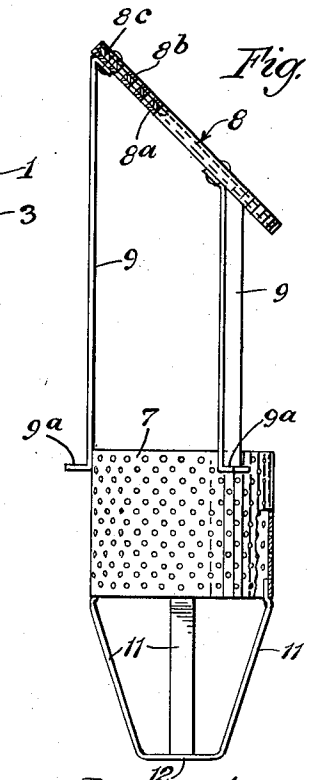


Fig. 3



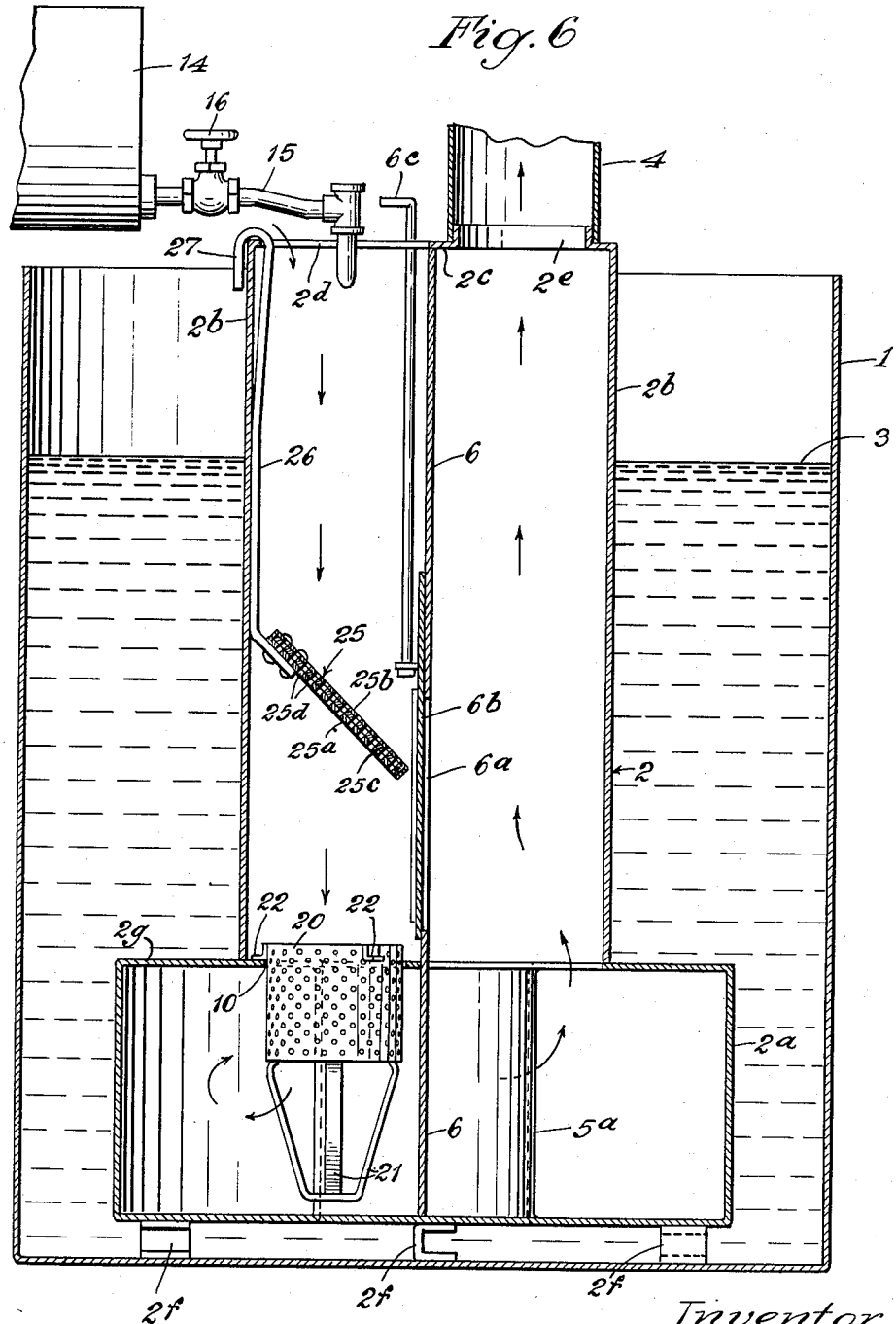
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Fig. 6



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BURNER FOR IMMERSION HEATERS

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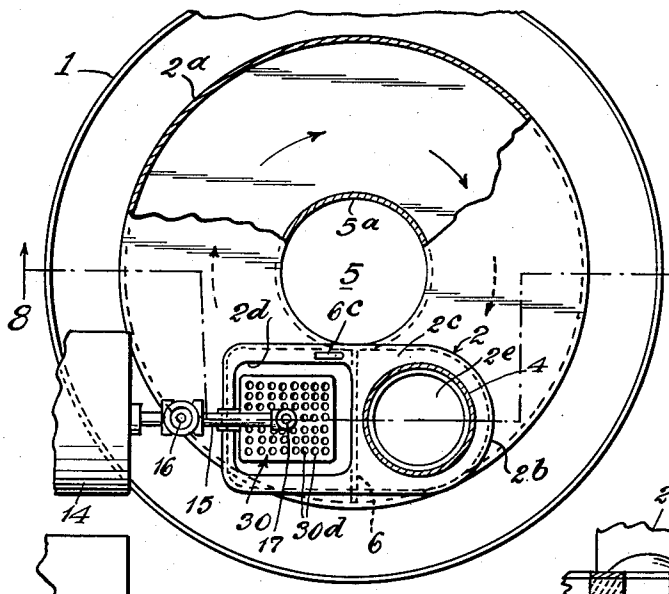


Fig. 7

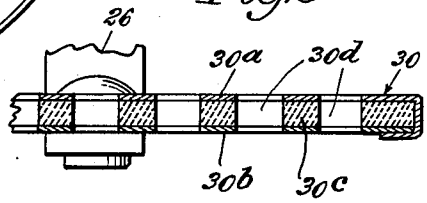


Fig. 9

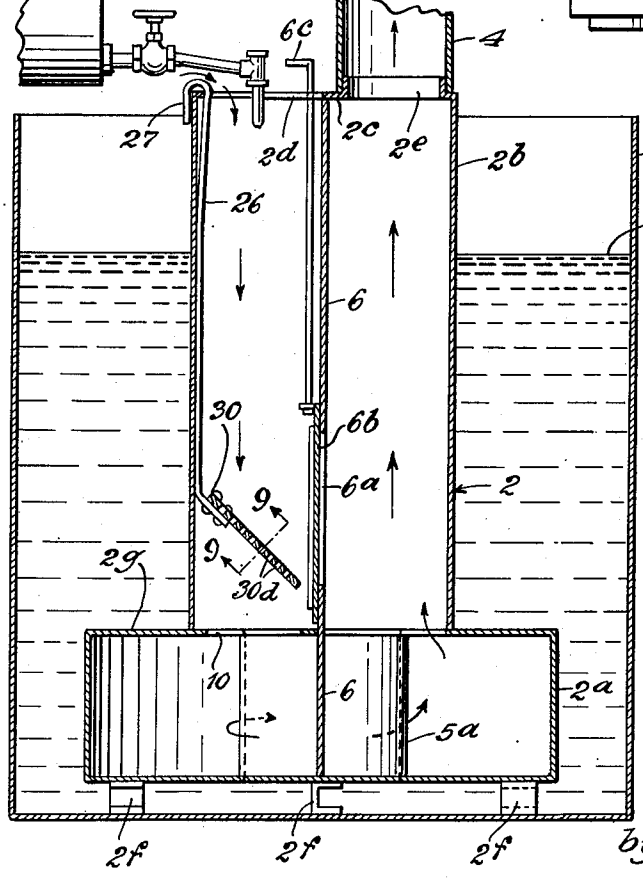


Fig. 8

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BURNER FOR IMMERSION HEATERS

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Application February 16, 1951, Serial No. 211,371

13 Claims. (Cl. 158—91)

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My invention relates to an improvement in burners, and has for one purpose to provide an improved immersion burner.

Another purpose is to provide an immersion burner including an improved baffle means.

Another purpose is to provide an immersion burner of simple, compact design, which permits a minimum of interference with the burner from outside.

Another purpose is to provide a burner which, when initially adjusted, remains in proper adjustment.

Another purpose is to provide a burner which may be used for immersion heaters, wherein fuel and air may be supplied from above, with the liquid fuel vaporized for use in a hydroxylating type of burner by a vaporizing arrangement which distributes the fuel and insures proper vaporization.

Another purpose is to provide an improved type of a hydroxylating burner.

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

The present application is a continuation in part of my application Serial No. 133,420, entitled "Burner For Immersion Heaters," and filed in the United States Patent Office on December 16, 1949.

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

Figure 1 is a plan view with parts broken away and parts in horizontal position;

Figure 2 is a vertical section on the line 2—2 of Figure 1;

Figure 3 is a side elevation, on an enlarged scale, of part of the burner structure;

Figure 4 is a plan view of the structure shown in Figure 3;

Figure 5 is a section, on an enlarged scale, on the line 5—5 of Figure 2;

Figure 6 is a vertical section through a variant form of burner;

Figure 7 is a plan view with parts broken away and parts in section of another embodiment of my invention;

Figure 8 is a section on the line 8—8 of Figure 7; and

Figure 9 is a section on an enlarged scale on the line 9—9 of Figure 8.

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

Referring to the drawings, and with particular reference to the form of Figures 1 to 5, 1 generally indicates a vat or container for a liquid

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in which the below-described burner is immersed. 2 generally indicates the burner structure or housing which has a lower, generally cylindrical portion 2*a* and an upwardly extending portion 2*b*. It will be noted that the portion 2*a* is completely submerged, and is located adjacent the bottom of the body of liquid 3 in the container 1. The upward extension 2*b* extends upwardly to and above the top level of the liquid. It is shown as generally oval in cross-section, although its cross-section may be widely varied. Its top 2*c* has at one side an air inlet opening 2*d* and at the other side a flue opening 2*e*, to which any suitable flue or chimney 4 may be secured. The lower portion 2*a* is shown as having a central aperture 5 surrounded by an inner wall 5*a*. Thus the liquid 3 in the container 1 may contact a maximum surface of the heater housing. The housing, as a whole, is preferably upwardly spaced from the bottom of the tank 1, for example, by any suitable spacers or supports 2*f*.

The interior of the burner portions 2*a* and 2*b* are shown as having or including a generally radial partition 6 which constrains the air, flame and gases of combustion to move in the direction of the arrows of Figures 1 and 2 from the intake aperture 2*d* downwardly to the portion 2*a*, around the portion 2*a* from the left side to the right side of the lower portion of the partition 6, and finally up through the right side of the portion 2*b* to the flue outlet 2*e*. The directions relate to the position of the parts as shown in Figures 1 and 2.

The partition 6 is shown as having an intermediate opening or vent 6*a* controlled by a valve or shutter 6*b* to which the manually accessible handle 6*c* is secured. When the handle 6*c* is raised the air which flows downwardly through the aperture 2*d*, or a substantial proportion of it, may be bypassed above the heater portion 2*a*.

The burner proper includes a foraminous, open-ended cylinder 7. Spaced above it is the inclined foraminous baffle 8. The cylinder and the baffle are shown as connected together by supporting arms 9, each of which is shown as having an outwardly extending flange 9*a* located adjacent the top of the cylinder 7. The cylinder freely fits an aperture 10 in the upper wall 2*g* of the lower burner portion 2*a*. The parts are so proportioned that the outwardly extending lugs 9*a* support and position the foraminous cylinder 7, as shown in Fig. 2, with the upper edge of the cylinder at or slightly above the top wall 2*g* of the burner portion 2*a*. The lower end of the cylinder may be reinforced by any suitable connecting legs or strips 11 in the form of cross-loops engaging at 12.

Fuel is supplied from any suitable tank or supply 14 through a supply duct or pipe 15 controlled by any suitable valve 16. Whereas I have illustrated a manually controlled valve, it is understood that any other suitable valve means or valve control may be employed. 17 is any suitable discharge nozzle or pipe end which is vertically aligned with the foraminous baffle 8, and which is generally centrally located in relation to the air inlet opening 2d. Thus liquid fuel, such as a suitable hydrocarbon, is dropped or fed downwardly upon the foraminous baffle 8 for combustion in or about the foraminous sleeve 7.

With reference to the form of Figure 6, I illustrate an immersion burner which is basically identical with that shown in Figure 2, the same indicating numbers being employed, except for parts as to which there is a difference. It will be noted, however, that I employ therein an open-ended cylinder 20 having a bottom guide structure 21. The cylinder in the bottom guide structure is shown as identical with the cylinder 7 and the guide structure or connecting elements 11 of Figure 2. It will be understood that the structure or legs 21 in both forms prevent deformation of the cylinder and also facilitate its insertion from above through the aperture 10. In Figure 6, however, the cylinder 20 is provided with any suitable abutment or abutments 22, whereby it is supported independently of the foraminous baffle located above it.

The baffle 25 is supported upon an upwardly extending support or handle 26 which is shown as having an upper crook or part 27 adapted to extend outwardly over the upper lip of the portion 2b. The member 25 may include upper and lower portions 25a and 25b between which is the wick or fibrous layer 25c. The parts may be riveted or otherwise secured together and preferably registering apertures 25d pass though the entire structure. It will be observed that the relation of the baffle 25 to the partition 6, the aperture 6a and the shutter 6b is the same in Figures 2 and 6.

Referring to the form of Figures 7 to 9, I omit the cylinder 7 or 20 and employ simply the baffle 30 shown in detail in Figure 9. It may be advantageous to employ a more or less rectangular rather than a cylindrical down-duct, and I therefore illustrate in the forms of Figures 7 and 9 a rectangular baffle positioned within a generally rectangular down-passage. The relation of the baffle, however, to the partition 6 and the closure 6b is identical with that of the other forms. Whereas I may vary the baffle structure, I illustrate in Figure 9, as in Figure 6, a compound baffle with upper and lower metal sheets 30a and 30b, an intermediate fibrous layer 30c, and apertures 30d which render the entire structure foraminous.

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. It will be realized in particular that I may vary the shape, cross-section and proportions of the various parts of the burner and of the down-draft flue and the up-draft flue. As will be seen from the various figures herein shown, the cylinder 7 or its equivalent may be employed or dispensed with, and it may be unitarily supported with the baffle or it may be supported separately therefrom.

The use and operation of the invention are as follows:

Referring first to the form of Figures 1 to 5, I illustrate an initial baffle or vaporizer 8 which includes a plurality of perforate plates 8a and 8b with registering perforations. Between them is an absorbent wick 8c of asbestos or other suitable material, which is also perforated in register. The vaporizer or burner plate is shown as oval, so that it largely fills the intake flue opening and extends diagonally across the path of the downwardly moving air. As fuel drops from the nozzle 17 it moistens the wick and supports combustion. In order to initiate combustion, suitable material, such as a ball of paper, may be soaked in oil, lighted and dropped down on the plate. With the door or valve 6b open the flame from the burning ball goes up the stack or flue and inaugurates a current of air moving downwardly through the inlet 2d, laterally through the port 6a, and upwardly through the flue opening 2e. Under some circumstances it is sufficient merely to soak the burner plate and its wick in oil and then put it in place in the downdraft flue, and drop a match on it. In any event, while the door 6b is open, air goes down the downdraft flue, and hot air from the flame rises through the updraft flue, thus inaugurating air movement upwardly through the longer or higher flue or chimney 4. Soon thereafter the operator may close the door 6b by depressing the handle 6c. Thereafter, flame from the burner plate passes down through the combustion chamber 2a and out up the stack, because of the fact that the current movement has already been set up in the updraft or flue. The lower foraminous cylinder or sleeve 7 performs a stabilizing and directing surface. It becomes highly heated by the downwardly flowing flame from the burner plate 7. In turn, it maintains or assists in maintaining a combustion zone and in stabilizing the flame flowing down below the initial burner plate or baffle 8.

The other forms differ from the forms of Figures 1 to 5 in the details of the relationship of the baffle to the cylindrical sleeve and also in the omission of the cylindrical sleeve from the forms of Figures 7 to 9. However, in all three forms the relation of the baffle to the burner as a whole is substantially the same.

My burner is particularly adapted to operate as a hydroxylating burner in which a rich mixture is initially formed and is burned by the addition of secondary air. The plate 8 is so proportioned in relation to the flue passage as to provide thereabout sufficient clearance to permit the descent of secondary air about the plate. The apertures in the plate 8 are of sufficient size and area to permit the downward movement through the plate of primary air. The primary air makes a primary mixture with the fuel which is being continuously dropped from the nozzle 17 upon the plate. Secondary air flows downwardly about the plate and mixes with the primary mixture to provide a finely combustible mixture which flows downwardly through and about the cylinder 7 and swirls about the combustion chamber 2a.

If it happens that the flame turns back up toward the inlet, the draft can be reversed by blowing into the air inlet, and the operation continues as before, once the draft has been started in the proper direction.

As combustion continues, with fuel being constantly delivered to the plate 8, the burner plate heats up thoroughly. After sufficient heating in the initial period the operator, of course, closes the door 6b, as above described, and the air and hot products of combustion pass downwardly and then upwardly in the direction of the arrows of Figures 1 and 2.

At full combustion the fuel is hydroxylated, primary air passing through the apertures in the burner plate and secondary air coming in around the edges of the plate to mix with the fuel hydroxylated below the plate. The hydroxylated fuel moving downwardly from the burner plate will be enveloped by the film of secondary air which passes down around the plate, and proper combustion will take place as in other hydroxylating burners.

In all forms herein shown, I illustrate an inclined baffle which, because of its slant, tends to throw the particles against the hot walls 6 or the closure 6b.

The members 6 and 6b having their opposite sides subjected to updraft are kept intensly heated. Any droplets which may be directed by the inclination of the burner against the hot side are promptly vaporized.

Between this action and the complete hydroxylation of the material by the passage of secondary air about the edge of the burner, I obtain a substantially complete and highly efficient combustion.

I claim:

1. A hydroxylating liquid burner which includes a vertically disposed downdraft flue and an updraft flue, and a metal partition between the two flues subjected to the heat of the updraft flue, a vaporizer plate suspended within the downdraft flue and diagonally inclined across the flue downwardly toward said partition, there being a clearance between the plate and the flue walls adapted to permit the passage of secondary air downwardly about the plate, the plate being foraminously apertured to permit downward movement of primary air therethrough, and means for releasing liquid fuel in the upper end of the downdraft flue for free fall and impingement upon the upper surface of the plate.

2. The structure of claim 1 characterized by and including a fibrous element forming part of the plate and adapted to receive for vaporization the liquid fuel released for impingement upon the plate, whereby a primary mixture flows downwardly through the plate to receive the secondary air flowing about the plate.

3. A hydroxylating liquid burner including an air conducting conduit having a wall portion subjected to a source of heat, an apertured burner member positioned in said conduit and spaced from the walls of said conduit to permit the flow of secondary air about the edges of the burner member while permitting the flow of primary air therethrough, means spaced upwardly from the burner member for releasing liquid fuel for free fall and impingement on the burner member, said burner member being inclined to the axis of the conduit and downwardly toward the heated wall portion whereby particles of fuel falling on the burner member and deflected toward the heated wall portion may be vaporized.

4. A hydroxylating liquid burner as recited in claim 3 wherein the wall portion is heated by the flue gases from the burner.

5. In a liquid fuel burner having a downdraft flue provided with a heated wall portion and means for discharging a liquid fuel for downward movement through the flue, the improvement comprising: a plate having at least one edge adapted to be spaced from the walls of said flue to permit the flow of secondary air between the walls and the plate, said plate having a plurality of apertures therein for the flow of primary air and fuel through the plate, and a support for said plate formed and adapted to position said plate adjacent said heated wall portion and in the line of discharge of said fuel, whereby fuel deflected from said plate toward said heated wall portion may be vaporized.

6. In a liquid fuel burner having a downdraft flue provided with a heated wall portion and means for discharging a liquid fuel for downward movement through the flue, the improvement comprising: a vaporizing plate having at least one edge adapted to be spaced from the walls of said flue to permit the flow of secondary air between the walls and the plate, said plate having a plurality of apertures therein for the flow of primary air and fuel through the plate, and a support for said plate formed and adapted to incline said plate toward said heated wall portion and in the line of discharge of said fuel, whereby particles of fuel deflected from said plate toward said heated wall portion may be vaporized by said heated wall portion.

7. The structure of claim 5 characterized in that the plate is formed of separate, metallic plates and has a fibrous wick therebetween, said plates and wick being foraminously apertured with aligned apertures, whereby the apertures extend entirely through the composite plate thus formed.

8. A burner assembly including a downdraft flue having a heated wall portion, a burner member positioned in said flue adjacent said heated wall portion, said burner member being spaced from the walls of said flue to permit the flow of secondary air between the walls and the member, means for releasing liquid fuel above the member for free fall and impingement upon the member, said member having a plurality of apertures therein formed and adapted for the flow of primary air and fuel through the member, whereby fuel particles deflected from said plate toward said wall portion will be vaporized.

9. In a burner structure insertable in the downdraft passage of a liquid fuel burner, an inclined, foraminous plate adapted to receive fuel thereon, an open-ended cylinder spaced downwardly below the plate, connecting elements extending between and spacing and connecting said plate and cylinder, and positioning flanges extending outwardly from said burner structure formed and adapted to position and support the burner structure so formed in the downdraft passage of a burner.

10. In a burner structure insertable in the downdraft passage of a liquid fuel burner, a foraminous plate adapted to receive fuel thereon, an open-ended cylinder spaced downwardly below the plate, said plate extending across the longitudinal axis of the cylinder, connecting elements extending between and spacing and connecting said plate and cylinder, and positioning means formed and adapted to position and support the burner structure so formed in the downdraft passage of the burner.

11. In an immersion burner, a burner housing having a downdraft passage thereto and a separate flue passage extending upwardly therefrom said downdraft passage and flue passage having a common wall, a burner positioned in said

downdraft passage and including a foraminous burner plate located above the burner housing, a bypass passage between the downdraft passage and flue passage and a closure for selectively opening and closing the passage, said passage being generally horizontally aligned with said plate, and means for delivering a liquid fuel to the top of the plate, the edges of the plate being spaced inwardly from the wall of the downdraft passage sufficiently to permit a flow of secondary air downwardly about the plate.

12. The structure of claim 11 characterized by and including a foraminous, open-ended cylinder connected to and spaced and located below the burner plate, said cylinder extending downwardly into the burner housing, and said cylinder and plate being unitarily removable upwardly through the downdraft passage.

13. The structure of claim 11 characterized by and including a foraminous, open-ended cylinder spaced below the foraminous plate and extending downwardly into the burner housing.

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