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 [21] Appl. No. **778,268**
 [22] Filed **Nov. 22, 1968**
 [45] Patented **June 8, 1971**
 [32] Priority **Nov. 27, 1967, Sept. 17, 1968**
 [33] **France**
 [31] **129,719 and 166,417**

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[54] **READILY CLEANED BURNER**
23 Claims, 14 Drawing Figs.

[52] U.S. Cl..... **431/338**
 [51] Int. Cl..... **F23d 3/02**
 [50] Field of Search..... **431/338,**
331, 333, 339

ABSTRACT: A liquid fuel burner having a combustion pot with perforated sides and a constant level feed valve connected to the pot by a feed pipe, and a radial access passage with a removable cover arranged to allow passage of a cleaning tool for scraping the pot bottom and for removing debris removed from the bottom, the lower edge of the access passage being in direct proximity to the bottom.

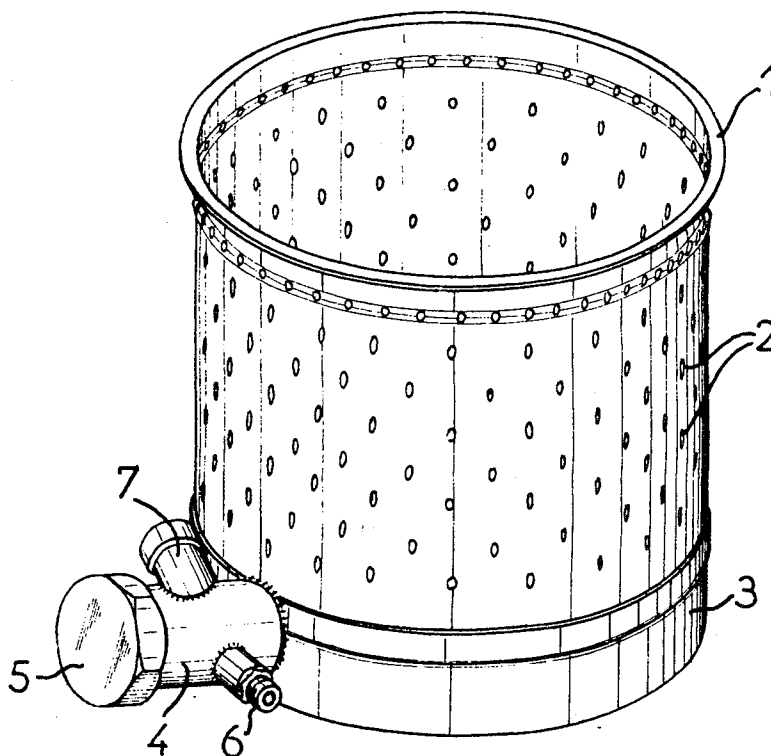


FIG. 1

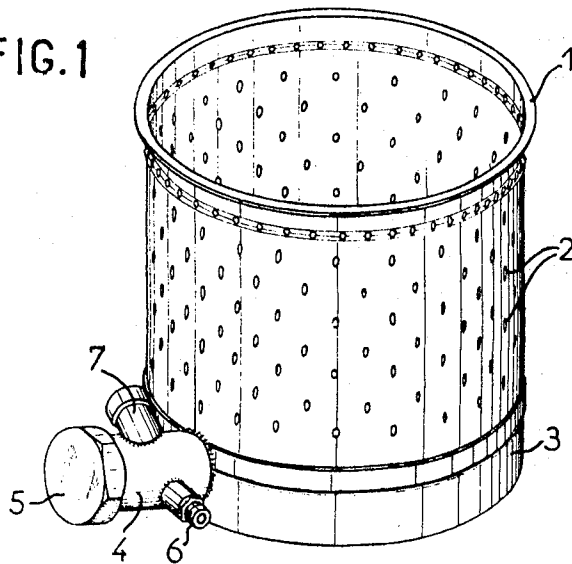


FIG. 3

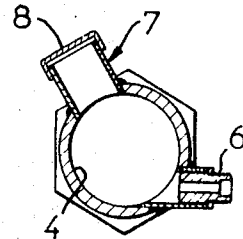


FIG. 2

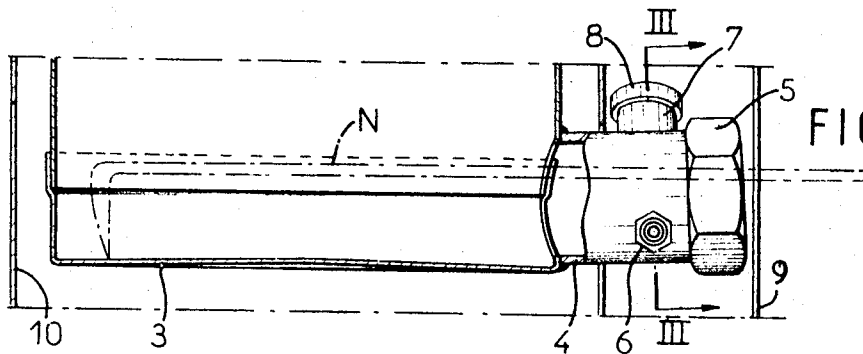


FIG. 4

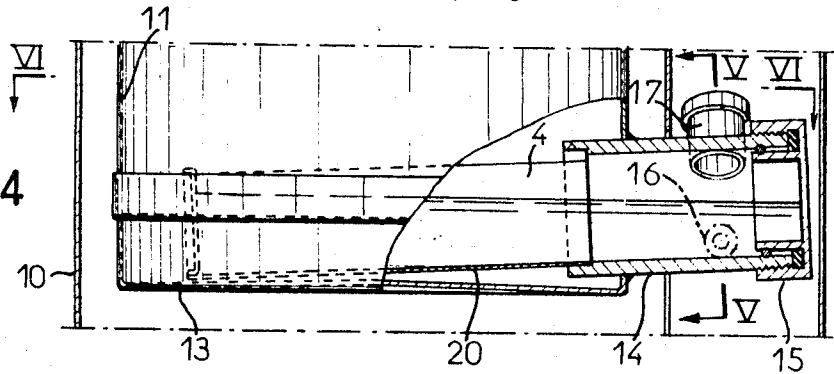
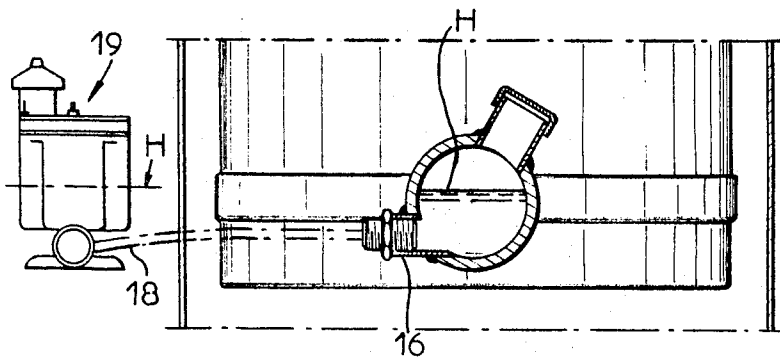


FIG. 5



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FIG. 6

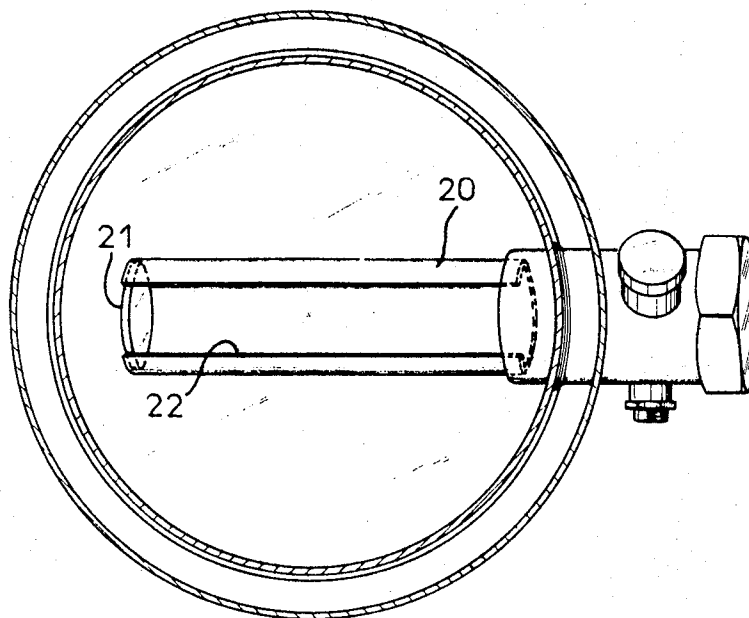
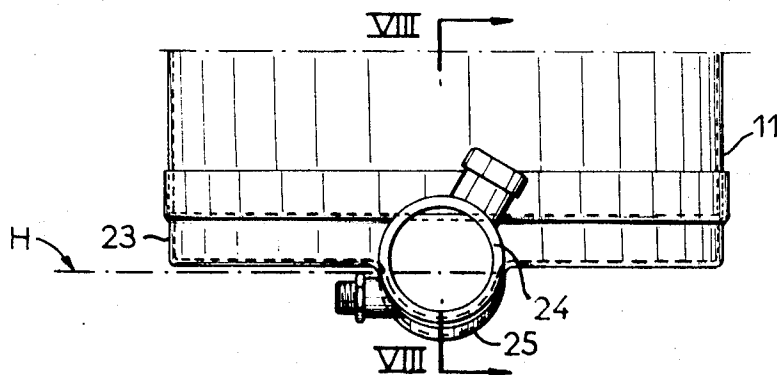


FIG. 7



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FIG. 8

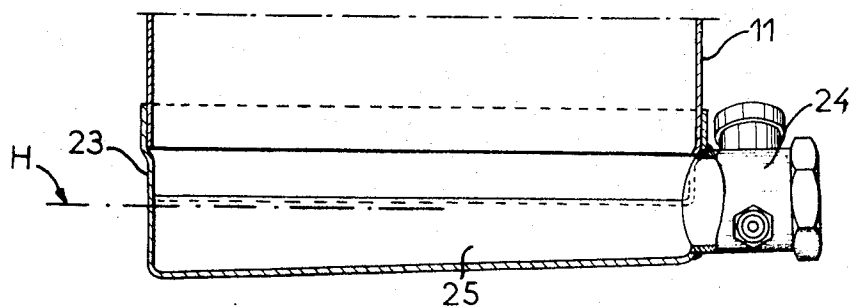


FIG. 9

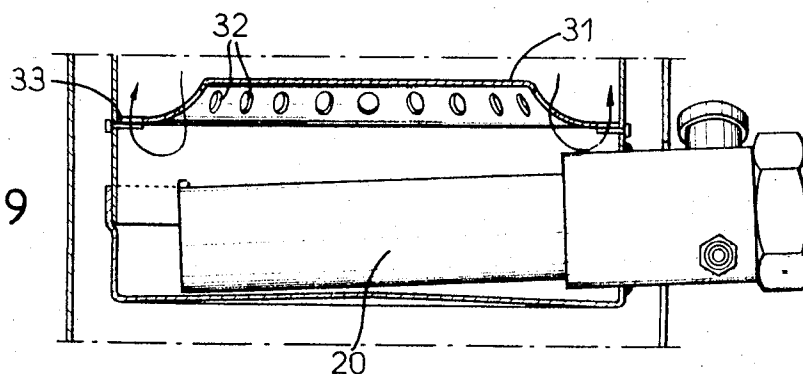
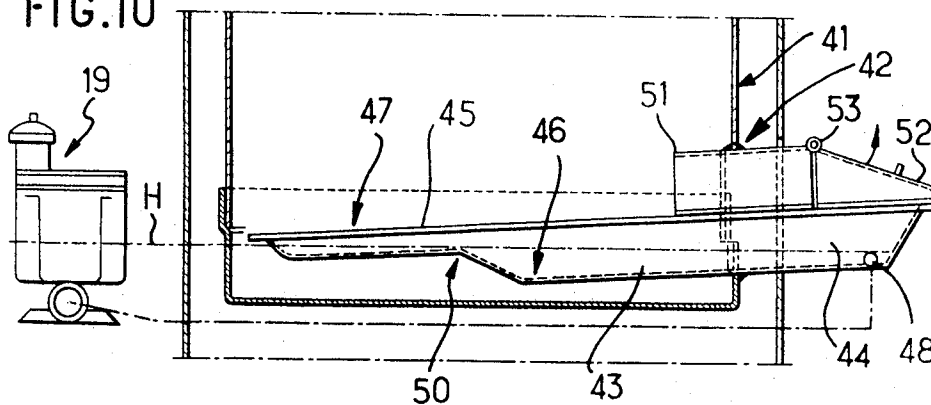


FIG. 10

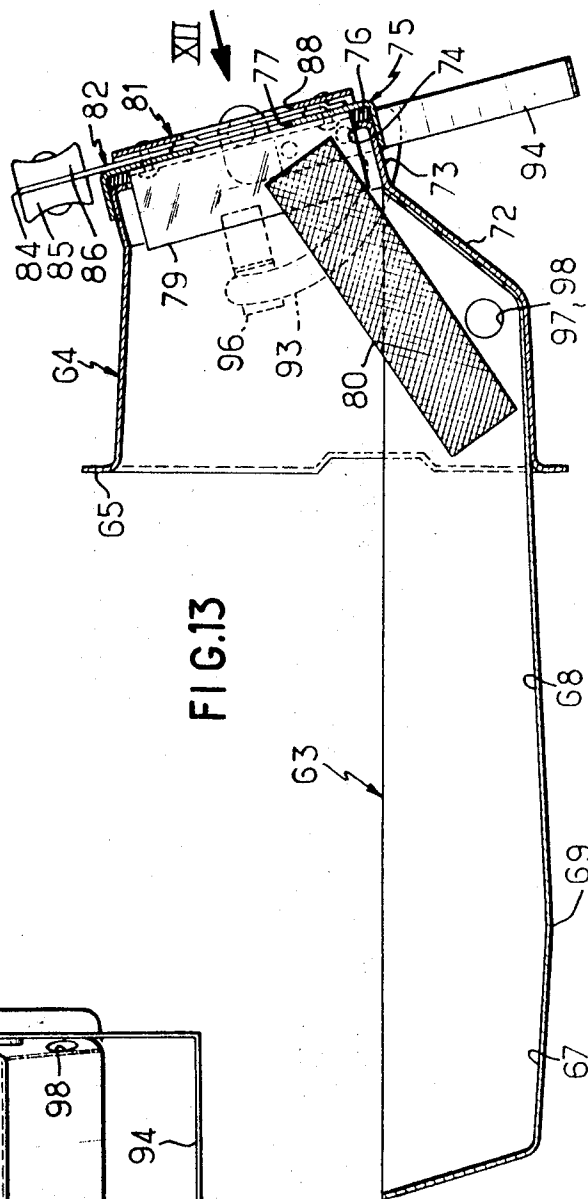
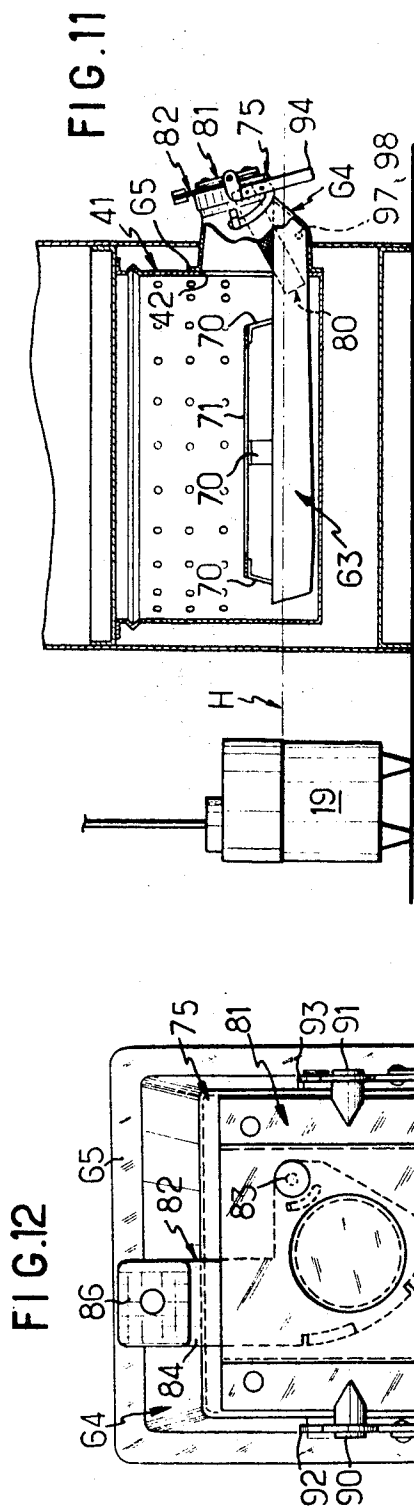


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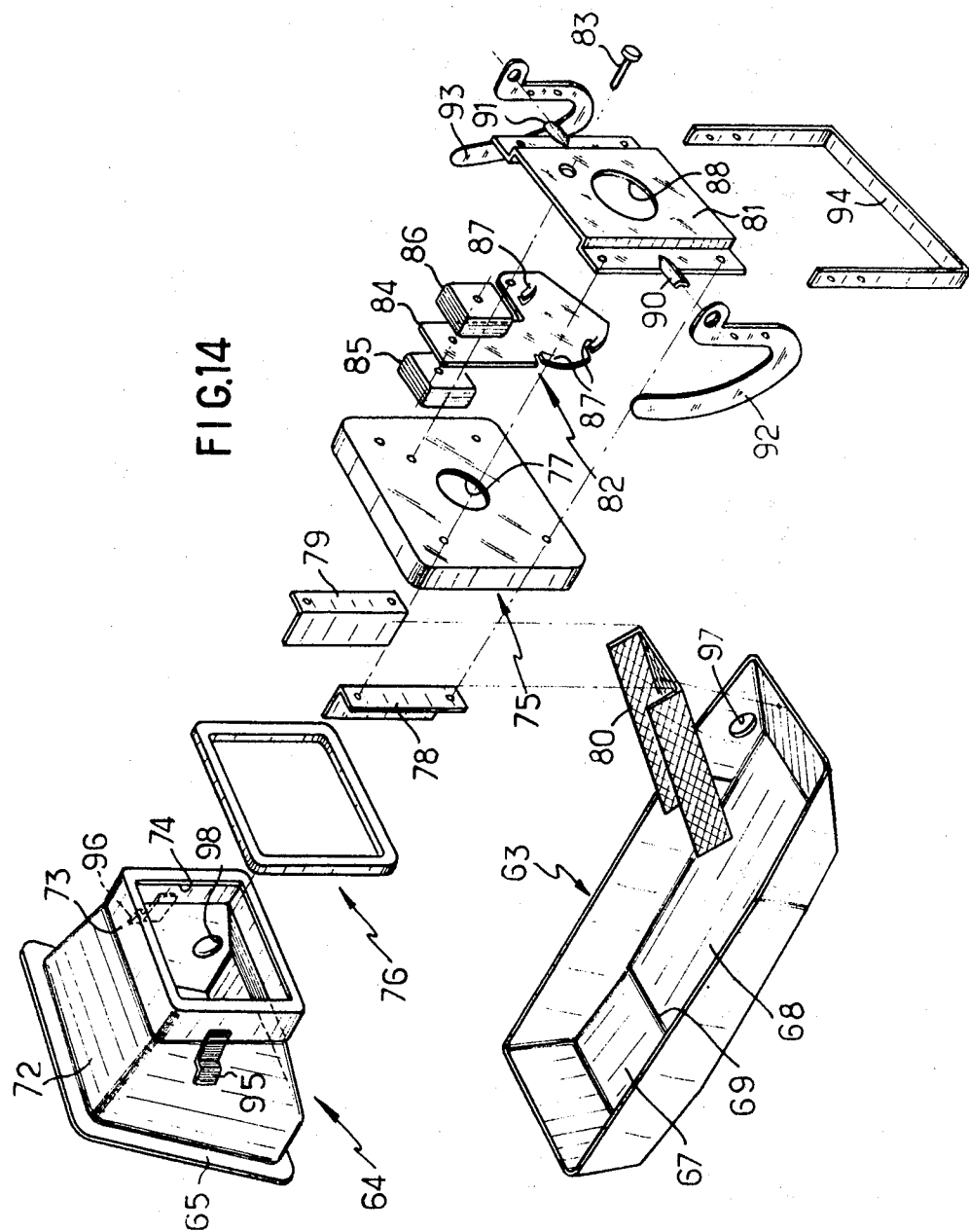


FIG.14

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READILY CLEANED BURNER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to liquid fuel heating appliances of the kind comprising a vaporizing burner. Such a burner comprises a cylindrical combustion pot having a perforated wall, in combination with a feed valve of the constant level-type arranged to limit the volume of liquid fuel allowed to enter the base of the pot.

2. Description of the Prior Art

The known appliances of this kind have a series of drawbacks affecting their conditions of use, by forcing upon their users onerous and soiling maintenance work, and without protecting them against combustions which are occasionally dangerous and at all events likely to cause production of soot injurious to the surroundings of the appliance.

In the known appliances it is practically impossible after a certain period of operation, to prevent the formation in the bottom of the combustion pot of a solid crust resulting from the accumulation of combustion wastes or cokes which eventually clog the fuel inlet and interfere with the normal operation of the gasifying or vaporizing process at the bottom of the combustion pot. It is and remains essential to undertake a cleaning action for removal of these wastes, from time to time. To this end, different types of clearing elements arranged to permit the flow passage for the fuel to be cleared periodically, have already been suggested, but it still remains essential to undertake a cleaning action from time to time, by scraping the entire surface of the base playing a part in the vaporization. This unavoidable operation is difficult and dirty in all cases in the absence of a convenient means of access to the bottom of the combustion pot and of removal of the scraps separated and broken over this base.

Another serious disadvantage of the known heating appliances of this kind is that the volume of liquid fuel which accumulates in the bottom of the combustion pot may remain considerable although it is limited by the constant level valve, possibly of the order of several liters, owing to the relatively great surface of the said bottom which may be of the order of some 10 square decimeters. When, after being turned off, the appliance loaded with a weight of fuel of this magnitude is relit, this may result in overheating which can seriously impair the safety of the system as a whole, entailing grave risks of fire and of explosion of the appliance.

The main object of the present invention is to provide a liquid fuel heating appliance in which these disadvantages may be minimized or eliminated by providing for easy cleaning of the combustion pot, a reduction in the maximum volume of fuel allowed to enter the burner, and a reduction of the surface exposed to soiling.

SUMMARY

According to the present invention a liquid fuel heating appliance comprises a liquid fuel burner comprising a combustion pot with perforate sidewalls, an elongate trough disposed laterally in the lower portion thereof, a feed pipe for feeding liquid fuel into the trough, a constant level feed device for preventing the overflow of the fuel from the trough, there being an access passage integrally formed with and generally aligned along the axis of the trough, the access passage extending through the sidewall of the pot and including an opening to provide straight line access along the entire length of the elongate trough for removing debris therefrom.

By the appliance of the invention it is possible to clean the bottom of the combustion pot easily and without the risk of getting dirty, while the debris resulting from the cleaning can be easily collected in a receptacle under the access passage which preferably comprises a pipe stub projecting from the wall of the combustion pot.

An extension of an access passage may be provided to form a fuel reception trough, channel or the like, the constant level

valve being arranged so that its control height is below the upper edge of the trough, whereby the fuel always remains enclosed therein.

This arrangement offers the very great advantage of limiting the maximum volume of liquid fuel liable to accumulate in the bottom of the combustion pot, as well as limiting the wetted surface of the pot bottom, and consequently the area of the surface likely to be soiled by incombustible wastes. At one stroke, it becomes even simpler to clean off these wastes, it being understood that although different forms may be specified for the plan view structure of the fuel reception trough, these forms will preferably be selected so that there is access along the entire length of the wetted surface of the trough and a scraping tool is easily inserted therein. The wetted surface of the trough is in such a case a small fraction of the surface of the bottom of the combustion pot.

By careful choice of the dimensions of the fuel reception trough it is possible to secure a compromise reconciling two conditions, which are contradictory at first sight, according to which the volume of fuel delivered by the constant level valve remains limited to a reasonable initial value on the one hand, but on the other hand remains sufficient for full-load operation of the appliance.

Contrary to the generally accepted belief that the totality of the surface of the combustion pot bottom is needed to ensure correct vaporization of the fuel in full-load operation, it is found that the deliberately restricted surface of the fuel reception trough of the invention is amply sufficient for a vaporization of this nature.

In a preferred embodiment of the invention an assembly is produced combining a fuel reception trough and an access passage, comprising a stamped component forming a trough placed astraddle on the lower rim of a lateral opening formed for this purpose at the bottom of the combustion pot, in conjunction with an openable cap or cowl capable of covering the part of the trough outside the pot.

This construction is particularly advantageous, in particular owing to the fact that the inlet of the access passage normally covered by the cap is disposed wholly above the fuel reception trough; the application of seals to prevent leaks of liquid fuel can thus be omitted entirely, since the level of the liquid will always remain below the rim of the trough.

The access passage may also, on the other hand, advantageously serve the purpose of ignition, which renders it possible to omit the pipe with a removable lid specially incorporated for this purpose in appliances of many known appliances.

A lighting wick may be provided extending from the bottom of the fuel reception trough into the proximity of the coordinated access passage. This lighting wick preferably consists of a spout, chute or the like, of very fine-meshed wire netting secured to the closing lid or cap of the access passage abreast of an opening therein.

This spout, whose base is permanently immersed in the fuel, soaks the fuel up by capillarity, from loop to loop, to an appreciable height. It is thus sufficient to allow a burning match or any other lighting device to enter the same to cause easy ignition of the burner; in point of fact, this match is adequate to vaporize and then ignite the fuel, normally fuel oil, contained in the meshes of the spout. It is thus possible to avoid the application of a more volatile fuel, such as alcohol for example, and which is always dangerous to handle, for a lighting action of this kind.

The trough may be in the form of a stamping from relatively thin-gauge stainless steel sheet whose surface is polished at the inner side, at least: experience shows that the adhesion of the solid combustion wastes is appreciably lessened on a metal surface thus polished or mirror-finished, thus evidently facilitating cleaning. Another advantage resides in the considerable reduction of thermal inertia, that is to say of the metal mass in contact with the mass of liquid fuel, which accelerates and promotes the vaporizing process.

In this respect, the trough is preferably at a distance from the bottom of the combustion pot, so that it is not affected by cold air, which is equally favorable to the vaporizing process.

This vaporizing action may be promoted further still by a trough having a bottom stepped on at least two levels; this arrangement renders it possible to increase the useful wetted surface liable to come into play at high operational settings whilst additionally reducing the maximum volume of fuel accumulated in the burner.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be more fully understood some embodiments in accordance therewith will now be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of a combustion pot;

FIG. 2 is an elevation in part section showing the lower part of the pot of FIG. 1 in a heating appliance;

FIG. 3 is a detail view in section along the line III-III of FIG. 2;

FIG. 4 is an elevation in part section of a construction comprising a distribution trough;

FIG. 5 is a section along the line V-V of FIG. 4;

FIG. 6 is a corresponding plan view in section along the line VI-VI of FIG. 4;

FIG. 7 is an elevation of another embodiment;

FIG. 8 is a section along the line VIII-VIII of FIG. 7;

FIG. 9 is an elevation in part section showing the lower part of a pot equipped with a deflector;

FIG. 10 is a diagrammatic view in elevation and in part section of the lower part of another burner construction;

FIG. 11 is a partial view in axial section of a heating appliance equipped with another burner;

FIG. 12 is a partial external view of the burner of FIG. 11, looking in the direction of the arrow XII of FIG. 13;

FIG. 13 is a longitudinal section of the assembly formed by the fuel reception trough of the burner of FIGS. 11 and 12 and by a cowl supporting this trough; and

FIG. 14 is an exploded perspective view of the assembly of FIG. 13.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 to 3, these show a burner pot 1 formed in conventional manner by a cylindrical sheet steel vessel having in its lateral side perforations 2 for supply of air and equipped with one or more inner deflectors (not shown) for guiding the flame and the comburant air. The cylindrical sleeve forming the barrel of this pot is closed at the bottom by an inset cup-shaped base 3. The pot thus formed is equipped with a radial access pipe 4 arranged to be sealed off with a hermetic cover 5. The lower part of this access pipe 4 is in the immediate vicinity of the bottom 3 of the combustion pot and is quasitangent to this bottom. In the middle part of the length and at the bottom of the access pipe 4, opens a joint 6 for connection of the customary fuel feed pipe, connected to a constant level feed valve (not shown), this joint forming an inlet substantially tangential to the inner wall of the pipe. On the other hand, a pipe 7 is radially disposed relative to the pipe 4, normally closed off by a removable lid 8 and in manner known per se serving the purpose of an access and an inlet for additional air for ignition. The pipe 4 thus arranged is in alignment with a door 9 when the combustion pot is installed in the heating jacket or case 10 of a heating appliance.

The access pipe 4 which is in alignment with and in extension of the bottom 3 of the combustion pot, is of sufficient size, when the door 9 is opened and the cap 5 has been removed, to allow passage for a tool for cleaning the bottom 3 by scraping, as shown dash-dotted at N in FIG. 2. Owing to the positioning of the pipe 4 in direct proximity to the bottom 3, the wastes separated therefrom may easily be extracted through this pipe 4, and owing to the projection of this pipe from the side of the combustion pot, these wastes may easily

be collected in a pan or any other appropriate receptacle placed below the outlet of the pipe 4.

In the construction shown in FIGS. 4 to 6, there is a pot 11 having an inset bottom 13 with an access pipe 14 possessing a hermetic cover 15, a fuel feed 16, and an igniting pipe 17. The access pipe 14, in this case, is slightly raised and slopes above the bottom 13 and is extended by a fuel reception element 20 in the form of a trough arranged, for example as in FIG. 6 in the form of a tube section closed at its extremity 21 and open at 22 at the top by removal of a fraction of the order of a quarter of its circumference, for example.

This trough 20 is preferably secured at a distance from the bottom 13, without contact with the same. The fuel feed 16 being supplied in conventional manner by a pipe 18 equipped with a constant level valve 19, the appliance is arranged so that the level H of the liquid fuel to be set by this valve is below the lowest point of the upper rim of the trough 20.

The section and length of this trough 20, which in this case extends in alignment with a diameter of the bottom of the combustion pot when viewed in plan, are determined so that the volume defined by the level H and the wetted surface of the trough 20 establishes a satisfactory balance between the vaporizing surface on the one hand the volume of liquid fuel and the quantity of comburant air, on the other hand.

The wetted surface of the trough 20 thus represents no more than a limited fraction of the surface of the base of the combustion pot.

FIGS. 7 and 8 show another form of embodiment of a fuel reception trough at the bottom of a pot 11; in this case, it is integral with the lower inset part 23 of the combustion pot by stamping into the base thereof a channel or trough 25 direction substantially diametrically across the bottom and having a semicircular cross section in which the diameter increases with distance from the access pipe 24. The nominal level H, in this case, is still below the upper edge of the trough thus formed, that is to say below the actual bottom of the pot.

The trough thus punched out may comprise an initial portion arranged in extension of the access pipe and a bifurcation into two branches, the whole forming a Y-shaped pattern in plan view. Or the trough may comprise an initial portion in the extension of the access pipe 24 and a part widened into the shape of a bulb occupying a portion of the bottom of the pot.

At all events, the different parts of the fuel reception trough preferably remain directly visible from the inlet of the pipe 24, and thus directly accessible by a scraper or other appropriate tool for periodical cleaning operations by removal of the more or less coked fuel wastes.

In all instances moreover, the wetted surface of the fuel reception trough should preferably amount to no more than a limited fraction of the surface of the combustion pot. This fraction should be smaller than half and preferably between one tenth and one third. In practice, it is preferably between one eighth and a fifth.

FIG. 9 shows an arrangement in which the trough 20 is disposed above the base as in the embodiments of FIGS. 4 to 6, but such a trough may be of any other form, of a deflector 31 advantageously consisting of an inverted dinner plate-shape having in its lateral side a circular row of openings 32 for passage of air and providing at its circumference a peripheral passage 33. In operation, the deflector thus formed, having its upper face exposed to the radiation of the flames, assures uniform and appropriately maintained heating of the mass of liquid contained in the trough 20 whilst allowing of uniform vaporization of this mass under protection from turbulences which could occur in the area of the flames.

The supply of comburant air is assured by the circular row of openings 32 and the combustible mixture thus formed is channelled, as indicated by the arrows, along the wall of the pot, thus assuring a regular supply of secondary air to the combustion through the lateral perforations in the cylindrical steel vessel (FIG. 1).

Finally, with reference to FIGS. 10 to 14, forms of embodiment of the invention will be described, characterized by the

fuel reception trough on the one hand, and the access passage on the other hand, being wrought in the form of an unitary assembly.

In FIG. 10, the lower part of the combustion pot (41 in FIG. 10) comprises a lateral opening 42 of generally rectangular shape for example, and a trough 43 formed by a stamping of stainless steel is placed astraddle on the lower edge of the opening, so that a terminal portion 44 of this trough remains outside the pot. The trough, which in plan view has an elongated rectangular shape, is enframed by a plane flange 5 extending throughout its periphery. Within the frame is formed a bowl or pan in two parts 46—47 of different depths formed by a base stepped on two different levels, the lower level being closer to the terminal portion 44 on a side of which portion is arranged the union 48 for connection of the fuel feed pipe.

As apparent from FIG. 10, trough 43 is disposed with a moderate inward and downward slope so that the scheduled level H of the constant level valve 19 is slightly above the transition crest 50 between the portions 46 and 47 of the pan.

In the area of the opening 42, the trough is topped by a transverse dome 51 which matches the rest of the outline of the said opening. In combination with the dome, a lid 52 articulated by a hinge 53 on the outer edge of the dome, is arranged to close the remainder of the terminal part 44 of the trough which is outside the pot and not covered by the arched portion 51. An opening, which is not apparent from FIG. 10, is formed in the upper face of the lid 52 and a flap is employed for more or less complete closure thereof.

It is apparent that, by tipping the lid 52 upwards, a particularly convenient access is available, providing a direct sight of the whole of the pan formed by the trough 43. For lighting purposes, this access means may be employed or the opening in the lid 52 may be used for this purpose. At all events, direct visibility is available of the fuel inflow through the union 48 and the presence and size of the sheet of liquid fuel to be ignited can be assessed. In operation, it remains possible to establish and maintain an inflow of air with an adjustable rate of flow, through the opening in the lid 52, by placing the flap coordinated with this opening in the appropriate position.

The stepped arrangement of the bottom renders it possible to increase the vaporizing surface whilst limiting the maximum volume of the liquid mass to an even lower value than in the preceding forms of embodiment. The vaporizing process is greatly facilitated, on the one hand thanks to the reduced thermal inertia of the distribution trough 43 which may advantageously be made of thin-gauge steel and preferably of stainless steel, of a thickness of 5 to 6 tenths of 1 mm., for example. This sheet may be polished or mirror-finished on its inner surface at least: experience shows that this arrangement considerably reduces the adhesion of solid deposits and consequently facilitates their removal.

The principal advantage of this form of embodiment appears however to reside in the fact that the removable lid 52 of the access passage wholly remains distinctly above the highest position of the level H of liquid, thus eliminating any risk of overflow, leakage or seepage of the liquid fuel without having to use any kind of plastic seals.

The hinged lid 52 may be replaced by a lid slidably arranged on the trough 43, on its flange 45.

In FIG. 11 at 41 is a combustion pot in which is cut a lateral opening 42 of generally rectangular shaped, and a trough 63 is placed straddling the lower edge of this opening. This trough is borne by a cowl or cap 64 equipped with a peripheral flange 65 by which it is secured to the combustion pot 41, around the opening 42 thereof.

The trough 63 consists of a stainless steel sheet stamping, for example; its bottom is in the form of a very widely open Vee, that is to say that it has two plane sides 67, 68 converging at a low slope towards a common lower inverted crest 69.

By brackets or lugs 70, this trough 63 has arranged above it an annular deflector 71 in a manner known per se, the deflector could be carried by the combustion pot 41 itself, but its fastening to the distribution trough 63 itself results in forming

an assembly whose production and installation are more economical.

The cap 64 is formed by a frustopyramidal element 72 (FIGS. 12 and 13), having a peripheral flange 65; this element 72 is extended by a cylindrical section 73 having a flange at its end forming a rectangular opening 74 forming the access passage arranged for the insertion of a cleaning tool.

On this section 73 is engaged a removable cover 75 with the interposition of a sealing joint 76.

The cover 75 is pierced by an opening 77. Internally, by two sections 78, 79, it carries a sloping ignition chute 80 whose lower extremity is close to the bottom of the trough 63 and whose upper extremity is close to the lid or cover 75, in alignment with its opening 77. This chute 80 consists of metal wire-netting with very fine meshes.

Externally, the cover 75 carries a plate 81 forming, with the cover, a seat in which a shutter 82 is arranged to pivot around a pin 83. This shutter controls the opening 77 of the cover 75; it has an operating tab 84 equipped at either side with insulating pads 85, 86 allowing it to be grasped; the flap 82 moreover has resiliently deformable strips 87 formed by cutting and appropriately deforming the panel from which it extends, the strips by means of the friction against the flange 81 assuring correct retention of the flap or shutter 82 irrespective of its position.

The flange 81 is provided with an opening 88 aligned with the opening 77 of the cover 75 and laterally has two pegs 90, 91 on which are hinged two hooks 92, 93 interconnected by a shared handling grip 94.

These hooks 92, 93 are intended to cooperate with lugs 95, 96 carried laterally by the barrel 72 of the cap 64 for locking the removable cover 75 on the cap.

The trough 63 and the cap 64 moreover possess openings 97, 98 in alignment for securing a union (not shown) for connection of the fuel pipe. This feed occurs through a constant level valve 19 which, as previously, is arranged in such manner that the sheet of fuel in the trough 63 is limited to the level H (FIG. 11), this level H being lower than the top section of the trough.

The openings 77 and 88 which are controlled by the shutter 82, render it possible to insert an igniting means such as an ignited match or the like, on the one hand, the igniting means being slipped into the chute 80, and on the other hand, allow of providing a supply of secondary air controlled by the shutter 82, particularly during the igniting action.

It is possible to equip one and the same combustion pot with several fuel reception troughs, which may be identical or not, these troughs for example being disposed in a star-shaped pattern, especially in the case of a cylindrical combustion pot having a circular base, or else disposed parallel to each other at equal distances or not, specifically to form a linear burner.

I claim:

1. A liquid fuel burner comprising a combustion pot with perforate sidewalls, an elongate trough disposed laterally in the lower portion thereof and having a width substantially less than the width of said lower portion of said pot, a feed pipe for feeding liquid fuel into the trough, a constant level feed device for preventing the overflow of the fuel from the trough, means defining an access passage integrally formed with and generally aligned along the axis of the trough, the access passage extending through the sidewall of the pot and including a removable cover over an opening to provide straight line access along the entire length of the elongate trough for removing debris therefrom.

2. A burner according to claim 1, said opening extending most of the width of the trough.

3. A burner as claimed in claim 1, the bottom of the trough being smoothly inclined up to said opening to facilitate the removal of debris from said trough through said opening.

4. A burner according to claim 1 wherein the fuel wetted surface area of said trough is a fraction of the cross section of the lower portion of the pot.

5. A burner according to claim 1 wherein the whole of said fuel wetted surface of said trough is visible from said access and can be reached by a scraping tool inserted into said passage.

6. A burner according to claim 1 wherein said trough is a cavity stamped into said pot bottom.

7. A burner according to claim 1 wherein said trough is an element inset in a sidewall of said pot.

8. A burner according to claim 1 wherein the whole of said trough is disposed at a distance from said pot bottom.

9. A burner according to claim 8 wherein said trough has a stepped base providing two levels of different heights with respect to said pot bottom.

10. A burner according to claim 1 wherein the bottom of said trough has a cross section of an oblique angle V.

11. A burner according to claim 1 wherein said trough is of polished stainless steel sheet.

12. A burner according to claim 1 wherein said trough has a deflector disposed above it and shaped to deflect the mass of vaporized fuel close to the interior part of said pot, said deflector being shaped as an inverted dinner-plate having a peripheral flow passage for flow rising along the inner side of said pot.

13. A liquid fuel burner as claimed in claim 1 wherein said trough is coordinated with an ignition wick extending from the bottom of said trough to a point close to said passage.

14. A burner according to claim 13 wherein said wick is a sloping chute pierced by a network of close set narrow orifices.

15. A burner according to claim 13 wherein said chute is formed by fine mesh wire netting.

16. A burner according to claim 13 wherein said wick is secured to said cover.

17. A liquid fuel burner comprising a combustion pot having perforations in the side thereof, a constant level feed valve

connected to said pot by a feed pipe, and a fuel trough in said pot and connected to said pipe and to a passage giving access to said pot bottom, said valve being disposed with the controlled fuel level below the upper edge of said trough thereby enclosing the fuel therein, the lower part of said pot being pierced by an opening the lower edge of which is straddled by said trough, and a cowl covering the part of said trough outside said pot.

18. A burner according to claim 17 wherein a transverse dome surmounts said trough in the area of said pot opening and matches the shape of said opening, said cowl being hinged to said dome.

19. A burner according to claim 17 wherein said cowl is slidable with respect to said trough.

20. A burner according to claim 17 wherein said cowl has an air inlet opening and means to vary the area of said opening.

21. A burner according to claim 17 wherein said trough is supported by a cowling having its periphery secured to said pot around said opening therein and having an opening closed by said cowl.

22. A burner according to claim 17 wherein said trough is supported by a cowling having its periphery secured to said pot around said opening therein and having an opening closed by said cowl, said cowling comprising an extension round said opening therein, the coordinated cover being filled to said extension and securable thereto by two lateral hooks solid with an operating member.

23. A burner according to claim 17 wherein said coordinated cover has an air inlet opening with a shutter displaceable between said cover and a flange thereon, said shutter having elastically deformable projecting strips maintaining said shutter in position by friction.

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