Jan. 5, 1937. M. A. POWERS 2,067,097

LIQUID FUEL BURNER AND HEARTH

Filed June 12, 1933 2 Sheets-Sheet 1

Fig. 1.

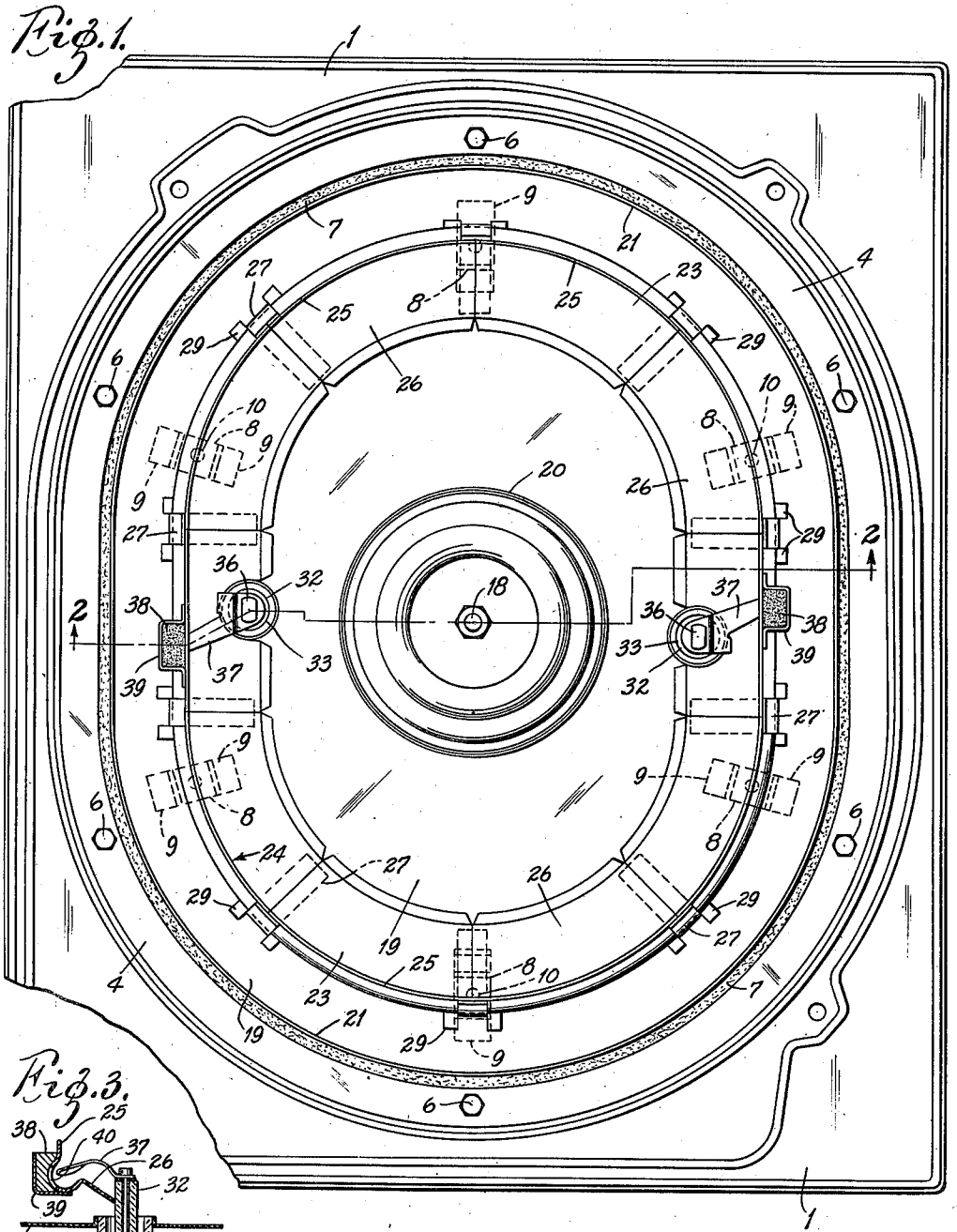
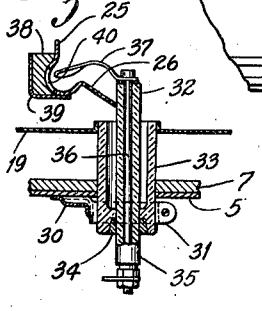


Fig. 3.



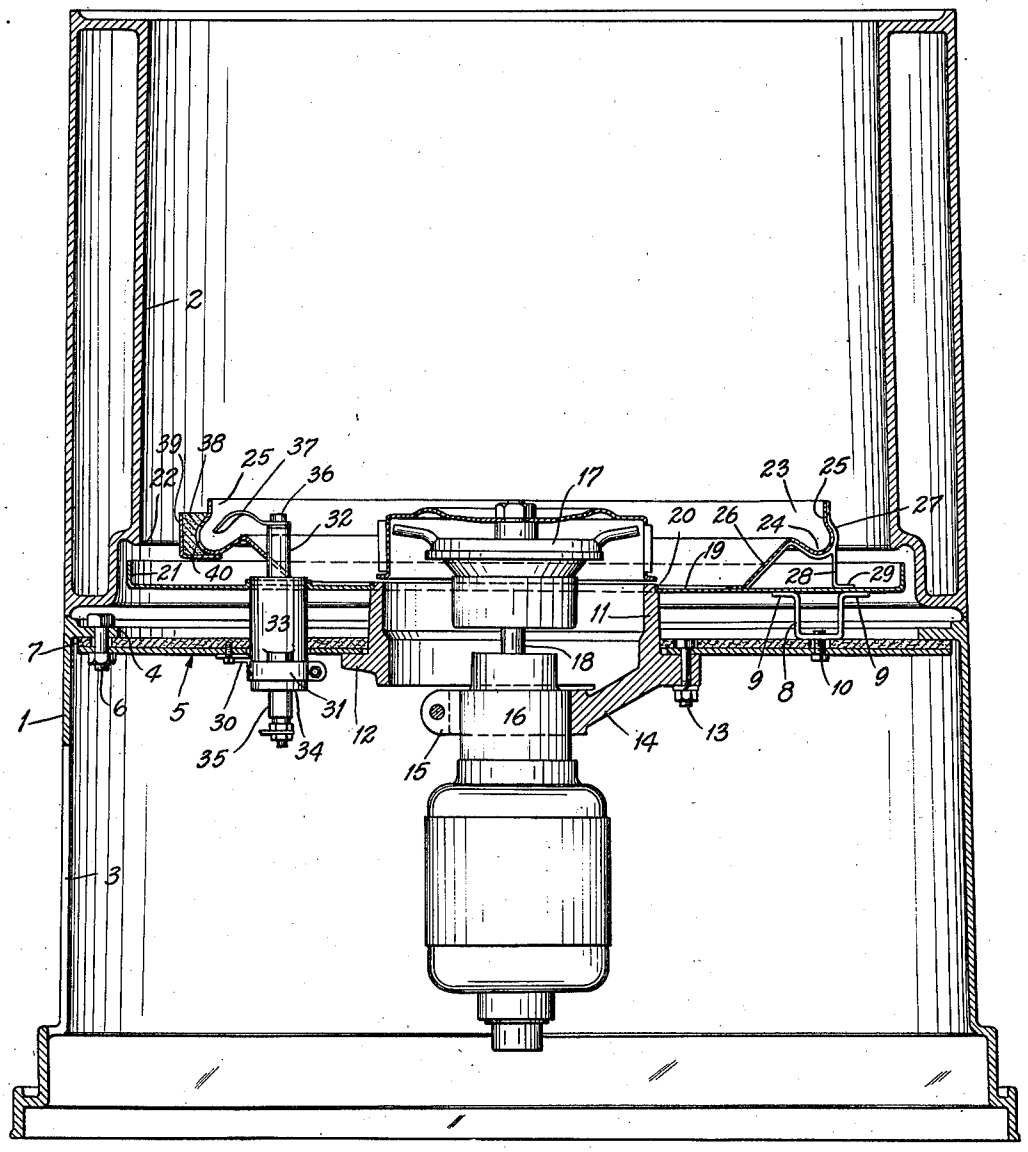
INVENTOR:
Milton A. Powers
by Connett Connett & Gravely
HIS ATTORNEYS.

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Fig. 2.



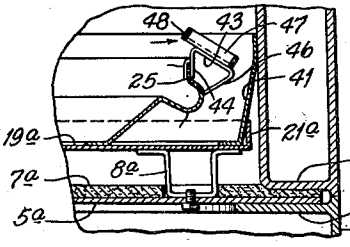


Fig. 4.

INVENTOR:
Milton A. Powers
by Cowart Cowart & Cowart

HIS ATTORNEYS

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UNITED STATES PATENT OFFICE

2,067,097

LIQUID FUEL BURNER AND HEARTH

Milton A. Powers, Detroit, Mich., assignor to The Timken Silent Automatic Company, Detroit, Mich., a corporation of Michigan

Application June 12, 1933, Serial No. 675,341

28 Claims. (Cl. 158—4)

My invention relates to liquid fuel burners and hearth constructions therefor, particularly to oil burners of the type wherein ignition and combustion take place around a burner ring located at the periphery of the hearth, oil being sprayed to said ring by a centrally disposed rotary distributor head and air being projected over the hearth surface toward the ring by a fan carried by said head, substantially as in Alden and Powers Patent No. 1,882,694, granted October 18, 1932. The invention has for its principal objects to simplify the construction of such rings and hearths and to enable the burner ring and hearth to be made of metal, also to provide a burner ring and hearth assembly capable of being mounted in and removed from a furnace, water heater or the like as a unit. Another object is to provide an explosion proof burner ring and hearth assembly. Other objects and advantages will appear hereinafter.

The invention consists principally in a burner ring and hearth construction wherein the parts are made of metal, wherein the hearth proper is mounted on a supporting plate that is removably sustained on the base of the furnace or the like, the motor and distributor head being supported by this same base plate and wherein said base plate is tightly sealed so as to prevent influx of air into the fire box except through openings especially provided for furnishing air in the proper amount and in proper relation to the fuel and to the annular flame. The invention further consists in the liquid fuel burner and hearth and in the parts and combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings wherein like reference characters indicate like parts wherever they occur,

Fig. 1 is a top plan view of a liquid fuel burner and hearth embodying my invention installed in the boiler of a heating plant,

Fig. 2 is a vertical sectional view on the line 2—2 in Fig. 1,

Fig. 3 is a detail vertical sectional view showing the mounting of a suitable electric ignition device; and

Fig. 4 is a fragmentary vertical sectional view of a device embodying a modification of my invention as mounted in a hot water heater.

In Figs. 1 to 3 is illustrated a portion of a boiler for heating purposes, showing a base 1 on which is mounted a fire pot or combustion chamber section 2 of the boiler.

Said boiler base 1 has an opening 3 in the wall thereof and has an inwardly projecting annular top flange 4 beneath which is supported an annular base or closure plate 5, which may be secured to said flange by bolts 6. Clamped between the annular flange 4 and the base plate 5 is an annular gasket 7 of asbestos or other suitable heat insulating material which prevents leakage of air between said flange and said plate. Mounted on the asbestos gasket 7 are a plurality of supports in the form of channel-shaped brackets 8 with outturned upper flanges 9. The brackets 8 are secured in place by cap screws 10, which extend upwardly through the plate 5 and the gasket 7 and are threaded into the bottoms of said brackets.

An annular burner supporting frame or collar 11 is provided with an outstanding flange 12 whose upper surface rests against the bottom of the burner base plate 5; and said collar 11 is secured to said plate 5 by means of bolts 13 passing through the plate 5 and said flange 12. Said collar 11 is provided with a plurality of inwardly extending spider arms 14 terminating in a split ring 15 in which is clamped the upper portion of a motor housing 16. A distributor head 17 of any suitable type projects upwardly from said motor housing, being supported on the motor shaft 18 in the usual way.

Mounted on the top flanges 9 of the brackets 8 is a hearth plate 19 having a central circular opening adapted to fit the upper end of the burner collar 11. Clearance is provided between the hearth plate 19 and the inner wall of the fire pot 2 to permit said plate to expand and contract freely with changes in temperature conditions and to facilitate its assembly in said fire pot. The hearth plate is provided along its inner and outer edges with upstanding flanges 20 and 21, respectively, whereby it is adapted to hold oil deposited therein. The inner wall of the boiler is offset outwardly opposite the upstanding outer peripheral flange 21 of the hearth plate 19 to form a depending lip 22 that overhangs said hearth plate, whereby any water condensate or oil deposited on said wall will drip from said lip onto said hearth plate. Secured to the hearth plate 19 is a burner ring or ignition and combustion ring 23, said ring being preferably made in sections. Said combustion ring includes a trough or gutter 24, an impact wall or flange 25 extending upwardly from the outer portion of said gutter and an air deflecting flange 26 extending inwardly and downwardly from the inner portion of said gutter portion and having its marginal portion

welded or otherwise rigidly secured flatwise to the base of the hearth plate. The sections of the burner ring 23 have their abutting end portions supported on and welded or otherwise rigidly secured to brackets or chairs 27 that are shaped to conform to the cross-sectional shape of said burner ring and have downwardly bent portions 28 terminating in outstanding base flanges 29 that rest on and are welded or otherwise rigidly secured flatwise to the hearth plate 19. The oil streams from the distributor head 17 strike the impact wall 25 above the gutter 24, ignition and combustion initially taking place in the sheltered zone of said trough or gutter and the flame gradually lifting to the top and to the rear of the burner ring when normal combustion conditions are reached.

Secured to the underside of the base plate 5 is a bracket 30 that supports a split ring 31 in which is mounted suitable electrodes 32. Any suitable electrode may be used. A preferred form is shown in the drawings and constitutes the subject matter of an application about to be filed. Said electrode includes a cup 33 of porcelain or the like having a perforated bottom 34, a tubular insulator stem 35 of porcelain or the like extending through the bottom of said cup 33 and cemented therein and an electrode proper 36 extending through said stem 35. A spark point member 37 is secured to the top of said electrode. The other electrode 38 is a block of carborundum or other suitable material mounted in a pocket member 39 secured to the outer side of a section of the burner ring 23. Said section has an opening 40 therein to expose the surface of said block 38. In construction and operation, sparking points conform to the disclosure of my Patent No. 1,888,695.

By reason of the mounting of the motor and distributor head on the base plate 5 the usual motor and distributor legs are dispensed with. The base plate 5 is insulated to protect the motor from heat and has substantially air tight connections with the boiler base and with the burner supporting collar 11 which prevent entry of air into the combustion chamber through these connections. The base plate 5, burner supporting collar 11, hearth plate 19 and burner ring 23 form a complete unit which can be inserted through the opening 3, in the boiler base 1 and then lifted and bolted to the underside of the inwardly projecting flange 4 at the top of said boiler base, after which the burner motor 16 may be inserted through said opening and mounted in the supporting collar 11 therefor. In replacing the parts, the base plate 5 is detached from the flange 4 of the burner base, after removing the motor and the control parts, and the entire unit lowered and then withdrawn from the burner base through the opening 3 therein. Normally the oil is completely consumed; but if any unconsumed oil should overflow from the burner ring 23 or be deposited upon the inner wall of the boiler, such oil will drain into the upwardly flanged hearth plate and be retained therein. As soon as normal conditions are reached, the hearth plate will become hot enough to ignite this oil.

In the modification shown in Fig. 4, the device is shown as mounted in a hot water heater. In this construction, the annular base plate 5a rests on the inwardly projecting annular flange 4a at the top of the heater base section 1a and is covered by an insulating layer 7a of asbestos, which extends beneath the bottom of the fire pot section 2 of said heater and is cut away to permit the supporting brackets 8a for the hearth plate 19a to rest directly on said base plate 5a. Extending around the periphery of the hearth plate 19a is a spring ring member 41 that seats within the outer flange 21a of said hearth plate and inclines upwardly towards the fire pot wall. Said ring member may touch said wall. Normally the oil is completely consumed; but if any oil should pass over the top of the burner ring, it will be guided by said ring 41 and deflected to the top of the hearth plate 19a. As soon as normal combustion conditions are reached, the hearth plate 19a will become hot enough to ignite this oil.

A perforated grill member 42, preferably composed of sections, is mounted on the upstanding outer impact wall 25 of the burner ring 23. Each section may have mounting strips 43 secured thereto, as by welding, one portion 44 of each mounting strip having split finger portions 45 fitting over the top of said wall 25, and the other portion 46 being inclined and resting at its lower end against said wall. This gives the grill member 42 an inclined position. The grill member has upwardly bent side flanges 47 and end flanges 48 extending along the openings therethrough.

This modified construction lends itself readily to mounting in a water heater and has the advantages and features of operation hereinbefore set forth.

Obviously numerous changes may be made without departing from the invention and I do not wish to be limited to the precise construction shown.

What I claim is:

1. A liquid fuel burner and hearth construction comprising a base plate having a central opening, a collar mounted in said opening, oil distributing mechanism supported by said collar and projecting into the combustion chamber, brackets on said base plate, a hearth plate mounted on top of said brackets, and a burner ring mounted on said hearth plate.

2. A liquid fuel burner and hearth construction comprising a wall defining a combustion chamber, a heat insulated base plate mounted at the bottom of said wall, oil distributing mechanism operatively supported by the base plate and projecting into the combustion chamber, a hearth plate supported on said base plate, a burner ring mounted on said hearth plate, said hearth plate being shaped to hold liquid, and means for delivering into said hearth plate any liquid that is projected past said burner ring toward said wall.

3. A liquid fuel burner and hearth construction comprising a wall defining a combustion chamber, a base plate mounted at the bottom of said wall and having a central opening, a collar mounted in said opening, oil distributing mechanism supported by said collar and projecting into the combustion chamber, brackets on said base plate, a hearth plate mounted on top of said brackets, a burner ring mounted on said hearth plate, and a ring mounted at the outer periphery of said hearth plate and inclining upwardly towards said wall.

4. A liquid fuel burner and hearth construction comprising a wall defining a combustion chamber, a base plate mounted at the bottom of said wall, liquid fuel projecting mechanism supported by said base plate and extending into the combustion chamber, a hearth plate spaced

above said base plate and supported thereon, and a burner ring disposed between said projecting mechanism and the periphery of said hearth plate.

5. A liquid fuel burner and hearth construction comprising a wall defining a combustion chamber, a base plate mounted at the bottom of said wall, liquid fuel projecting mechanism supported by said base plate and extending into the combustion chamber, an oil retaining hearth plate spaced above said base plate and supported thereon, and a burner ring disposed between said projecting mechanism and the periphery of said hearth plate, said wall having a depending lip overhanging the outer portion of said hearth plate.

6. A liquid fuel burner and hearth construction comprising a wall defining a combustion chamber having a drip edge, a base plate mounted at the bottom of said wall and having a central opening, liquid fuel projecting mechanism extending into the combustion chamber through said opening, a hearth plate supported on said base plate and having an upwardly flanged outer margin extending beneath said drip edge and an upwardly flanged central opening adapted to accommodate said fuel projecting mechanism, and a burner ring adjacent to the periphery of said hearth plate.

7. A liquid fuel burner and hearth construction comprising a base plate having a central opening, liquid fuel projecting mechanism extending through said opening, a layer of insulation on said base plate, a hearth plate spaced above said base plate and supported thereon and a burner ring disposed between said projecting mechanism and the periphery of said hearth plate.

8. A liquid fuel burner and hearth construction comprising a base section having an inwardly extending flange, a base plate operatively sustained by said flange and having a central opening, a collar mounted in said opening, oil distributing mechanism removably supported by said collar and projecting into the combustion chamber, brackets removably supported on said base plate, a hearth plate mounted on top of said brackets, and a burner ring mounted on said hearth plate.

9. A liquid fuel burner and hearth construction comprising a base section provided with an inwardly extending flange and an opening below said flange, a fire pot section supported on said base section, a base plate removably secured to said flange, liquid fuel projecting mechanism operatively supported by said base plate and extending into said fire pot section, a hearth plate supported on said base plate, and a burner ring disposed between said projecting mechanism and the periphery of said hearth plate, said base plate, said hearth plate and said burner ring being adapted to be inserted in and removed from said base section through the opening therein as a unit.

10. A liquid fuel burner and hearth construction comprising a base, a wall mounted thereon and defining a combustion chamber, a base plate mounted on said base and closing that part of the bottom of the combustion chamber which is adjacent to and surrounded by said wall, said base plate having a central opening therein, a hearth plate spaced above said base plate and supported thereon, said hearth plate having a central opening therein, and liquid fuel projecting mechanism supported on said base plate and extending through said opening in said hearth plate.

11. A liquid fuel burner and hearth construction comprising a base, a wall mounted thereon and defining a combustion chamber, a base plate mounted on said base and closing that part of the bottom of the combustion chamber which is adjacent to and surrounded by said wall, said base plate having a central opening therein, a hearth plate spaced above said base plate and supported thereon, said hearth plate having a central opening therein, liquid fuel projecting mechanism supported on said base plate and extending through said opening in said hearth plate, a burner ring structure mounted on the hearth outwardly from said liquid fuel projecting mechanism, and a second ring structure surrounding the burner ring structure, said second ring structure engaging the periphery of said hearth plate and being of materially greater height than said burner ring structure.

12. A liquid fuel burner and hearth construction comprising a base section, a fire pot section supported on said base section, a heat insulated base plate extending between said sections and constituting a partition therebetween, liquid fuel projecting mechanism supported by said base plate extending into said fire pot section, a hearth plate supported on said base section, and a burner ring disposed between said projecting mechanism and the periphery of said hearth plate.

13. In combination, a firepot wall, mounting means for the wall comprising a supporting base provided with a substantially horizontal opening, a liquid fuel burning apparatus readily insertible through the opening in the base into position within the firepot wall at a level adjacent the top level of the base, said apparatus comprising a hearth structure having means for detachable connection with the base, and a fuel projector mounted adjacent the top of the hearth structure.

14. In combination with a firepot wall and a supporting base therefor providing a compartment below the firepot chamber; a liquid fuel burning apparatus mounted adjacent the bottom of the firepot wall, said apparatus comprising a hearth structure readily mountable in preassembled form and having means for detachable connection with the supporting base and designed to separate the firepot chamber from the base compartment when connected to said base, a fuel projector arranged adjacent the top of the hearth structure, driving means for the projector disposed within said compartment and means for mounting said projector and its driving means upon the hearth structure for support as a unit therewith.

15. In a liquid fuel burning apparatus of the type comprising means forming an upright wall surface and a fuel projector located relatively remote from the wall surface and embodying means for throwing fuel toward the latter: a hearth structure disposed below the level of said fuel throwing means and extending across the space between said projector and said wall surface, said hearth structure comprising a substantially horizontal plate having an upstanding flange located adjacent said wall surface but at a greater distance from the fuel projector than is the latter, the lower edge of said flange being continuously joined to the plate, whereby any fuel that strikes said surface without

atomization or vaporization will be prevented from flowing off said plate adjacent said wall surface.

16. In a liquid fuel burning apparatus of the type comprising a rotary head for projecting fuel and air, and an upright wall surrounding said head in spaced relation to the latter; a hearth structure bridging the space between said head and said wall, a collar projecting upwardly through said hearth structure to supply air to said head, and said hearth structure comprising a metal hearth plate having an inner edge upturned and shaped and disposed for snug cooperation with said collar.

17. In a liquid fuel burning apparatus of the type comprising a rotary head for projecting fuel and air, and an upright wall surrounding said head in spaced relation to the latter: a hearth structure bridging the space between said head and said wall, a collar projecting upwardly through said hearth structure to supply air to said head, and said hearth structure comprising a closure plate fitted between said collar and said wall, and a metal hearth plate disposed above said closure plate and having its outer edge free relative to the wall to permit radial expansion and contraction of the metal plate under variations in temperature.

18. In a liquid fuel burning apparatus of the type comprising a substantially horizontal hearth, a substantially vertical wall mounted above the hearth and a fuel and air projector located just above the hearth level at a point relatively remote from said wall, for discharging all of the projected fuel directly through space and without interference into impingement with said wall and for projecting a blast of air along the hearth surface toward said wall: means forming an upwardly and outwardly sloping surface on the hearth as a continuation of the hearth surface adjacent said upright wall, the upper edge of said sloping surface terminating in horizontally spaced relation to said wall, and means providing a sheltered ignition zone below the plane of the upper edge of said sloping surface and adjacent the bottom of the upright wall on that side of the latter which faces the projector.

19. In a liquid fuel burning apparatus of the type comprising an upright wall to be heated, a substantially horizontal hearth below said wall, and a fuel and air projector disposed just above the hearth level at a point remote from said wall, for throwing fuel toward said wall and for projecting a blast of air along the hearth surface toward said wall: a metal combustion member mounted above the hearth in the zone between the projector and the wall, said member comprising means forming an impingement surface spaced materially from said wall and arranged to intercept all of the fuel that is projected toward said wall, a gutter portion integral with said means and disposed below said impingement surface, and an integral air deflecting portion providing a surface sloping downwardly from said gutter portion toward the projector and into continuous close contact with the hearth surface.

20. In a furnace of the type comprising a firepot wall and a supporting base; a substantially horizontal plate carried by the base; a collar extending vertically through said plate and having a lower flange secured to said plate; a hearth spaced above said plate, said hearth surrounding and closely fitting the upper end of said collar and having its outer edge disposed adjacent the firepot wall; and a fuel projector extending upwardly through said collar.

21. In combination with a firepot wall and a supporting base therefor providing a compartment below the firepot chamber; a liquid fuel burning apparatus mounted adjacent the bottom of the firepot wall, said apparatus comprising a readily removable and reinsertible hearth structure separating the firepot chamber from the base compartment, a fuel projector arranged adjacent the top of the hearth structure, driving means for the projector disposed within said compartment and means for mounting said projector and its driving means and said hearth structure as a unit assembly.

22. In combination with a firepot wall and a supporting base for holding it in elevation with respect to a primary supporting surface, a refractory hearth cooperating with said wall to form a liquid fuel burning chamber, said hearth comprising a unit structure made up for bodily insertion and removal through the base, said unit structure being supported in position to bridge the horizontal space surrounded by the top of the base and the bottom of the firepot wall, and means for supplying liquid fuel to said chamber.

23. In a liquid fuel burning apparatus, a hearth structure comprising a plurality of vertically spaced and substantially coextensive plates, each substantially horizontal; a collar extending vertically through and surrounded by each of said plates; a fuel supply mechanism comprising a fuel distributor aligned with the collar and disposed above the uppermost plate; an electric motor aligned with the collar and disposed below the lowermost plate; said plates being substantially imperforate and associated with the collar to insulate the space below the hearth around said motor from the space above the hearth around said fuel distributor; and a driving connection between said motor and said distributor.

24. In combination with a firepot wall and a supporting base for holding it in elevation with respect to a primary supporting surface, a liquid fuel burning apparatus mounted adjacent the bottom of the firepot wall, said apparatus comprising a rigid unitary hearth structure including a metal plate removably mounted on the upper part of said base; a collar projecting upwardly through said plate and detachably secured thereto; and a fuel distributor supported by said collar above said plate; said collar being removable downwardly without removal of said plate, thereby facilitating any necessary dismantling of said distributor.

25. In a liquid fuel burning apparatus, an upright wall having a surface to be heated, said wall being of reduced thickness near its bottom portion to provide a recess in said surface; a liquid fuel projector arranged in offset relation to said surface of said wall; and a metal hearth extending between said projector and said wall, said hearth having an upstanding edge fitted into said recess.

26. A liquid fuel burning apparatus comprising a supporting base and a wall mounted upon said base; a horizontally arranged supporting and insulating structure secured to said base adjacent the bottom of the wall, said structure having a central vertical opening; a fuel distributing head projecting upwardly through said opening and secured to said structure;

and a metal hearth plate fitted between said head and said wall and supported upon said structure.

27. In a liquid fuel burning apparatus of the type comprising means forming an upright wall surface and a fuel projector located relatively remote from the wall surface and embodying means for throwing fuel toward the latter; a hearth structure disposed below the level of said fuel throwing means and extending across the space between said projector and said wall surface, said hearth structure comprising a substantially horizontal plate and a sheet of refractory material extending upwardly from said plate adjacent said wall surface to a height above the path through which the fuel is thrown.

28. In a liquid fuel burning apparatus, a substantially horizontal hearth comprising a metal plate; a substantially vertical wall mounted above the hearth; a fuel and air projector located just above the hearth level at a point relatively remote from said wall for discharging all of the projected fuel directly through space and without interference into impingement with said wall and for projecting a blast of air along the hearth surface toward said wall; and a sheet metal member integrally joined to said metal plate in the path of the projected air blast and sloping upwardly toward the top of said wall.

MILTON A. POWERS.