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HEARTH CONSTRUCTION FOR OIL BURNERS

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*Fig. 1.*

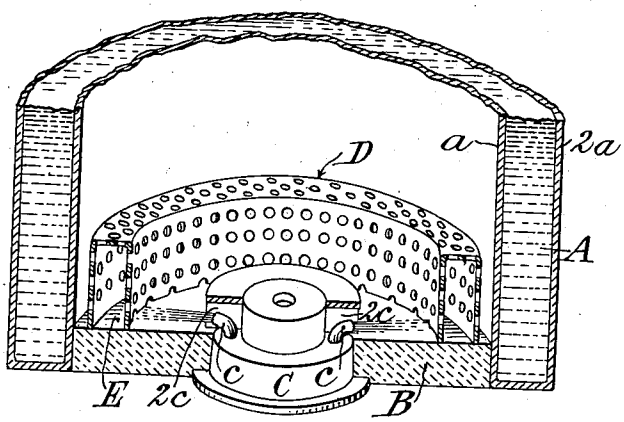



*Fig. 2*

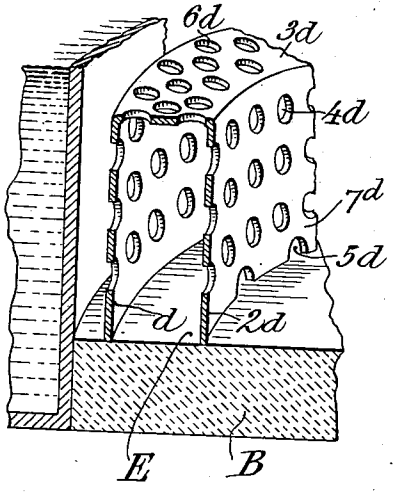
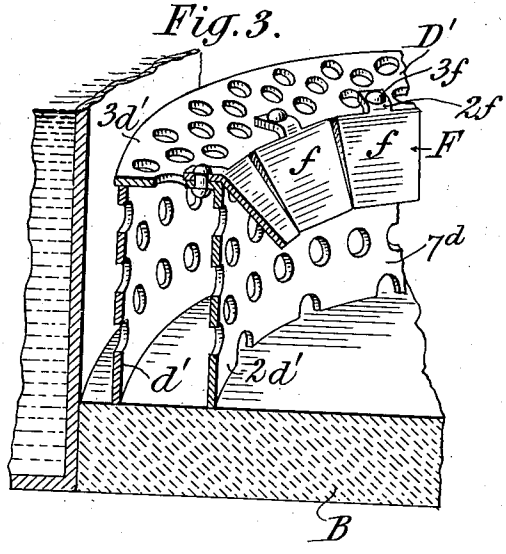



*Fig. 3.*




INVENTOR

Oscar J. Appel,

BY

Fraser, Myers & Manley

ATTORNEYS.

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## HEARTH CONSTRUCTION FOR OIL BURNERS

Oscar J. Appel, Paterson, N. J.

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11 Claims. (Cl. 158—4)

My present invention relates to hearth constructions for liquid fuel or oil burners for household heating and similar uses, and aims to provide certain improvements therein. It has particular application to the vertical rotary type oil burning apparatus wherein oil or other liquid fuel is sprayed from one or more rotating nozzles toward a refractory wall disposed inwardly of the fire box of the furnace, whereat the fuel is ignited and burned.

The primary object of my invention is to generally improve the hearth and fire ring constructions of devices of the type specified so as to produce and maintain a more efficient flame. A further object is to provide a fire ring of simple construction which can be cheaply manufactured, easily installed, removed and kept clean.

The foregoing and other objects of my invention I accomplish by providing in an apparatus of the type specified a fire ring having an annular chamber in the path of the fuel and air discharge, which chamber has openings through its wall exposed to said discharge and also in its top, and which preferably comprises a pair of spaced, perforated refractory walls extending upwardly from the hearth and a perforated top wall bridging the spaced walls.

The invention will be better understood from the detailed description which follows, when considered in conjunction with the accompanying drawing showing two embodiments of my invention, and wherein

Figure 1 is a fractional perspective partly sectional view through an oil burning apparatus embodying my invention.

Fig. 2 is a fractional enlargement of the fire ring of my invention shown in Fig. 1.

Fig. 3 is a view similar to Fig. 2 showing a slight modification of my invention.

Referring first to Figs. 1 and 2 of the drawing, let A indicate the water leg of a suitable steam boiler, said water leg having spaced walls *a* and *2a*, the inner wall *a* of which constitutes the inner wall of the fire box of the furnace. The bottom of the fire box is closed by a hearth B which is preferably formed of refractory material such as fire brick or the like, and centrally of the hearth is located a rotary burner head or fuel discharge means C. This discharge means may be of any preferred construction and usually comprises a plurality of liquid fuel or oil discharge nozzles *c* and a plurality of fan blades or vanes *2c* which are rotatable at a relatively high rate of speed by any suitable means, usually an electric motor (not shown) disposed below or within the ash pit of the boiler.

Adjacent the outer periphery of the hearth B and spaced inwardly from the wall *a* of the boiler is a fire ring D, which, as herein shown, consists of two radially-spaced, vertically-disposed refractory walls *d* and *2d*, which may be of the same height and are preferably bridged or connected together at their tops by a top wall *3d*. The walls *d* and *2d* are preferably each formed with a plurality of openings or perforations *4d* arranged in superposed horizontal rows, the inner wall *2d* having openings or perforations *5d* therethrough at its lower edge whereat it rests upon the hearth whereby to provide openings in said wall at the hearth level thereof, and an imperforate annular fuel impact area *7d* between said perforations *5d* and the lowermost row of perforations *4d*. The top wall *3d* is likewise provided with openings or perforations *6d* therethrough which may be arranged in one or more annular rows or staggered, as desired.

The fire ring D may be formed of any suitable refractory material, but I prefer for the sake of simplicity, economy, ease of installation, cleaning and repair, to make said ring of metal capable of withstanding the heat of the furnace. I prefer the two spaced walls *d* and *2d* and top budging wall *3d* of said ring to be of substantially inverted U-shape in cross-section, and it will be apparent that when made of metal it may be made in any desired manner, for example, from a number of sections suitably formed by casting, bending, stamping or pressing operations capable of ready assembly into an annular ring. It will, of course, be understood that the fire ring need not necessarily be circular, but may, if desired, follow the contour of the fire box or have any other contour. It will also be appreciated that said fire ring may be mounted upon the hearth in any preferred manner and that the hearth may be grooved or channeled or otherwise formed to receive and truly position said ring. The fire ring D, when mounted upon the hearth B, provides therewith an annular chamber E.

In Fig. 3 of the drawing I have shown the fire ring D′ as having a wall *d′* which is formed separately from the inner wall *2d′* and top wall *3d′*, which latter two walls are integral. I have also shown said fire ring D′ as provided with deflector means F extending inwardly and downwardly over the inner wall *2d′* so as to provide a hood which will function to positively direct

the combustible mixtures into or against the annular chamber of the fire ring. Obviously the hood or deflector means F may be made in any desired manner, and as herein shown are in the form of separate elements or plates *f* having lugs **2***f* which are secured to the top wall **3***d'* by rivets **3***f*.

A pilot or other ignition means (not shown) may be located near the inner face of the fire ring at the hearth level thereof or within the chamber provided by the walls of the fire ring for igniting the combustible mixture of fuel and air upon reaching the fire ring.

In the operation of my device it will be apparent that as the burner head or projecting device C is rotated at a high rate of speed, a mixture of finely divided liquid fuel and air is thrown off tangentially horizontally by the nozzles and fan blades of the burner head outwardly toward the fire ring. Substantially all of the projected mixture after impacting the inner wall **2***d* and particularly the imperforate area **7***d* thereof and being deflected therefrom, produces the first stage of the more intimate mixing and causes the combustible mixture upon being ignited by the pilot light, to propagate a flame either along the inner face of the fire ring or within the chamber thereof, or both. As this action proceeds, the fire ring becomes well heated so that upon impact of the fuel and air projected thereagainst by the burner head, efficient fuel gasification and mixing takes place, creating a combustible mixture which is forced through the apertures in the inner wall of the ring into the annular chamber thereof. The injection of the mixture into the hot chamber causes much eddying and a highly homogenized flaming mixture within said chamber. The apertures or passages in the top and rear walls allow the hot products of combustion and flame to expand and pass above and to the rear of said fire ring whereat the heat therefrom is transferred to and absorbed by the boiler. The openings **5***d* at the hearth level are adapted to permit the passage of a portion of the fuel mixture into the inner chamber E at a low level, said portion, as well as the remainder of the fuel vaporizing upon impacting the inner wall or the hearth ahead of the wall, being adapted to be carried by the air blast from the fan blades **2***c* through the openings **4***d* and **5***d* into the annular chamber, or may be sucked therein by eddy currents or flame within the chamber. The perforated top wall **3***d*, in addition to permitting the escape of the hot products of combustion therethrough, functions to provide a protected area or anchorage for the flame passing therethrough for preventing the carrying away of said flame by the strongly propelled air currents which find their way into the chamber. The hood or deflector F serves to confine all of the combustible mixtures produced at the inner face of the fire ring to the vicinity of the fire ring and to cause substantially all of said mixtures to be directed inwardly into the combustion chamber of the fire ring.

While I have shown and described certain preferred embodiments of my invention, I do not wish to be limited to the precise details of construction disclosed, since it will be apparent that the same may be varied within the range of engineering skill without departing from the spirit of my invention.

What I claim is:

1. In a liquid fuel burning apparatus, a fire box, a hearth closing the bottom thereof, means for discharging fuel and air toward the wall of the fire box, and a fire ring adjacent the outer periphery of the hearth comprising spaced perforated refractory walls extending upwardly from the hearth providing an annular chamber and a perforated top wall bridging the spaced walls.

2. In a liquid fuel burning apparatus, a fire box, a hearth closing the bottom thereof, means for discharging fuel and air toward the wall of the fire box, and a fire ring adjacent the outer periphery of the hearth comprising spaced perforated refractory walls extending upwardly from the hearth providing an annular chamber and a perforated top wall bridging the spaced walls, said fire ring being substantially of inverted U-shape in cross-section.

3. In a liquid fuel burning apparatus, a fire box, a hearth closing the bottom thereof, means for discharging fuel and air toward the wall of the fire box to produce thereat a combustible mixture, a perforated refractory wall extending upwardly from the hearth in spaced relation to the wall of the fire box, and a substantially imperforate deflector means extending inwardly from adjacent the top of said refractory wall for directing the combustible mixture of fuel and air toward said refractory wall.

4. In a liquid fuel burning apparatus, a fire box, a hearth closing the bottom thereof, means for discharging fuel and air toward the wall of the fire box, a perforated refractory wall extending upwardly from the hearth in spaced relation to the wall of the fire box, and deflector means extending inwardly and downwardly adjacent the top of the refractory wall.

5. In a vertical rotary type liquid fuel burner, a hearth and a fire ring adjacent the outer periphery of the hearth comprising two radially-spaced, vertically-disposed perforated refractory walls, means at the tops thereof providing a protected area for preventing the carrying away of the flame, and deflector means extending inwardly from adjacent the top of the inner of said walls.

6. In a vertical rotary type liquid fuel burner, a hearth and a fire ring adjacent the outer periphery of the hearth comprising two substantially coaxial-spaced, vertically-disposed perforated refractory walls, a perforated top wall bridging the spaced walls and therewith providing an endless chamber, and deflector means extending inwardly and downwardly adjacent the top of the inner of said walls.

7. In a liquid fuel burner, an ignition or vaporizing wall comprising a refractory element of substantially inverted U-shape in cross-section, the walls and bight of which are perforated.

8. In a vertical rotary type liquid fuel burner, a hearth and a fire ring adjacent the outer periphery of the hearth comprising a perforated metal ring of substantially inverted U-shape in radial section.

9. In a vertical rotary type liquid fuel burner, a hearth and a fire ring adjacent the outer periphery of the hearth comprising a perforated metal ring of substantially inverted U-shape in radial section, each of the walls and the bight of said ring having perforations extending therethrough.

10. In a liquid fuel-burning apparatus, the combination of a centrifugal burner head adapted to discharge a horizontal spray of oil and a draft of air, a fuel impact wall surrounding said burner for intercepting said oil and air, a hearth

extending from the burner head to the wall, said wall having annular perforated areas and having a substantially imperforate annular area between the perforated areas at approximately the oil impact level of said wall.

11. In a liquid fuel burning apparatus, a fire box, a hearth closing the bottom thereof, means for discharging fuel and air toward the wall of the fire box, a fire ring adjacent the outer periphery of the hearth comprising spaced refractory walls extending upwardly from the hearth to form an annular enclosure, the innermost wall of which is adapted to intercept said fuel and air discharge and has perforations therethrough, and a perforated top wall bridging the spaced walls.

OSCAR J. APPEL.