

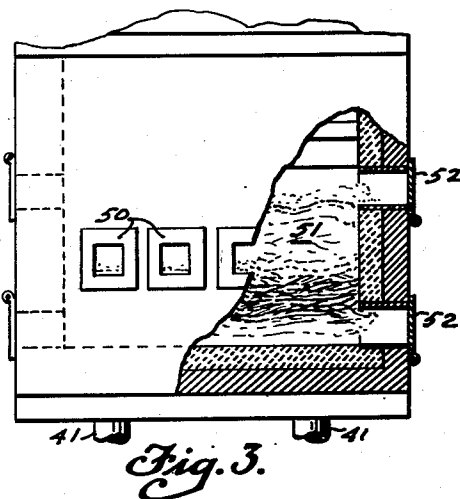
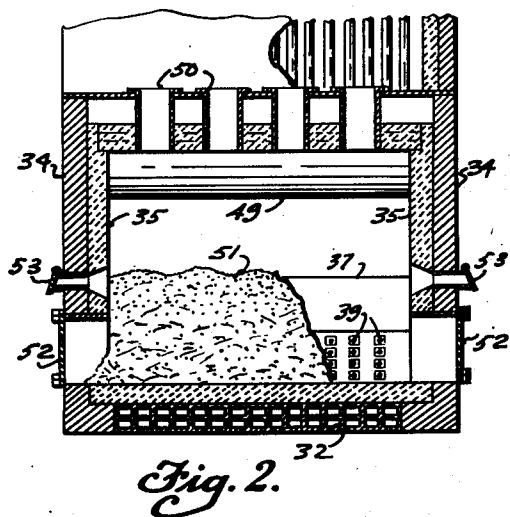
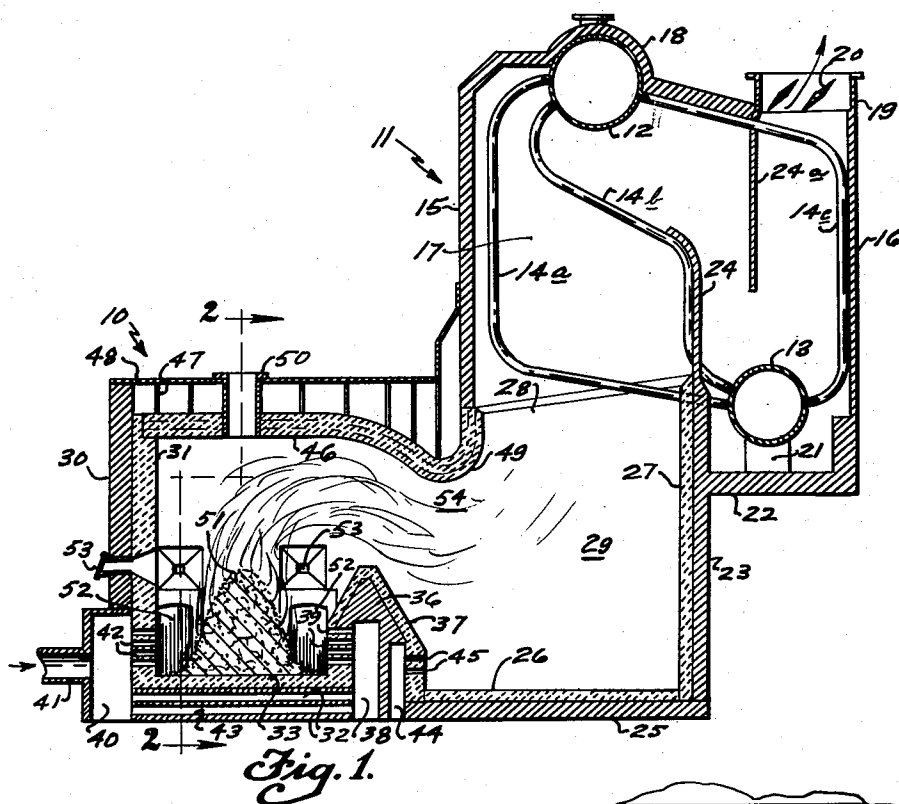
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HEARTH FURNACE

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HEARTH FURNACE

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This invention relates to improvements in hearth furnaces, for heating boilers and the like.

An object of the invention is to provide a hearth furnace which will supply a constant and even flow of heat to the boiler tubes or other surfaces to be heated.

Another object of the invention is to provide a hearth arrangement whereby the ashes may be removed without disturbing the burning fuel pile.

A further object of the invention is to provide a hearth furnace for heating a boiler wherein the operating boiler pressure is maintained while fuel is being added to fuel pile, or while ashes are being removed therefrom.

A further object of the invention is to provide ample storage space for unburned fuel within a hearth furnace, and which space not only positions the fuel for burning but dries the same as well.

These and other objects will become apparent from the following description and the accompanying drawings of an exemplary form of the invention.

Figure 1 is a schematic vertical sectional view of a hearth furnace and boiler assembly embodying the features of the invention.

Figure 2 is a vertical sectional view taken on lines 2—2 of Figure 1 and showing the arrangement of the fuel pile in the hearth furnace.

Figure 3 is a broken plan and sectional view of the furnace and showing the arrangement of the clean out doors with respect to sides of the fuel pile.

The present invention is directed to a hearth furnace construction wherein the fuel pile extends from one side of the hearth furnace to the other for providing a constant and even flow of heat to the surfaces, such as boiler tubes or the like, to be heated. The flowing heat remains uniform across the entire width of the furnace and the boiler assembly, and thereby avoids stratification. The practice has been, in relatively large furnaces of the described class, to provide two or more cells in side by side relation, each containing a fuel pile and fire therein, for the purpose of keeping the fire in one cell burning while the ashes were being removed from the remaining cell, thus allowing only a partial pressure drop in the boiler. By reason of the constantly burning fuel pile of uniform size and width in the present invention, there is no appreciable pressure drop in the boiler, either when adding fuel or removing ashes.

Hearth furnaces, generally, burn inexpensive fuels and waste materials which are added in

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particle form to the fuel pile as needed for maintaining boiler pressure. Most of the fuel used is usually moist and must be dried before it can be burned. As will become apparent from the following description, the present invention not only provides for drying the fuel, but also provides for storage of the same during the drying process.

In the form of the invention shown, the numeral 10 generally designates a hearth furnace connected with the front of a boiler assembly 11 which includes a steam drum 12, lower drum 13, front, intermediate, and rear boiler tubes 14a, 14b, and 14c, all connected with each other in the usual manner. The assembly 11 also includes front, rear and side walls 15, 16 and 17, respectively, together with a top 18 which encloses the steam drum 12. A damper box 19 containing dampers 20 therein is located in the upper rearward part of the top 18. The lower drum 13 is supported on a boiler support 21 mounted on a platform or raised floor 22 secured between the rear wall 16 and an inner wall 23, a baffle 24 extends upwardly from the inner wall 23 and behind the intermediate tubes 14b, and a similar baffle 24a depends from the top 18 between the intermediate tubes 14b and the rear tubes 14c. Both said baffles 24 and 24a are arranged to permit passage of hot gases around their respective ends. The floor 25, inner wall 23, and the side walls 17 are lined with refractory material, as at 26, 27 and 28, to provide a combustion chamber 29. Any suitable refractory material, such as fire brick, not shown in detail, may be used. It is to be understood that the boiler assembly 11 is typical, and comprises no part of the present invention, but is herein described to illustrate the utility of the hearth furnace 10.

The hearth furnace 10 includes a front wall 30 having a refractory liner 31, a floor 32, also covered with refractory material 33, and side walls 34 lined with refractory material 35. The side of the floor 32 opposite the front wall 30 is provided with an upwardly projecting bridge wall 36 which is also covered with refractory material 37. There is a transverse air chamber 38 extending through the bridge wall 36 and is connected with the interior of the hearth furnace 10 by means of tuyères 39, in the manner illustrated in Figures 1 and 2. Across the front wall 30 and at the lower end thereof, there is a transverse air chamber 40 connected with a source of primary air by means of a duct 41. Any suitable means may be used for forcing air into the last described air chamber 40, from where it is communicated with

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the interior of the hearth furnace 10 by means of tuyères 42 extending through the refractory material 31 of the front wall 30. Air is also conveyed from the front air chamber 40 to the air chamber 38 in the bridge wall 36 by means of ducts 43 connected therebetween and extending through the hearth furnace floor 32. Secondary air is supplied to the combustion chamber 29 by means of a cross duct 44 extending through the bridge wall 36, rearwardly of the air chamber 38 therein, and communicating with the atmosphere. The duct 44 is connected with the combustion chamber 23 by means of additional tuyères 45 in the rearward side of the bridge wall 36.

The hearth furnace roof of refractory material 46 covers the floor 32 and the refractory material thereon, and is suspended in position by means of hangers 47 connected with an outer roof or cover 48 of steel or the like and supported by the front wall 30 and the side walls 34. The inner end of the roof 46 is downwardly, thence upwardly curved where it joins the lower front wall 15 of the boiler assembly 11. The curve referred to forms a nose 49 which is positioned rearwardly of and spaced from the upper surface of the bridge wall 36. Spaced fuel feed holes 50, in the form of flanged cast iron ducts, are vertically positioned through the hearth furnace roof 46 and through the cover 48, and are in spaced alignment with each other above the transverse center of the hearth furnace floor 32. The feed holes 50 provide for dropping fuel therethrough to form a fuel pile 51 on the floor 32 and extend from one side wall liner 35 to the other.

Secondary air may also enter the hearth furnace 10 by way of the feed holes 50.

In the form of the invention shown, there are two doors 52 in each wall 34 and positioned opposite the ends of the lower edges of each side of the fuel pile 51 whereby ashes, which fall downwardly from the pile, may be raked out. However, it is to be understood that within the scope of the present invention only one door need be positioned at the end of each lower side of the pile 51. Peepholes 53 are provided in the front and side walls 30 and 34 of the hearth furnace 10 for observing the fuel pile 51 to determine whether or not additional fuel is required, and whether or not the ashes falling to the side thereof need to be removed.

In operation, additional fuel is provided through the feed holes 50 as required, and the ashes falling to the sides of the cross pile 51 are removed as required. The added fuel on the top of the stack is dried by the fire and burns when it becomes dry. The pile 51 itself provides for ample storage whereby the fire may be maintained without frequently replenishing the fuel. By reason of the described construction, a uniform continuous flow of heat is conveyed through the throat 54, formed by the top of the bridge wall 36 and the roof nose 49, into the combustion chamber 23, and upwardly between the forward boiler tubes 14, thence outwardly through the damper box 13. Since the fire from the pile 51 is continuous, and may be added to as required and the ashes removed therefrom without disturbing the flame, there is no appreciable pressure drop in the steam boiler 12 during such operations.

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The present invention is not limited to the construction herein shown and described, but may be made in many ways within the scope of the appended claims.

What is claimed is:

1. In a hearth furnace, a substantially rectangular floor adapted to support waste material fuel, thereon, a front wall and opposing side walls around three sides of said floor, a roof supported on said walls and positioned over said floor, said roof including fuel feed holes therethrough and arranged substantially over the center of said floor along an imaginary line extending from one said side wall to the other said side wall, a bridge wall along the side of said floor opposite said front wall, the top of said bridge wall being spaced below said roof, at least one clean-out door in each said side wall, one of said doors being arranged adjacent said front wall and the remaining said door being arranged adjacent said bridge wall.

2. In a hearth furnace, a substantially rectangular floor adapted to support waste material fuel thereon, a front wall and opposing side walls around three sides of said floor, a roof supported on said walls and positioned over said floor, said roof including fuel feed holes therethrough and arranged substantially over the center of said floor along an imaginary line extending from one said side wall to the other said side wall, a bridge wall along the side of said floor opposite said front wall, the top of said bridge wall being spaced below said roof, two cleanout doors in at least one said side wall, one of said doors being arranged adjacent said front wall and the remaining said door being arranged adjacent said bridge wall.

3. In a hearth furnace, a substantially rectangular floor adapted to support waste material fuel thereon, a front wall and opposing side walls around three sides of said floor, a roof supported on said walls and positioned over said floor, said roof including fuel feed holes therethrough and arranged substantially over the center of said floor along an imaginary line extending from one said side wall to the other said side wall, a bridge wall along the side of said floor opposite said front wall, the top of said bridge wall being spaced below said roof, two cleanout doors in each said side wall, one of said doors in each said side wall being arranged adjacent said front wall and the remaining said doors being arranged adjacent said bridge wall.

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