

June 22, 1948.

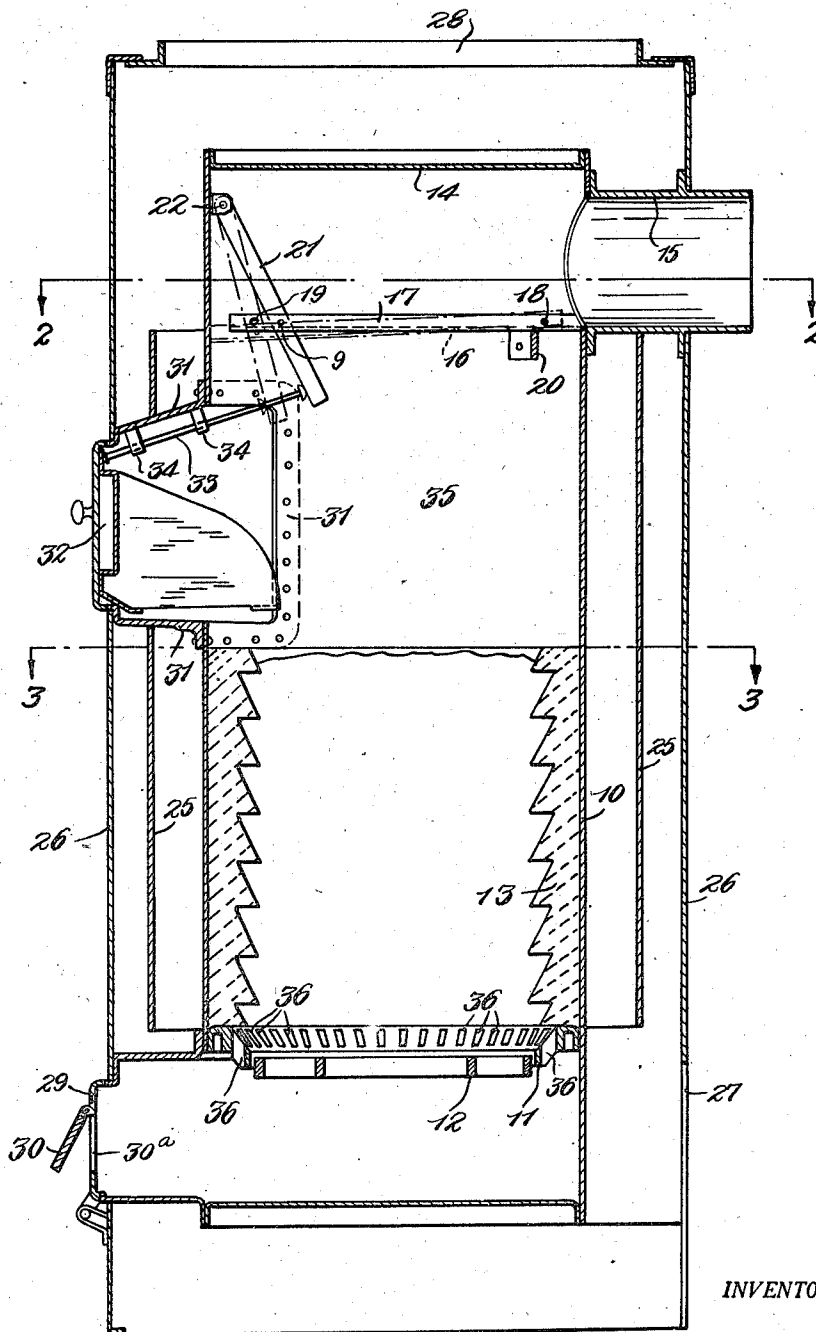
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2,443,910

MOVABLE DEFLECTOR PLATES FOR FURNACES

Filed Dec. 22, 1943

3 Sheets-Sheet 1



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MOVABLE-DEFLECTOR PLATES FOR FURNACES

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3 Sheets-Sheet 2

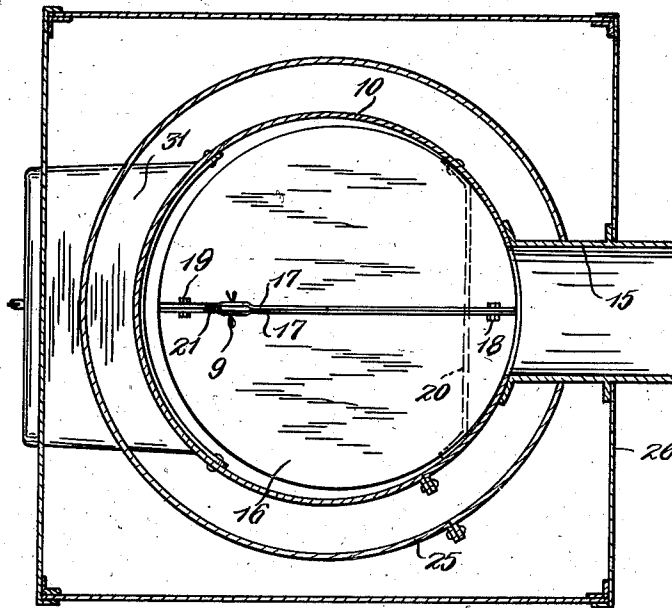


FIG. 2

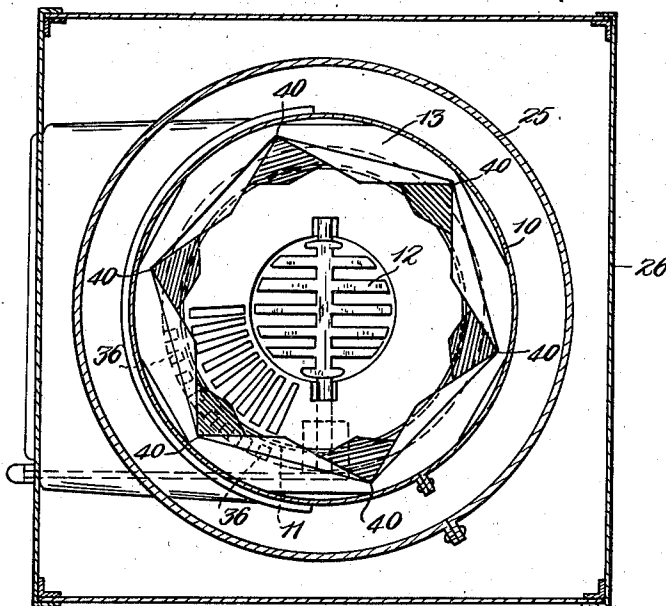


FIG. 3

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3 Sheets-Sheet 3

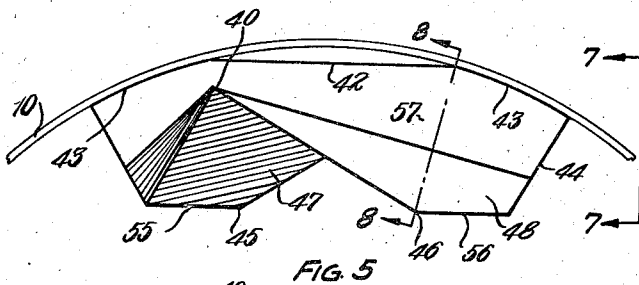


FIG. 5

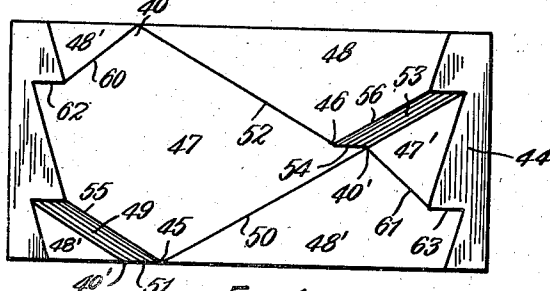


FIG. 4

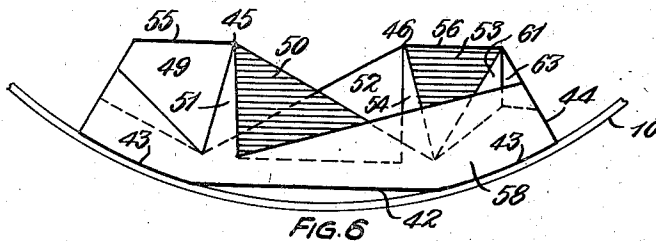


FIG. 6

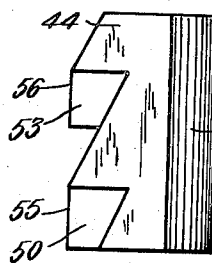


FIG. 7

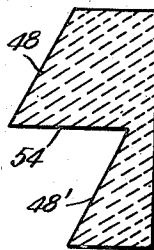


FIG. 8

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2,443,910

MOVABLE DEFLECTOR PLATE FOR FURNACES

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Application December 22, 1943, Serial No. 515,214

3 Claims. (Cl. 126—83)

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This invention relates to improvements in furnaces, particularly furnaces of the magazine type. In certain of its aspects the invention constitutes an improvement over the co-pending application of Eric H. Ryden and myself, Serial Number 449,744, filed July 4, 1942, now abandoned. It comprises however a refractory lining of a character disclosed and claimed per se in my co-pending application, Serial Number 472,965, filed January 20, 1943, now matured into Patent No. 2,378,220, which is a continuation in part of my earlier application, Serial Number 449,743, filed July 4, 1942, now matured into Patent No. 2,365,193.

One of the objects of the invention is the provision in a furnace of the character stated of means for producing a heat pattern extending upwardly from above a lining wall, distributed throughout the extent of that wall, and spaced somewhat from a shell that extends around the wall and upwardly therefrom to constitute a heat exchanger, whereby the heat is concentrated close to the heat exchanger but there is no direct contact between the flame and the heat exchanger, so that the heat exchanger is not deteriorated by excessive temperature nor is combustion retarded by excessive cooling.

Another object of the invention is the provision of baffle means for inducing flow of hot gases along the wall of the heat exchanger, in other words, for insuring the continuation of flow in the pattern induced by the lining formation.

Another object is the provision of means functioning automatically upon the opening of the fuel admission door for shifting the baffle to bypass flow directly to the flue pipe and thereby to relieve pressure in the combustion chamber and thus prevent the discharge of gases into the furnace room.

Another object of the invention is the provision of a furnace of the character stated wherein the structural parts may be largely sheet metal.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which

Fig. 1 is a vertical sectional view of a furnace embodying my invention.

Figs. 2 and 3 are horizontal sectional views, taken substantially on the lines 2—2, and 3—3 respectively of Fig. 1.

Fig. 4 is an elevational view of the fuel confining face of a lining block from a plurality of

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which the lining pattern illustrated in Figs. 1 and 3 may be made up.

Figs. 5 and 6 are top and bottom plan views respectively of the block of Fig. 4.

Fig. 7 is an end view of the same looking in the direction of arrows 7 of Fig. 5, and

Fig. 8 is a detail, sectional view taken substantially along the line 8—8 of Fig. 5.

In the drawings, 10 represents a shell of sheet metal upon which is mounted a grate. In the illustrated case the shell is cylindrical and the grate comprises two elements, an annular member 11 suitably secured to the shell and a circular member 12 surrounded by and supported upon the

annular member. Above the grate 11, 12, the internal surface of the shell is covered by a refractory lining indicated generally at 13, which extends vertically far enough to constitute a fuel magazine of a capacity sufficient to make frequent refueling unnecessary.

The lower portion of the shell constitutes a wrapper sheet for the refractory lining, but in addition it constitutes a heat exchanger inasmuch as combustion occurs throughout the inner face of the lining due to the peculiar formation thereof. That part of the shell which extends above the lining 13 constitutes further heat exchange means, and it is with this latter portion of the heat exchanger that the present invention is more particularly concerned. The upper end of the shell may be closed by a plate 14.

A flue pipe 15 makes connection with the upper part of the shell, and below the opening for this flue connection I mount a circular baffle 16 of somewhat smaller diameter than the inner diameter of the shell, normally positioned tangent to the shell on the flue connection side thereof, as illustrated in Fig. 2. Normally this baffle causes the heat pattern set up at the top of the lining 13 to be continued upwardly, the gases flowing upwardly along the shell, through the space intervening between the shell and the baffle and then over the baffle to the flue pipe 15.

Baffle 16 is formed preferably in two halves, with upwardly extending flanges 17 at the meeting line between the halves, and removable fastening means 18 and 19 extending through the flanges for holding the halves of the baffle together.

Preferably the baffle is movably mounted in order that it may be shifted away from its illustrated tangent position, thereby setting up a bypass for gases and smoke directly into the flue, and preventing their discharge into the furnace

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room when the furnace door is opened. To this end I provide a bar 20 which is secured at its extremities to the shell and serves as a support upon which the baffle 16 is free to slide. That part of the baffle to the left of bar 20 of course greatly overbalances the smaller part to the right of that bar, and this overbalanced part is hung from shell 10 by a lever 21 which is pivotally supported at 22. This lever extends between offset portions of the flanges 17 and has a hole therethrough for the reception of a cotter pin 9 or the like to provide a removable pivotal connection carried by the lever for the support of the overbalanced portion of the baffle.

A second sheet metal member 25 of cylindrical form surrounds shell 10 to provide a radiation shield. The parts thus far described are enclosed within a casing 26 which has a return air inlet at 27 and a heated air exit at 28. As shown, it has an ash door 29 in which there may be mounted a damper 30 controlling an opening 30a through which combustion supporting air may be admitted to the space beneath the grate 11, 12.

31 is a casting which surrounds a fuel admission opening in shell 10 just above the lining 13. The casting 31 is secured to shell 10, extends through an opening in member 25 and meets an opening in the front of casing 26, where it forms the frame for a downwardly and outwardly opening door 32, which is more particularly described in the above mentioned application of Eric H. Ryden and myself.

33 is a bolt which slides freely in a pair of brackets 34 carried by the casting 31. The lower end of this bolt is adapted to be engaged by a door part when the door is closed, and a head on the upper end of the bolt is adapted to engage the lower end of the lever 21. When the door 32 is opened bolt 33 is free to slide downward by gravity, thereby permitting gravity acting upon the lever and the baffle 16 to swing the lever 21 and the baffle 16 from the full line positions of Fig. 1 to the dotted line positions thereof which shifts baffle 16 downwardly and toward the left from its full line eccentric position, thereby automatically opening a direct and short passage from the combustion chamber 35 to the flue pipe 15 and relieving any pressure which may be present in the combustion chamber through the flue rather than through the door opening. When the door 32 is closed, however, bolt 33 is slid upwardly and the head on its upper end engages the lever 21 shifting it back to the full line position and sliding baffle 16 over bar 20 toward the right into its full line eccentric position.

The lining 13 is so formed on its fuel confining face that continuous passages are set up along that face from bottom to top thereof, which passages are distributed in a pattern over that face. The slope of the passages along the wall of the firepot is less than the angle of repose of the fuel, while the slope considered in a radial direction is approximately zero. The annular grate member 11 is formed with air openings 36 therethrough which introduce air to the bottom extremities of these passages. The passages are formed by overhangs on the lining, the under surfaces of the overhangs being so disposed that they have slope less than the angle of repose of the fuel, and consequently do not tend to fill with fuel when the firepot is filled or when the unburned fuel settles in the firepot after some of it has been burned away. The passages remain open, and air and gases are free to flow upwardly through them. Since air is present in

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these passages combustion takes place in them. The proportions of air, combustible gas and products of combustion flowing through the passages, vary with the conditions of operation, but whether or not there is flame at the upper extremities of the passages there will always be a neat pattern of roughly annular form rising from the upper ends of the passages and extending upwardly along the walls of the shell above the firepot but spaced away from these walls.

The detail form of lining may vary more or less as indicated in my co-pending applications above identified, but I prefer a form wherein the passages are arranged in a network pattern of crossed helices. A lining of this character may be constructed of a multiplicity of identical blocks of the form illustrated in Figs. 4 to 8, inclusive. This block per se constitutes an embodiment of the invention of my co-pending application, Serial Number 472,965 above mentioned, where it is described in detail. For the purposes of the present application a short description will be sufficient.

In the drawings each block covers an angle of 60 degrees, so that there are six blocks in each course. The rear face of each block has an intermediate flat surface 42 and two arcuate surfaces 43 of cylindrical contour which are adapted to conform with the inner wall surface of shell 10. The sides 44 of the block conform with radial planes through the axis of the cylindrical shell 10.

The front or fuel confining face of each block has two high points, 45 and 46, that is to say, these are the points which project inwardly in a radial direction furthest from the shell 10. These points are at the lower extremities of plane surfaces 47 to 48, respectively, which are inclined to the vertical. These surfaces overhang the surfaces beneath and to the sides thereof, that is to say, surface 47 overhangs a surface 49 and a surface 50, and a small intermediate surface 51. Similarly, surface 48 overhangs a surface 52, a surface 53 and a small intermediate surface 54. Surfaces 47 and 49 and surfaces 48 and 53 intersect in lines 55 and 56 respectively, both of which lie in a plane that is parallel to the rear surface 42 of the block. The top of each block has a flat surface 57 while the bottom thereof has a flat surface 58 in the same plane with surface 51. The surfaces 50, 51, 52, and 54 are in planes substantially at right angles to the rear surface of the block, except that allowance is made for draft in molding. The same is true of triangular surfaces 60, 61, 62, and 63. Surfaces 50 and 52 in the middle of the block and the triangles 51 and 54 are complete. Most of the other surfaces are continued in the blocks on either side or above and below, two surfaces at the left side of the block and one at the bottom thereof being marked 48' because they are continuations of the surface 48 in the next block to the left and the next block below, and a surface at the right side of the block being marked 47' because it constitutes a continuation of the surface 47 of the block next to the right. The surfaces 60, 62 together constitute a continuation of the surface 53 of an adjacent block, and the surfaces 61, 63 together constitute a continuation of the surface 49 of an adjacent block. When a lining is assembled the blocks are arranged in vertical alignment, that is to say, they are not staggered in the manner of the bricks of a brick wall.

It will be observed therefore that the overhung passages of a complete lining are arranged in a pattern which roughly approximates crossed

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helices, that is to say, each helix is made up of a series of plane surface increments which approach a true helix. The passages defined by these overhung surfaces extend from bottom to top of the firepot, their upper ends terminating at the points marked 40. Two oppositely inclined helices meet at each of these points. Hence there are twelve helical passages distributed around the firepot. These passages are nonre-entrant, that is to say, the overhung surface does not incline downwardly in a radially inward direction. Hence, gases flowing along the passages can escape without flowing in a downward direction, and the low slope of the passages tends to promote such escape. Especially, in the region near the top of the fuel bed escape of the gases is rendered the more likely because the cross-sectional area of the passages decreases toward the points 40 with the result that the gases tend to be crowded out largely before reaching such points. Hence, each helical passage will be discharged at the top of the fuel bed, not with concentration at the point 40, but rather with substantial lateral distribution each way therefrom. The resulting heat pattern practically attains continuity all around the firepot.

While the disclosure herein is of a furnace embodying a cylindrical firepot it is to be understood that in its broader aspects the invention is applicable to furnaces having firepots other than those of circular cross-section, or to certain firepot face portions only.

I claim:

1. In apparatus of the character described, a magazine firepot comprising an upright cylindrical fuel enclosing wall, a shell of cylindrical form extending upwardly therefrom to constitute a heat exchanger, a flue pipe connected with said shell at one side and near the top thereof, a circular baffle of smaller diameter than the interior diameter of said shell horizontally mounted below said flue connection and normally disposed tangent to the shell on the flue connection side thereof, a fuel admission opening in the shell above said firepot diametrically opposite said flue connection, a furnace door controlling said opening, and means operatively associated with said door for causing said baffle to have translatable motion away from the flue connection side of the shell to open a direct path of discharge from said firepot to the flue when the door is moved from closed to open position.

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2. In apparatus of the character described, a magazine firepot comprising an upright cylindrical fuel enclosing wall adapted to promote combustion peripherally of fuel-within said firepot, a shell of cylindrical form extending upwardly therefrom to constitute a heat exchanger, a flue pipe connected with said shell at one side and near the top thereof, a circular baffle of smaller diameter than the interior diameter of said shell horizontally mounted below said flue connection and normally disposed tangent to the shell on the flue connection side thereof, a fuel admission opening in the shell above said firepot diametrically opposite said flue connection, a furnace door controlling said opening, and means operatively associated with said door for causing said baffle to have translatable motion away from the flue connection side of the shell to open a direct path of discharge from said firepot to the flue when the door is moved from closed to open position.

3. In a furnace of the class described and having an upright cylindrical wall with a forwardly located fuel admission opening and a rearwardly located flue outlet opening, said flue outlet opening being located at a level above that of said fuel inlet opening, circular baffle means of smaller diameter than that of said wall, disposed at a level between said openings, and means mounting said baffle means for translatable fore and aft adjustment between a rearward location adjacent said flue outlet opening and a forward location adjacent said fuel inlet opening.

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