Nov. 16, 1954 R. E. SAMPSON 2,694,370

MOIST FUEL BURNING FURNACE

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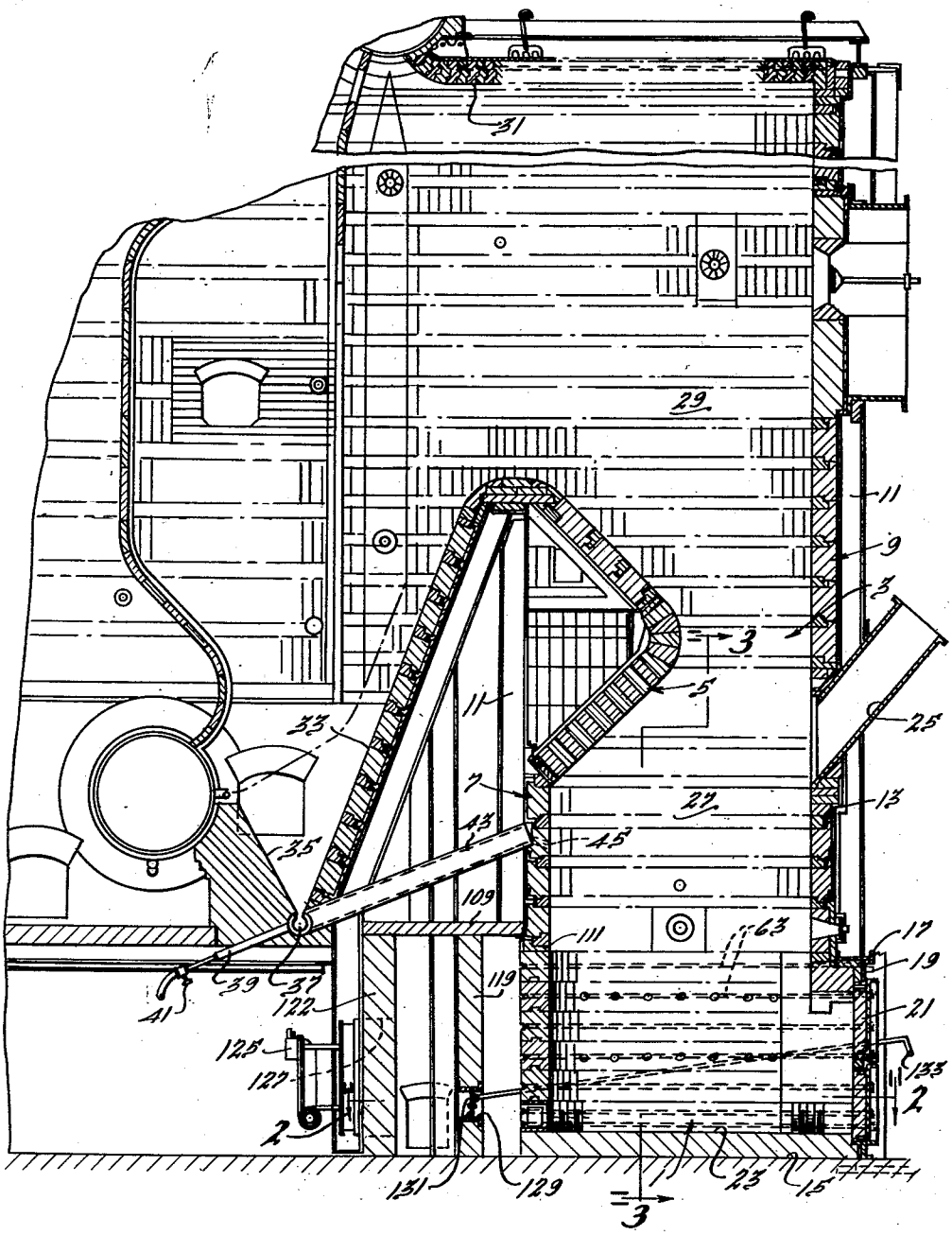


Fig. 1.

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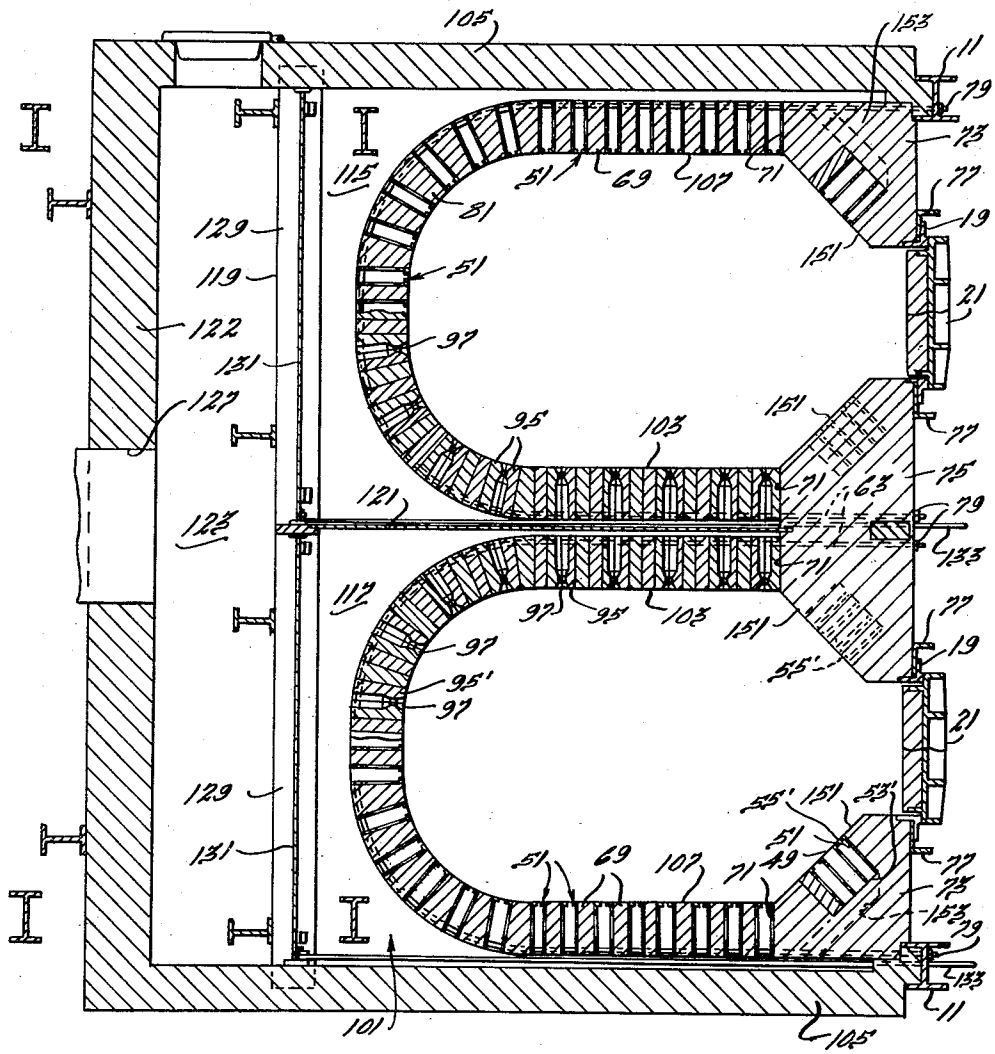


Fig. 2.

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MOIST FUEL BURNING FURNACE

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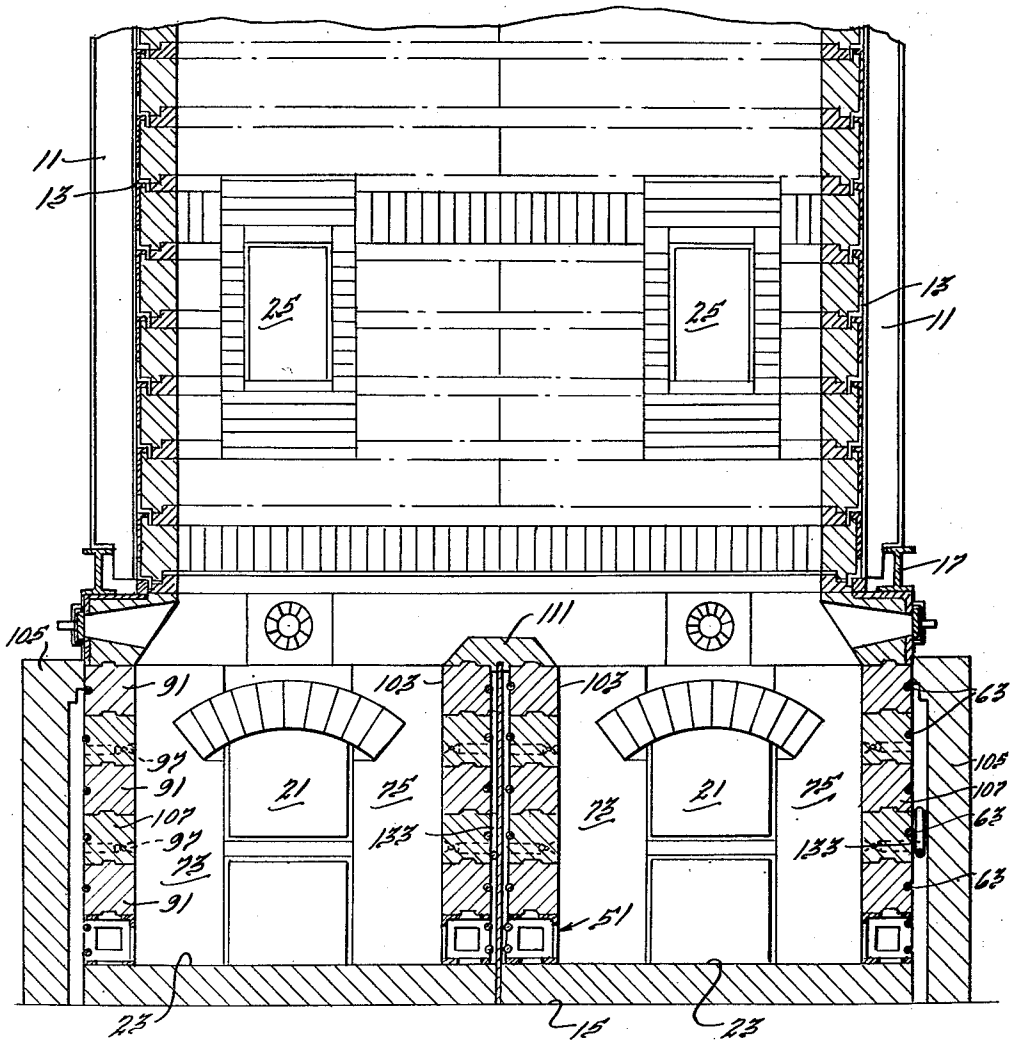


FIG. 3.

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MOIST FUEL BURNING FURNACE

Filed Jan. 15, 1952 7 Sheets-Sheet 4

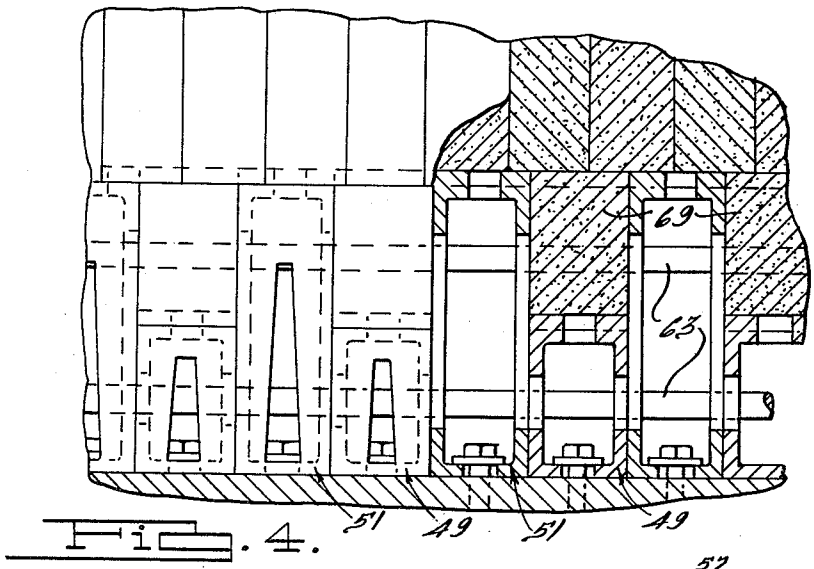


Fig. 4.

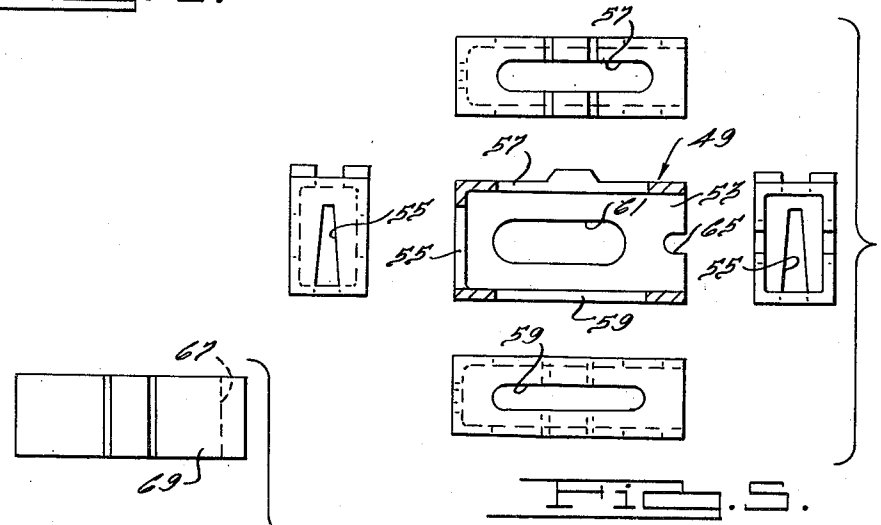


Fig. 5.

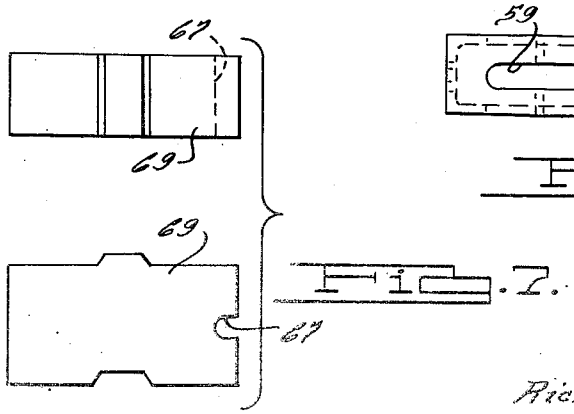


Fig. 7.

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MOIST FUEL BURNING FURNACE

Filed Jan. 15, 1952

7 Sheets-Sheet 5

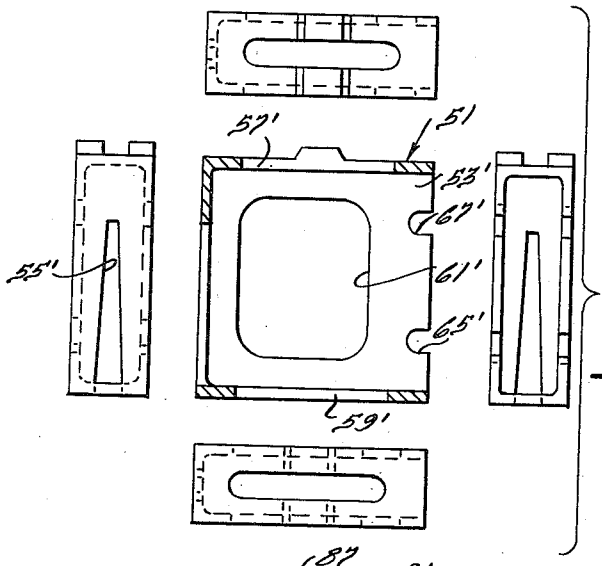


FIG. 6.

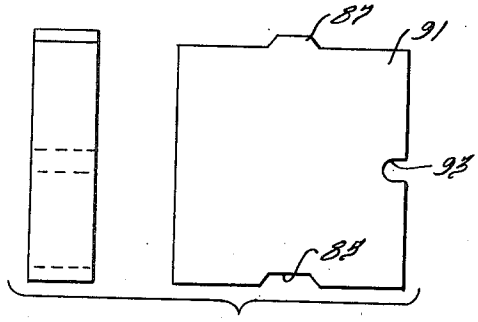


FIG. 9.

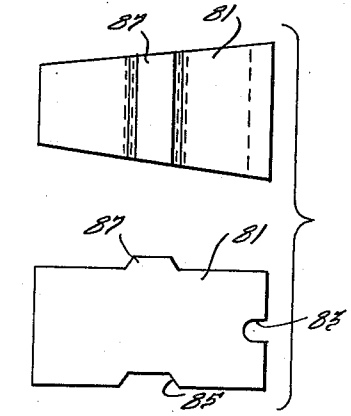


FIG. 8.

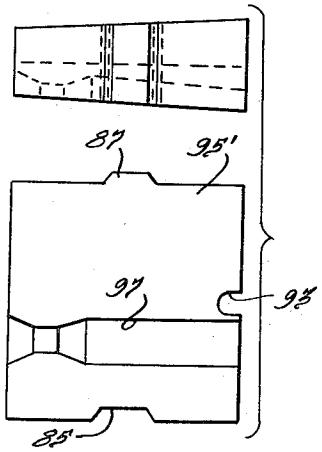


FIG. 11.

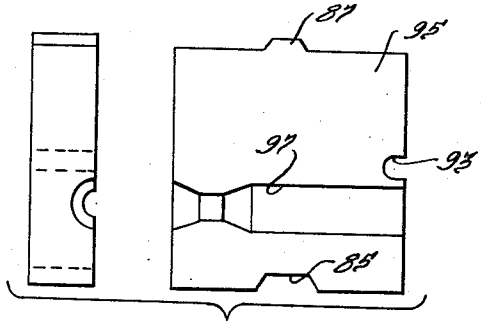


FIG. 10.

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MOIST FUEL BURNING FURNACE

Filed Jan. 15, 1952 7 Sheets-Sheet 6

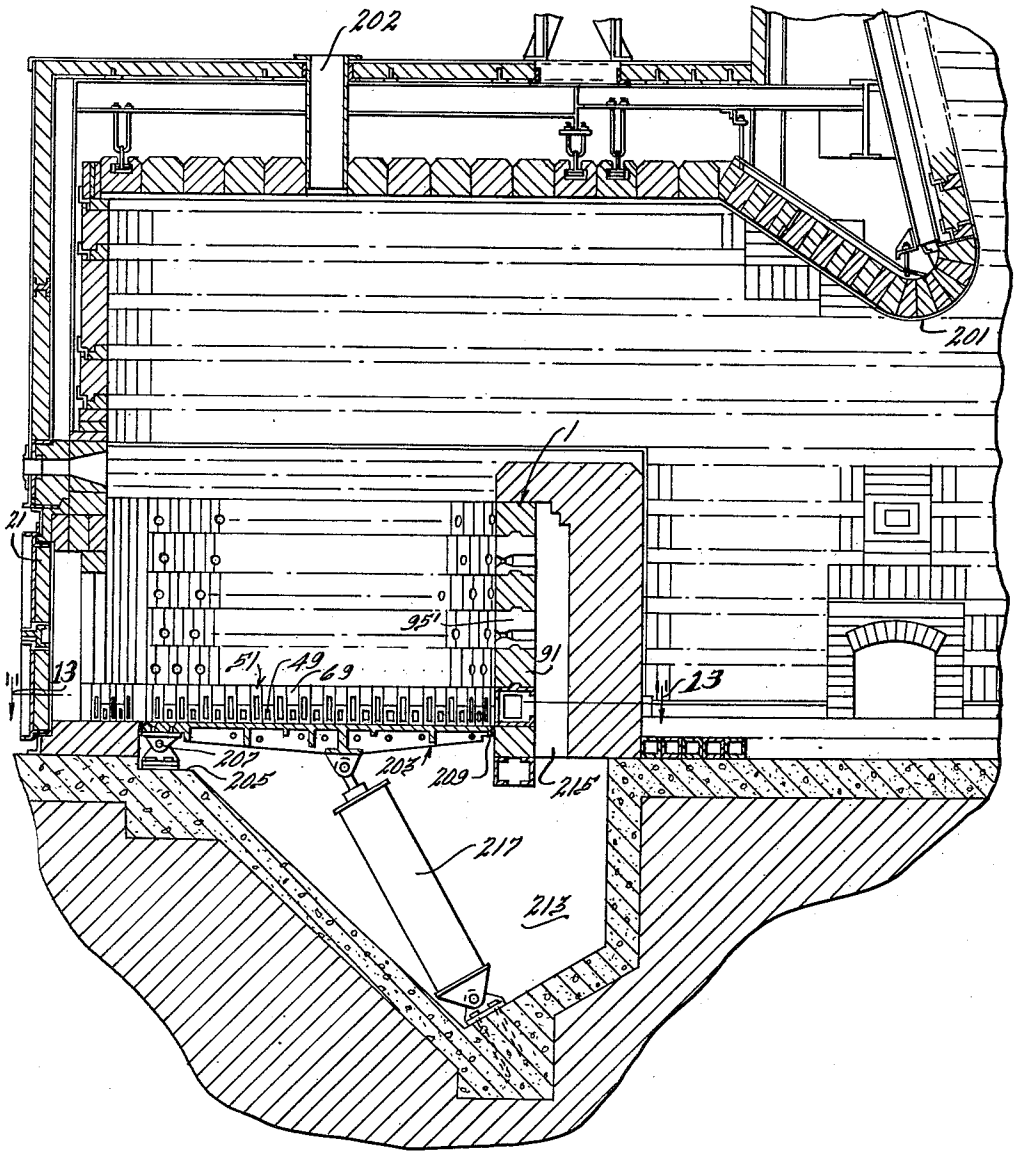


Fig. 12.

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MOIST FUEL BURNING FURNACE

Filed Jan. 15, 1952 7 Sheets-Sheet 7

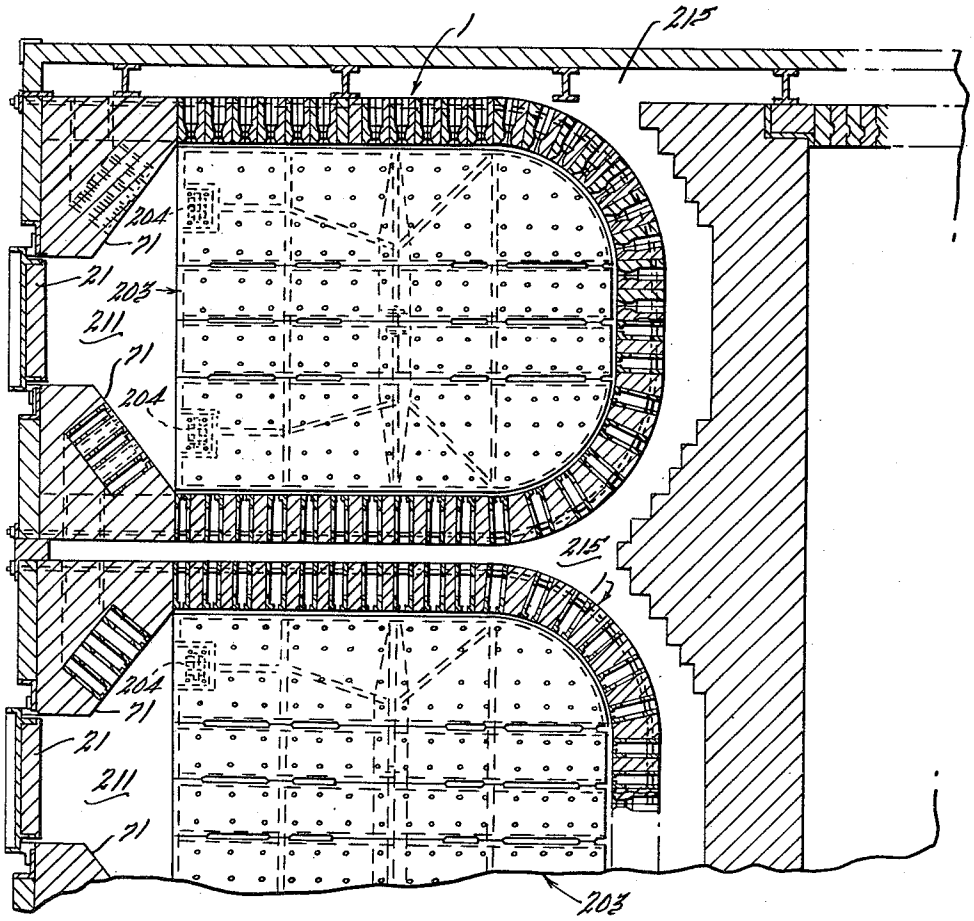


Fig. 13.

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United States Patent Office 2,694,370 Patented Nov. 16, 1954

2,694,370

MOIST FUEL BURNING FURNACE

Richard E. Sampson, Detroit, Mich., assignor to Bigelow-Liptak Corporation, Detroit, Mich., a corporation of Michigan

Application January 15, 1952, Serial No. 266,489

6 Claims. (Cl. 110—7)

My invention relates to industrial furnaces and, in particular, to moist fuel burning furnaces, e. g., bagasse furnaces.

As pointed out in more detail in my copending application, Serial No. 266,490, entitled "Furnace," filed January 15, 1952, the cane sugar industry is a principal user of one type of moist fuel, namely, refuse or bagasse from the grinding of sugar cane, and has, in the past, been perhaps more concerned with the continuity of operation of a furnace than with its efficiency in burning the fuel. Likewise, continuity or reliability of the furnace was likely to overshadow its original cost or cost of maintenance. In recent years, at least two factors have contributed to an increased attention on the part of this industry to efficiency of operation and to the cost of installation and operation. First, there is a tendency toward increasing the yield of the sugar cane and toward the use of steam for other purposes, such as pumping water for irrigation or refining the syrup at the mill. These demands either reduce the quantity of bagasse that is available at the mill or increase the steam requirements so that, instead of a surplus of bagasse being available, there may actually be a shortage if it is not efficiently used. Second, in certain sugar cane areas, Louisiana, for example, other cheap fuels such as natural gas have become available. Units utilizing these fuels are naturally competitive to the bagasse furnaces, so that in these areas, at least, the cost of installation, operation, and maintenance is now a consideration of primary importance.

There are several distinct types of furnaces for burning bagasse but, for various reasons, the hearth or cell type is perhaps most widely used. In this type of furnace, the bagasse is burned in piles on the floor of the hearth and combustion air is furnished to the sides of the pile by tuyères in the side wall of the hearth cell. In the past, the cell walls have been constructed of solid masonry with tuyères therein and the nature of this construction is generally such that very non-uniform distribution of air is obtained. This has resulted in a high percent of excess air and in high carry-over of unburned bagasse and thus in low efficiency. Furthermore, walls of masonry are expensive to construct and repair particularly when elaborate expansion joint arrangements are included. In view of the trend in the industry that is noted above, there is now a demand for improvements in this type of furnace which will improve its efficiency and the economics of its installation and operation.

I have found that by using mechanically interlocked tile to construct the cell the undesirable attributes of the prior cells can be in large measure overcome. A more uniform and more easily controlled distribution of air is possible; and the construction is thinner, lighter, and less costly to install or repair. Furthermore, my tile cell construction is stabilized without the need for masonry bonding or elaborate expansion joints. Where more than one cell is used in a furnace, my invention makes it possible to completely shut off all combustion air to any individual cell without shutting down the air to all the cells in the furnace, a feature of importance in maintaining boiler capacity during cleaning.

While my invention is illustrated in connection with two particular types of furnaces, it will be appreciated that it can be used in various other types and also that various types of boilers may be fired with the furnaces, such as a straight tube, bent tube, etc.

In the drawings;

Figure 1 is a vertical section through one type of bagasse furnace embodying the invention, parts of the furnace and boiler installation being broken away and the boiler tubes being omitted;

Fig. 2 is a cross section taken along the line 2—2 of Fig. 1;

Fig. 3 is a section taken along the line 3—3 of Fig. 1;

Fig. 4 is a view and section of the lower portion of the fuel cell wall, looking outwardly from the interior of the cell;

Fig. 5 includes top and bottom plan views and left- and right-hand side elevations and an axial section through one of the bottom castings used in the present invention;

Fig. 6 is similar to Fig. 5 and shows another and larger one of the bottom castings;

Fig. 7 is a side elevation and top plan view of a filler tile used in the present invention;

Fig. 8 is a side elevation and top plan view of another type of tile used in practicing the invention;

Fig. 9 is a side elevation and a rear view of another of the tile shapes used in practicing the invention;

Fig. 10 is a side elevation and rear elevation of another tile shape used in practicing the invention;

Fig. 11 is a side elevation and top plan view of another tile shape used in practicing the invention;

Fig. 12 is a vertical section through a different type of furnace embodying my invention and including the tilting floor of my copending application; and

Fig. 13 is a cross section taken on line 13—13 of Fig. 12.

Fig. 1 illustrates my improved hearth or cell construction 1 in conjunction with the well-known Ward type bagasse furnace. In this furnace, the cell (or cells) is directly below the restricted throat 3 formed by the suspended arch 5. As pointed out hereinbefore, the invention may be used with other types of furnaces, and the one shown herein is merely intended to illustrate a commercial embodiment of the invention. In accordance with the invention, it is preferred that the side walls 7 and 9 of the furnace be suspended on suitable vertical columns 11 so that their weight does not rest on the side walls of the cells 1, though, as will be evident hereinafter, the cell walls are capable of taking at least some degree of vertical loads. Suspended wall designs are well-known, though, to my knowledge, none have been used before to take the load from the walls of the fuel cells in bagasse furnaces, and generally comprise vertically spaced horizontally disposed hanger bars 13 that may be of the Z-shape illustrated with one flange welded or bolted to the columns 11. The various tile blocks and refractory material are suspended on the horizontal sections of the hanger bars 13 so that their weight is transmitted directly to the columns 11 from the bars and thence into the foundation 15 beneath the furnace. In the construction shown in Fig. 1, the right-hand column 11 rests on a horizontal beam 17 which, in turn, transmits the load to the door frames 19 at the front of the furnace, the door frames resting on the foundation 15. The door frame 19 and Dutch door construction 21 that is shown herein forms the subject matter of a copending application of my co-worker, Robert A. Banck, entitled Moist Fuel Burning Furnace Door Construction, Serial No. 314,901, filed October 15, 1952, which application has been assigned to the same party as the present application.

Bagasse is supported in a conical pile, in accordance with conventional practice, on the floors 23 of the cells 1. The floors may be of refractory material, or of metal, or of the dump-grate design described and claimed in my copending application, Serial No. 266,490, filed January 15, 1952, entitled "Furnace." The bagasse is fed to the cells 1 by means of chutes 25 which, in the furnace illustrated, are mounted in the front wall 9 of the furnace, it being recognized that other designs of furnaces may have other locations for the chutes or other means for feeding the fuel to the cells 1. The bagasse slides by gravity through the chutes 25 to land in heaps on the floors 23 of the cells. When the fuel is burned, the products of combustion along with a certain amount of unburned bagasse rise from the cell into the chamber 27 below

the arch 5 and thence pass through the restricted throat 3 into the chamber 29 above the throat. The roof 31 of the furnace illustrated prevents further upward movement of the products of combustion and causes them to flow to the left over the top of the arch construction 5 and over the boiler tubes (not shown) which are supported to the left of the arch construction 5. The back wall 33 of the arch 5 is inclined, as shown, and acts with an inclined wall 35 to form a trough or funnel into which the solid, unburned fuel descends to be collected in a horizontal pipe 37. A steam line 39, with a valve 41 for control, opens into one side of the tube 37 and blows the unburned fuel into the outlet tubes 43 which open into the rear wall 7 of the furnace, as shown at 45, so as to blow the unburned fuel back into the chamber 27 where it will be mixed and burned with the rising products of combustion from the cells.

In the furnace illustrated, two cells constructed in accordance with the present invention are used and they are located side by side as will be seen clearly in Figs. 2 and 3. The cells are of identical construction and each preferably includes a bottom course of cast metal blocks such as shown in detail in Figs. 5 and 6 and in assembled condition in Fig. 4. Blocks 49 and 51 (Figs. 5 and 6, respectively) of two different heights are preferably used so as to provide a staggered arrangement of base castings which will serve to key in the tile in the courses above. The blocks 49 and 51 are preferably formed of cast iron but may be formed of other metals, including heat-resistant alloys, as desired. As will be seen, the blocks 49 and 51 are almost identical in their structural features, the principal difference being that the various features are twice as high in the larger block 51. The blocks 49 and 51 are hollow and have open rear sides 53 and 53', respectively. The front faces of the blocks have vertically tapered openings 55 and 55' therein which extend over a major portion of the height of the block and which are of substantially less width than the blocks. The top and bottom sides of the blocks 49 and 51 have openings 57 and 57' and 59 and 59' therein. The vertical sides of the blocks have openings 61 and 61' therein, and it will be seen in Fig. 4 that when the blocks are placed in position next to each other the openings 61 and 61' are in alignment so that if no solid blocks are used the interior of the hollow castings communicate with each other throughout the entire length of the bottom course. As indicated in Fig. 4, the blocks may be bolted to the floor 23 by bolts extending with clearance through holes in the bottoms of the blocks 49 and 51 so as to make some shifting of the blocks possible.

The cells 1 are preferably of the U-shape illustrated. The U-shaped course of blocks 49 and 51 is stabilized against expansion and individual blocks are held tightly against each other by means of U-shaped retaining bars or cables 63, best seen in Fig. 2. Each block 49 has a notch or recess 65 in its rear side to receive the retaining member 63. The blocks 51 have notches 65' in their rear sides which are on a level with the notches 65 so that a common retaining member 63 may be used for the blocks 49 and 51. The blocks 51 also have notches 67' on a level above the notches 65' (and in alignment with notches 67 formed in a filler tile 69 that fills the spaces between the staggered blocks 49 and 51) so that it will be seen that two retaining members 63 are used to hold the blocks 51 in place.

The retaining members 63 hold the blocks against the flat vertical front faces 71 of the masonry pillars 73 and 75 formed at the front of the furnace and the front of the cells 1. The pillars 73 and 75 may be constructed in accordance with previous practice in building moist fuel cells and they preferably abut against certain of the vertical columns 11 and 77 which form a part of the structural steel framework for the furnace. The masonry pillars 73 and 75 will ordinarily comprise refractory bricks bonded together and to the floor 23 by masonry cement. The retaining members 63 extend through suitable notches or apertures in the pillars 73 and 75 so that the ends of the members are accessible from the front of the furnace. Suitable nuts 79, or other types of clamping devices, are secured on the ends of the retaining members and shoulder against the front faces of the pillars or against the steel framework whereby tension may be readily applied to or relaxed in the members 63. It will be seen from Fig. 2 that the members 63, in conjunction with the wedge-shape of the blocks in the curved portions of the cell wall courses, act to hold the individual blocks tightly together and against the faces 71 so that a sufficiently stable construction is obtained.

The bottom course of the cell walls are preferably formed of the metal castings 49 and 51 because of their ability to resist the wear and breakage occasioned by the use of pokers by the operators in cleaning out the cells. It will also be recognized that the ease with which they can be made hollow and provided with large openings well adapts them to furnish the large volume of primary combustion air that is needed at this bottom level of the cells. The curved sections of the course may be formed by tapering the blocks 49 and 51 or by filling in with tapered tile, such as shown in Figs. 8 and 11.

The courses above the bottom course provided by the metal blocks 49 and 51 are conveniently and economically made up of refractory tile pieces such as shown in Figs. 7–11. Intermediate the blocks 51 and resting on the tops of the blocks 49 are tile of a height such that when combined with the blocks 49 their top faces are on a level with the top faces of the blocks 51, though it will be appreciated that the intermediate refractory blocks could terminate on a higher level than the blocks 51 so as to provide a certain additional amount of lateral keying. The filler tile are of rectangular shape as illustrated by the tile 69 in Fig. 7 and also of wedge-shape to go around the curved portions of the side wall as illustrated by the tile 81 in Fig. 8. The tile 81 and 69 have notches 83 and 67 which will be on a level with and in alignment with the notches 67' in the blocks 51 whereby a common retaining member may be used for them. The blocks 49 and 51 and all of the tile have transverse key slots 85 formed in the bottom faces thereof and transverse keys 87 projected from the top faces thereof which will fit into the slots 85. It will be recognized that these serve to mechanically interlock the adjacent courses of tile and blocks to prevent relative horizontal movement thereof and to distribute horizontal or transverse loads throughout the height of the cell side wall. Sufficient clearance is provided between the slots 85 and keys 87 to permit easy assembly.

On top of the bottom course provided by the blocks 49 and 51 and the tile 69 and 81 may be placed a course of solid tile 91 (Fig. 9) which will include also suitable wedge-shaped tile for going around the curved sections. The tile 91 have notches 93 located in alignment with each other to receive a retaining member 63 for holding them against the front faces 71 of the pillars.

The third course of tile in the cell wall may be formed of blocks 91 and also blocks 95. The blocks 95 are of left- and right-hand sections, each having one-half of a venturi-shaped tuyère passage 97 formed therein; and tile 95' similar to the tile 95 but of wedge shape may be used in conjunction with the tile 91 and 95 to complete the third course. It will be seen that the tuyères provided by passages 97 will furnish secondary combustion air at a desired level. The fourth course of tile, illustrated in Fig. 1, may be similar to the second, and the fifth course may be similar to the third course so as to supply additional secondary air. A top course may be formed of tile 91 and suitable masonry filling connects their tops to the suspended side walls, as seen in Fig. 3.

It will be seen that the various shapes of tile and blocks 49 and 51 are assembled very simply and easily and that they can be used to form various sizes and shapes of cells.

As seen clearly in Figs. 2 and 3, each of the cells 1 has its own side wall which is spaced from and independent of the side wall of the other. It is, therefore, possible to isolate one of the cells from the air supply without interfering with the air supply to the other. As a consequence, air to one of the cells can be shut off while the other is still operating and steam can be maintained in the boiler with a minimum of dilution by excess air of products of combustion emanating from the operating cell. When this feature is combined with my tilting floor, as mentioned hereinafter and in my aforesaid copending application, it will be seen that it is possible to clean out the cells very quickly with virtually no loss in steam.

The cells 1 are placed in a suitable air chamber 101 which is constructed so that air can reach the chamber

27 in the furnace only by passing through the passages 97 in the tile 95 and 95' and through the hollow blocks 49 and 51, that is, there is no short-circuiting of air directly into the chamber 27. Since the cells 1 are spaced transversely away from each other, it will be seen that air can flow between them and thence laterally in opposite directions through the tuyères in the side wall sections 103 of the cells. The chamber 101 includes side walls 105 on opposite sides of the furnace that are spaced outwardly from the side wall sections 107 of the cells so that air can flow between the side walls 105 and 107 and thence through the openings in the cell side wall into the interior of the cells. The chamber 101 has a roof or ceiling 109 which includes suitable sections 111 for engaging the top surfaces of the cell side walls to prevent by-passing of air from the chamber 101 into the chamber 27.

In order to provide for isolation of air flow to the respective cells, the chamber 101 may be subdivided into two compartments 115 and 117, each containing a single cell 1, by means of the transverse wall 119 and the longitudinal partition 121 between the wall sections 103 of the cells. The wall 119 and the rear wall 122 of the chamber 101 define a plenum chamber 123 into which air is forced under pressure by the blower 125 through an opening 127 in the wall 121. The wall 119 has elongated, transverse openings 129 in it to admit ample air to each compartment 115 and 117. The openings 129 may be closed separately by means of dampers 131 pivotally mounted therein. Longitudinally extending damper control rods 133 for each compartment are mounted in the front wall of the furnace and accessible from the front of the furnace. The rods are secured by suitable means to the dampers so that longitudinal movement of the rods 133 will shift the dampers to open or close the openings 129. Thus, air to one of the cells 1 can be cut off while it is being cleaned while air is still supplied to the other cell.

The pillars 75 and 71 have vertical faces 151 facing inwardly toward the cell and which are inclined toward the door 21. Tuyères or air openings may be formed in the pillars to open out of the faces 151 and thus direct air into the front end of the chamber, it being recognized that ordinarily the pile of bagasse will not project substantially forwardly of the faces 71. The tuyères in the pillars 73 and 75 are conveniently provided by embedding blocks 49 and 51 in the masonry so that the openings 55' are in the face 151. The rear openings 53' in the blocks communicate with passages 153 that are formed in the pillars and which open into the space between the wall 105 and the side wall sections 107. Thus, air in the chamber 101 will flow through passage 153 and through the blocks 49 and 51 out of the face 151 into the cells. The embedded blocks 49 and 51 or other air openings are preferably used on both sides to give good air distribution.

Those in the art will recognize that the cell construction that has been described herein is extremely simple and easy to construct as compared with solid masonry heretofore used, and that it is thinner, lighter, and less costly. Furthermore, no elaborate expansion requirements need to be incorporated into the cell side wall. The means for admitting air to the interior of the cell is simplified and it is not necessary to cut intricate air passages through solid masonry or to attempt to form them in the masonry during or after construction. At each level, the various passages for air through the side wall of the present cell impose substantially equal resistance to air flow so that very uniform conditions are obtained within the cell, a feature in marked contrast with the commercial forms of old types of cells.

Figs. 12 and 13 show that the cell 1 may be used in other types of furnaces. The furnace shown in these figures is of the Dutch oven construction with a secondary combustion chamber to the rear of the cell. Cells 11 are in a furnace section located forwardly of the arch 201 and a feed chute 202 is located in the furnace roof above each cell. Each of the cells is constructed in the same way as previously described except for the floor 203. This floor is illustrated as constructed in accordance with the teachings of my aforesaid copending application and is preferably formed of metal castings which are secured together and contoured to closely fit to the inside of the cell side wall. The floor 203 is hinged to a suitable ledge 205 at the front of the cell along a pivot axis 204, the rear end of the floor being supported on a ledge 209 provided at the foundation of the cell. The floor area, included between the pillars 71, comprises a sill 211 that may be of masonry. A pit 213 is provided beneath the cell and this communicates with the air chamber 215 behind and to the side of the side wall of the cell. Air cylinder 217 is pivotally mounted in the pit and pivoted to a central portion of the floor 203 so that upon application of pressure to the cylinder and extension of the piston rod therein the floor 203 will be pivoted upwardly to dump the material thereon onto the sill 211. While the floor 203 is moving upwardly, it will scrape the inner faces of the various blocks and tile which comprise the side wall and thus remove slag and other material clinging to them. By opening door 21, the operator can quickly shovel material on the sill out of the furnace and complete cleaning of the cell whereupon the cylinder 217 can be actuated to lower the floor back into place.

A pair of side-by-side cells may be used in this furnace as indicated in Fig. 13 and in this embodiment they have a common air supply and separate tilting floor though, of course, the air supplies can be individualized as in the previous embodiment. It will thus be realized that each cell can be cleaned mechanically in a matter of minutes and without interfering with the operation of the other cell.

Those in the art will now realize that the advantages mentioned above and other advantages will be obtained by the improvements described herein. The invention, of course, is susceptible to modifications in various details and, hence, is not to be limited to the precise structure which has been shown herein for purposes of illustration.

I claim:

1. In a moist fuel furnace, means defining a combustion chamber, a cell to receive moist fuel located below said chamber and communicating therewith, said cell having a front wall with a door therein and vertical abutments on opposite sides of said door, said cell having a side wall of substantially U-shape with the mouth of the U facing said door and the ends of the legs thereof against said abutments, said side wall comprising superimposed horizontal courses of individual refractory tile each mechanically interlocked with adjacent tile, certain of said tile having tuyères therein directed inwardly of the cell and opening into the interior of the cell, at least one retaining member for each horizontal course and of substantially U-shape and extending around the outside of the course and having its ends secured to said abutments whereby said member holds its course against said abutments, the bottom course of said side wall being formed of individual hollow metal blocks mechanically interlocked with each other and with the tile of the course above, said blocks having openings in their inner and outer faces whereby air may flow through the blocks, and means associated with the side wall for supplying air to said tuyères and openings.

2. The invention set forth in claim 1, wherein each of said metal blocks has openings in the sides thereof aligned with openings in the adjacent metal blocks whereby adjacent blocks are in fluid communication with each other and air may flow around the U-shaped course formed thereby.

3. The invention set forth in claim 2 wherein said metal blocks are staggered in height.

4. The invention set forth in claim 1 wherein said vertical abutments include masonry pillars having inner vertical faces converging toward the door, hollow metal blocks embedded in said pillars and having inner faces opening out of the inner face of the pillar and outer faces opening into an air passage in the pillar which in turn opens into the outer face of the pillar, the inner and outer faces of said metal blocks having openings therein whereby air may flow from the passage through the blocks and into the cell.

5. In a moist fuel furnace, means defining a combustion chamber, a cell to receive moist fuel located below said chamber and communicating therewith, said cell having a front wall with a door therein and vertical abutments on opposite sides of said door, said cell having a side wall of substantially U-shape with the mouth of the U facing said door and the ends of the legs thereof against said abutments, said side wall comprising superimposed horizontal courses of individual refractory tile each me-

chanically interlocked with adjacent tile, certain of said tile having tuyères therein directed inwardly of the cell and opening into the interior of the cell, at least one retaining member for each horizontal course and of substantially U-shape and extending around the outside of the course and having its ends secured to said abutments whereby said member holds its course against said abutments, said cell having a movable floor of substantially the same size and shape as the area defined within the side wall, said floor being pivoted on a horizontal axis at the forward edge thereof adjacent the lower end of the door, said pivot axis being substantially parallel to the door, said floor being movable upwardly about said axis whereby material on said floor slides toward said door, and means operatively associated with said floor for moving it upwardly about said axis, said floor being closely fitted to said side wall to serve as a scraper thereof during its movement.

6. In a moist fuel furnace, a cell to receive moist fuel, said cell having a front wall with a door therein and vertical abutments on opposite sides of the door, said cell having a side wall of substantially U-shape with the mouth of the U facing said door and the ends of the legs thereof against said abutments, said side wall comprising superimposed horizontal courses of individual refractory tile each mechanically interlocked with adjacent tile, certain of said tile having tuyères therein directed inwardly of the cell and opening into the interior of the cell, at least one retaining member for each horizontal course and of substantially U-shape and extending around the outside of the course and having its ends extending through said abutments and terminating in front thereof, said retaining members holding said courses against said abutments, clamping means for each end of each member at the front of said abutments operatively connecting said members and said abutments for regulating the tension in said members and the force with which said courses are held against said abutments, means defining a combustion chamber communicating with said cell and including an upright wall substantially coplanar with and directly above a portion of said U-shaped cell side wall, said upright wall being the suspended type including vertical columns and a plurality of vertically spaced horizontal hanger bars mounted on the columns with refractory tile carried on the bars and defining the inside surface of the wall, the weight of said upright wall being carried by said vertical columns and substantially no load therefrom being transmitted to said cell side wall portion.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
408,587	Cook	Aug. 6, 1889
1,354,507	Myers	Oct. 5, 1920
1,360,408	Johnson	Nov. 30, 1920
1,553,652	Vrba	Sept. 15, 1925
1,622,431	Feigenbaum	Mar. 29, 1927
1,627,349	Snow	Mar. 3, 1927
1,744,185	Waite	Jan. 21, 1930
1,747,822	Foltz	Feb. 18, 1930
1,798,410	Fish	Mar. 31, 1931
1,811,486	Anderson	June 23, 1931
1,952,010	Gregory	Mar. 20, 1934
1,952,227	Adams	Mar. 27, 1934
1,974,143	Spencer	Sept. 18, 1934
2,022,312	Foltz	Nov. 26, 1935
2,193,714	Covey	Mar. 12, 1940
2,284,368	Burgess	May 26, 1942
2,602,409	Dennis	July 8, 1952