

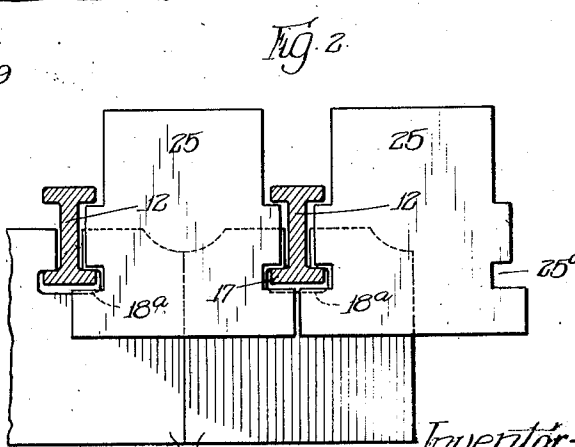
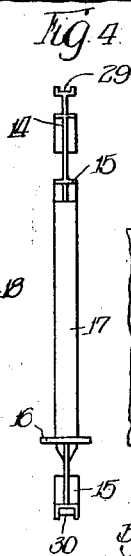
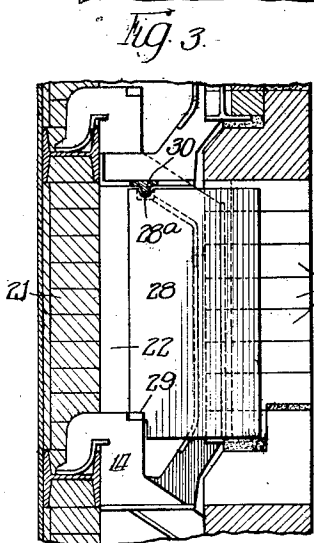
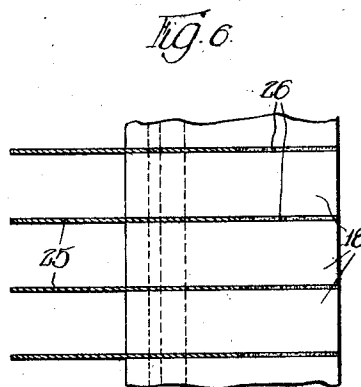
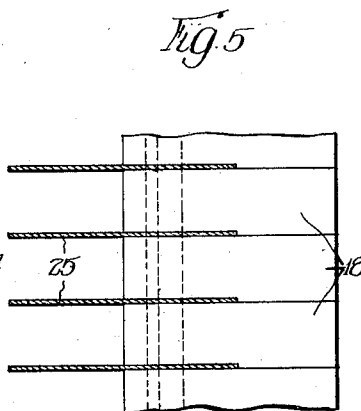
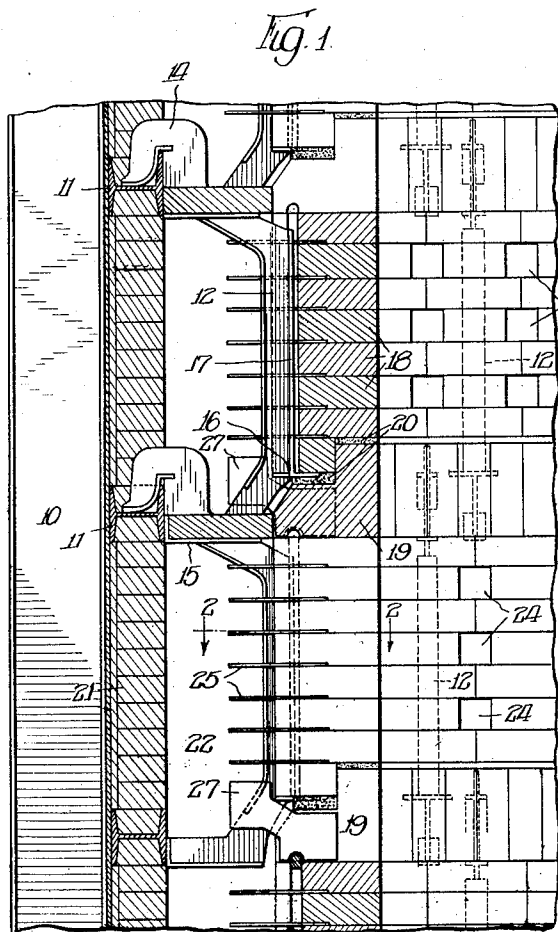
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FURNACE WALL CONSTRUCTION

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UNITED STATES PATENT OFFICE

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FURNACE WALL CONSTRUCTION

Application filed November 29, 1926. Serial No. 151,301.

This invention relates to the construction of refractory walls for heat confining chambers, such as furnaces. It has particular applicability to furnaces in which very high temperatures are generated by the combustion of fuel.

The general object of the invention is the provision of an improved construction which will be effective to decrease the destructive effects of high furnace temperatures and their various concomitants, upon the refractories of the furnace wall.

Another object is the provision of furnace wall construction which will be effective to accomplish the result just mentioned and at the same time contribute to the preheating of air which is to be supplied to the furnace for combustion or otherwise utilized.

Another object is the provision of a construction which will aid in the diffusion of heat from the wall refractories and at the same time possess a desirable flexibility permitting the components of the structure to accommodate themselves to expansion and contraction incident to heating and cooling, without imposing injurious stresses upon them or lessening their security in the assembly.

Another object is the provision of a construction having attributes mentioned above and particularly adapted to walls of the suspended and sectional types.

Yet another object is the provision of a construction having attributes mentioned above and which is easily assembled and repaired.

Other and further objects and advantages of the invention will be pointed out or indicated hereinafter, or will be apparent to one skilled in the art upon an understanding of the same or its employment in practice.

In the drawings forming a part of this specification, I illustrate certain structural arrangements in which the invention may be embodied, but it is to be understood that these are presented for purpose of illustration only and are not to be accorded any interpretation having the effect of limiting the

claims short of the true and most comprehensive scope of the invention in the art.

In the drawings,

Fig. 1 is a part sectional elevation through a portion of furnace wall showing a part of the inner face of a conjoined wall in elevation;

Fig. 2 is a cross sectional detail as on line 2-2 of Fig. 1;

Fig. 3 is a detail in the nature of a sectional elevation of a portion of a similar wall construction showing another arrangement of heat diffusing members;

Fig. 4 is a detail in the nature of a rear elevation of a wall hanger or bracket of the type employed in the construction illustrated in Fig. 3;

Fig. 5 is a detail in the nature of a sectional elevation showing one arrangement of wall refractories and heat diffusing members; and

Fig. 6 is a similar detail showing another arrangement of wall refractories and heat diffusing members.

While the examples of construction illustrated in the drawings, and now about to be described, show instances of the application of the invention in the construction of furnace side walls or front walls, it is to be understood that I use the term "wall" in a broad sense and that the invention is likewise applicable to top walls or arches, and bottom walls or floors.

In the operation of furnaces at very high temperatures, conditions arise which are likely to exercise destructive effects on the refractories of which the furnace walls are composed. Among these is the effect known as "slagging". This results from fusion of ash and perhaps other material carried in the combustion gases, upon the highly heated refractories, so that the fused material flows down the faces of the refractories with a wearing or destructive effect upon them, said effect probably resulting from the erosive action of the fused material and its tendency to promote fusion of portions of the material in the refractories. By maintaining the wall refractories at a temperature sufficiently low to avoid the quick fu-

sion of ash upon their surfaces, therefore, slagging and its destructive effects may be quite substantially decreased. While it is necessary to maintain the wall refractories at high temperatures in order to obtain high furnace efficiency, it is likewise desirable, for the reasons just mentioned, to avoid the heating of refractories to a point where these destructive influences are pronounced. The present invention makes provision for the abstraction of heat from the refractories, so that their temperature may be kept below a desired limit in the presence of extremely high temperatures within the furnace. It also makes provision for the utilization of the heat abstracted from the refractories for the heating of air supplied to the furnace for supporting combustion therein.

The examples of construction illustrated in the drawing show the application of the invention to a wall of the Detrick suspended sectional type, such as is described and claimed in the U. S. patents to Raymond D. Foltz, Nos. 1,747,822 and 1,747,823. In a wall construction of this type a supporting frame is provided, consisting of column members 10 and transverse members 11 supported on the column members and in turn affording support for section hangers or brackets 12. These hangers are metal castings having hook portions 14 at their upper ends and foot portions 15 at their lower ends, which portions engage the transverse frame members 11 to retain the hangers suspended thereon. The hangers also have shelf portions 16 from which extend upwardly the flanged portions 17. Upon each hanger is supported a stack of wall refractories in the form of slotted tile 18, having the T-shaped slots 18^a which receive the flanged portions 17, to hold the refractories against displacement from the hanger, whereon they are afforded support by the shelf portions 16. Thus, each hanger supports a section of the wall, the sections being assembled in lateral abutment to form horizontal courses of sections. These courses of sections are arranged one above another throughout the height of the wall, the hangers in the adjacent courses being disposed in offset or staggered relationship, as indicated in the dotted lines in Fig. 1. The topmost refractories in these courses are formed of the L-shaped shoe tile 19 which overlap the lowermost tile of the superjacent section so as to form a sliding expansion joint, expansion between the courses being accommodated by interposed layers of compressible refractory material 20, such as asbestos. Surrounding the refractory wall thus formed is a sheathing wall 21, spaced from the refractory wall to provide an intervening air chamber 22. Air is supplied to this chamber through suitable inlets, preferably provided in or adja-

cent the rearward portion of the side walls of the furnace, as illustrated in the first application above mentioned, and at suitable locations in one or more of the furnace walls are provided ports 24, through which this air may be drawn from the chamber 22 into the furnace chamber, for purpose of combustion. Heat diffusing members are built into the refractory wall and project into the air chamber 22. These may take various forms. The heat diffusing members designated by the numeral 25 are in the form of thin metal plates which are introduced between superposed tile 18. These plates terminate short of the inner faces of the tile and extend beyond the outer ends of the tile for a substantial distance so as to have liberal surface exposure to the air in air chamber 22. They have notched portions 25^a which accommodate the flange portions 17 of the hanger, whereby the plates are held against displacement in horizontal directions. The tile 18 may be formed with a shallow depression across one of the broader faces to accommodate the plates 15 and permit the balance of the face to be laid in contact with the superjacent or subjacent tile, as illustrated in Fig. 5, or the tile and plates may be laid upon top of one another, as illustrated in Fig. 6, the resulting spaces between the tile being filled with fire clay 26. As the plates are quite thin, these joints will be quite shallow. The heat diffusing members designated 27 in Fig. 1 are likewise thin metallic plates which are set in the vertical joints between the shoe tile 19. They are of such form as to have liberal surface contact with the juxtaposed shoe tile and to extend into the air chamber 22 with liberal surface exposure to the air. In the construction illustrated in Fig. 3, the heat diffusing members 28 are in the form of thin metallic plates which are set vertically so as to extend into the vertical joint between the wall sections and to project into the air chamber 22. The portions of these plates which are bedded in the wall have surface contact with the lateral faces of the tile 18 in juxtaposed sections. To aid in the support of the plates 28, the hangers 12 are formed with the lugs 29 and 30. The lug 29 is formed on the upper margin of the hook portion 14 as a short channel or seat in which the lower end of a plate will be retained, and the lug 30 is formed as a projection from the lower flange of the foot member 15 and is received in a notch 28^a in the upper edge of the plate 28. The lugs 29 and 30 are of proper width to allow for variations in the alignment of the plates 28. It will be observed that in this arrangement, the plates 28 are engaged with the lugs 30 of the hangers which carry the superjacent course of sections and with the lugs 29 of the hangers which carry the subja-

cent course of sections. This arrangement is of particular advantage in installations where the movement of air in the air chamber 22 is in a vertical direction.

5 In the operation of the furnace, air is admitted to the air chamber 22 at suitable points remote from the ports 24, and travels through the air chamber to the ports, through which it is drawn into the furnace chamber. In this movement of the air 10 through the air chamber 22, it flows in contact with the portions of the heat diffusing members exposed therein, and abstracts some of the heat from them. This cooling 15 of the heat diffusing members contributes, in turn, to removal of heat from the wall refractories with which the heat diffusing members are in contact. In this fashion, the temperature of the wall refractories may 20 be kept down, even in the presence of extremely high temperatures in the furnace, below the point at which they are subject to rapid destruction by the heat. The heat taken from the diffusing members by the air 25 in air chamber 22 is not lost, but performs a useful function in preheating the air which is drawn into the furnace. Among the various advantages of the construction is its flexibility. It will be observed that the 30 heat diffusing members do not have fixed anchorage outside the refractory wall itself. Hence they may accommodate themselves to the various local adjustments of the wall sections or individual refractories 35 which are occasioned by expansion and contraction under different temperatures. Because of the improved capability of the refractories to withstand the furnace temperatures, my invention renders it feasible 40 in some instances to reduce the thickness of the refractory wall below that which is now regarded as advisable. Another advantage resides in the adaptability of the construction. It permits of a wide range of 45 variation as to the location and distribution of the heat diffusing members. They may be inserted where desired and left out at other places. In this fashion, the invention affords a convenient and simple provision for equalizing the wall temperature 50 as between different areas or localities. In localities subject to particularly high heat, the diffusing members may be inserted numerous, while in other portions of the wall not subject to such high heats, they 55 may be employed in fewer number. The construction does not complicate the erection of the wall structure, as the heat diffusing members are assembled in it in much 60 the same fashion as are the wall refractories. A further advantage flowing from the invention is the protection which it affords to the wall supporting hangers against destructive overheating. This is an important consideration in view of the fact that the

wall hangers have to carry the weight of the wall refractories, whence it is highly important that they be not weakened by overheating. Through the increased diffusion of heat afforded by the diffusing members, the heating of the wall hangers is kept below a detrimental value. Consequently, in many instances, it is possible to reduce the amount of metal heretofore regarded as necessary to afford the proper 70 factor of safety in the hangers. 75

What I claim is:

1. In furnace wall construction, the combination of wall refractories supported in groups, anchoring members retaining the refractories of a group in association, and heat diffusing members bedded between juxtaposed refractories, said heat diffusing members engaging said anchoring members and having portions exposed to air outside 80 the wall. 85

2. In furnace wall construction, in combination, wall refractories arranged in separately supported groups, retaining members holding refractories of a group against dislodgment therefrom and heat diffusing members bedded between refractories of a group and presenting heat diffusing surfaces exposed to air outside the wall, said heat diffusing members having movable anchorage on the retaining members. 90 95

3. In furnace wall construction, in combination, a supporting bracket, a stack of wall refractories having support and anchorage on said bracket, and heat diffusing members bedded between refractories and having retentive cooperation with said bracket, said heat diffusing members having surface portions exposed in air outside the wall. 100 105

4. In furnace wall construction, in combination, a frame member, a group of refractories having support and anchorage on said frame member and susceptible of vertical movement thereon, and heat diffusing members bedded between refractories and having vertically movable anchorage on the frame member, said heat diffusing members having portions exposed in air outside the wall. 110 115

5. In furnace construction, in combination, a flanged frame member, slotted refractories anchored on a flange of said frame member, and heat diffusing members between refractories and anchored on the frame member, said heat diffusing members having portions projecting beyond the refractories at the outer side of the wall. 120

6. In furnace wall construction, in combination, collaterally arranged frame members, refractories retained in alignment by said frame members and heat diffusing members engaged between adjacent frame members and between juxtaposed refractories, said heat diffusing members extending 125 130

through only a fraction of the wall's thickness and into air beyond the refractories.

7. Furnace wall construction comprising slotted refractories arranged one upon another to form a wall portion for a furnace chamber, metallic anchoring members engaged in the slots of the refractories to hold the latter in association, metallic heat-diffusing members embedded between some of the refractories but having no parts exposed within the furnace chamber, said heat-diffusing members having portions projecting exteriorly of the wall and exposed to air for diffusion of heat.

8. In furnace construction, in combination, a wall supporting frame, a refractory wall spaced collaterally of said frame to afford an intervening air space, said refractory wall being made up of refractories arranged in wall sections supported independently of one another on the wall frame, and relatively movable heat diffusing plates embedded between refractories in respective wall sections and extending only part way through the refractory wall and having portions of substantial area exposed to air in the air space outside the refractory wall.

9. In furnace construction, in combination, a wall supporting frame, refractories movably supported thereon to form a refractory wall alongside the frame, means anchoring the refractories against displacement from said wall, and heat diffusing plates extending into the refractory wall for a portion of its thickness and having substantial areas projecting beyond the outer side of the wall and exposed to air, said heat diffusing plates being movable relative to one another and relative to the frame.

In testimony whereof I have hereunto subscribed my name.

LOUIS H. HOSBEIN.

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