Oct. 3, 1939. G. W. DAVEY 2,174,871

FURNACE WALL STRUCTURE

Filed Jan. 23, 1937

Fig. 1.

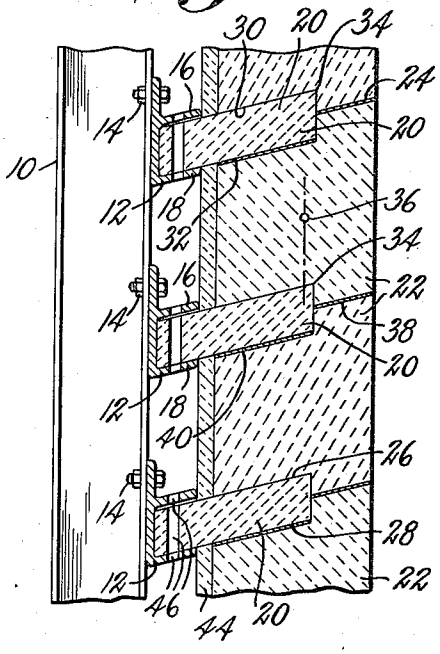


Fig. 3.

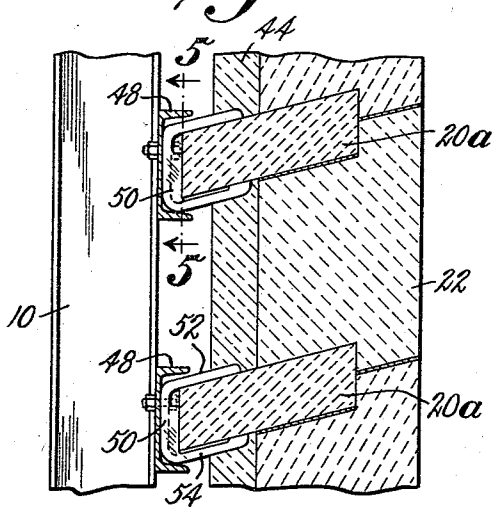


Fig. 4.

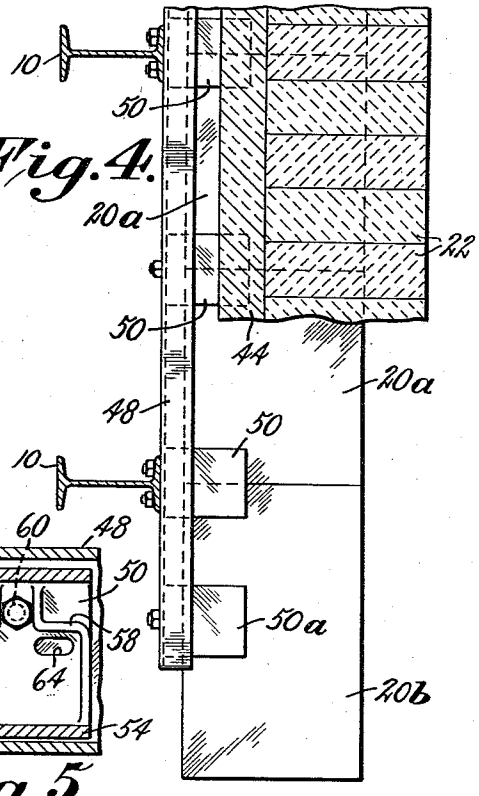


Fig. 2.

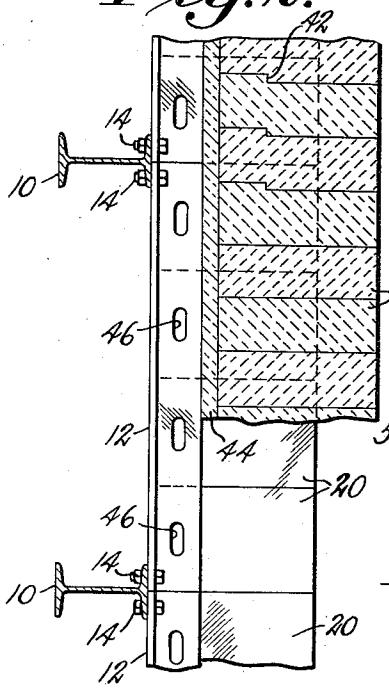


Fig. 5.

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FURNACE WALL STRUCTURE

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18 Claims. (Cl. 72—101)

The present invention relates to furnace wall structures and has particular reference to furnace wall structures of the kind in which an inner refractory wall is sectionally supported by an outer framework. The general object of the invention is to provide an improved form of wall structure having numerous practical advantages as compared with previous forms of construction.

The nature of the invention and of the various advantages to be derived from its use may best be understood from the ensuing description of practical embodiments of the invention, as illustrated in the accompanying drawing forming a part of this specification, in which:

Fig. 1 is a vertical section showing one form of wall embodying the invention;

Fig. 2 is a horizontal view of the wall shown in Fig. 1, partly in section and partly in plan view.

Fig. 3 is a view similar to Fig. 1, showing another form of construction;

Fig. 4 is a view similar to Fig. 2 and showing the form of wall illustrated in Fig. 3; and

Fig. 5 is a view taken on the line 5—5 of Fig. 3.

Referring now to the drawing and more particularly to Figs. 1 and 2 thereof, the outer supporting framework comprises a row of vertical columns 10, preferably of I-beam section as shown in the drawing. A series of vertically spaced rows of cast supporting members 12 is carried by the columns 10 as, for example, by bolts 14. Each of these members 12 is provided with spaced flanges 16 and 18 which most advantageously are inclined inwardly and upwardly to provide substantially continuous horizontally extending channels for the support of bearing tile 20.

The bearing tile 20 are advantageously, although not necessarily, of diamond shape cross-section as shown in the drawing.

The inner refractory wall is composed of a series of vertically superposed rows of wall tile 22 which are of general diamond shape so as to provide upwardly and inwardly extending joints 24 parallel to the upper and lower faces 26 and 28 respectively of the bearing tile. At their upper and lower outer corners the wall tile 22 are notched as at 30 and 32 to provide channel-like recesses at the outer part of the joint between adjacent rows of wall tile.

The portions of the bearing tile which project beyond the flanges 16 and 18 extend into the channels formed by the notches, each shelf formed by a row of bearing tile providing independent support for a different row of wall tile.

As will be evident from the drawing, the inclination of the bearing surface of the bearing tile enables the wall tile to be retained in position by gravity alone and it is to be noted that in accordance with the invention it is important that the inner upper corner 34 of each row of bearing tile that is in supporting contact with the wall tile is located inwardly of the center of gravity (indicated at 36) of the latter tile.

By extending the support inwardly of the center of gravity of the wall tile, any tendency of the latter to be displaced inwardly of the furnace on account of any movement induced by expansion or contraction of the furnace wall is avoided.

Obviously, it is not necessary for the bearing tile to be of diamond shape cross-section in order to achieve the desired object, but for the sake of uniformity of notching of the wall tile and general efficiency of design, I prefer to use the diamond shape sections illustrated in the drawing.

Some slight space should be left at the joints for expansion vertically of the wall tile and these joints are advantageously packed by suitable refractory packing material indicated at 38 and 40.

As will be evident from the drawing, the refractory supporting tile cooperate with the wall tile to provide a ship-lap horizontal joint between adjacent rows of wall tile, thus diminishing the chance for air or gas leakage through the wall, and if desired the vertical joints between adjacent wall tile in the same row may be made of ship-lap form as indicated at 42 in Fig. 2.

The bearing tile may have the same horizontal extent as the horizontal extent of the wall tile but I prefer to have the bearing tile of somewhat greater horizontal extent than that of a single wall tile. Advantageously the bearing tile are placed so that the joints between them are staggered with respect to the vertical joints between adjacent wall tile, as shown in Fig. 2.

Advantageously, the outer face of the refractory wall between the rows of bearing tile is covered with a layer of insulating material 44.

Further, vertically extending slots may advantageously be formed in the flanges of the bearing members and in the bearing tile as indicated at 46 to facilitate vertical circulation of air immediately outside the refractory wall. This slot arrangement is of particular utility in case the outer framework is provided with sheathing (not shown) to enclose the inner structure.

In the form of construction shown in Figs. 3 to 5, the same form of wall tile is employed as is used in the form previously described. In the present form, however, the vertical columns 10 are horizontally connected by a series of vertically spaced horizontally extending structural steel channel members 48, and cast supporting clips 50 of the form shown in Fig. 5 are bolted to these channel members at suitably spaced intervals. The clips 50 have inclined flanges 52 and 54 similar to the flanges 16 and 18 on the members 12, and in this instance the bearing tile 20a are relatively long so that their horizontal extent is that of a substantial number of the wall tile. In this form of construction the bearing tile bridge a substantial horizontal space between adjacent clips.

In other respects the construction is in general similar to that previously described, although it will be evident from Fig. 4 that the spaces between adjacent clips 50 make unnecessary any slotting of the bearing tile or their supporting members.

Advantageously, the inner faces of the clips 50 are provided with inwardly projecting ribs 56 and 58 of the shape shown in Fig. 5, and are further provided with a central bolt hole 60 and laterally located bolt holes 62 and 64.

In some instances it may be desirable to bolt a clip to the channel member directly in alignment with the web of one of the vertical columns, in which event it will be bolted through the holes 62 and 64 and the proximity to these holes of parts of the ribs 56 and 58 prevents the bolt heads from turning when the nuts are screwed on or off from the outer side of the framework. In cases where a clip is bolted to a channel member between the vertical columns, a single bolt passing through the hole 60 will be sufficient and as will be evident from Fig. 5, turning of the bolt head will in this case also be prevented by the proximity of the ribs 56 and 58.

Among the more important of the advantages to be derived from the use of the construction described, the following are to be noted.

The shape of the wall tile is relatively very simple and easy to produce and presents no weak or easily fracturable portions. The same is also true of the shape of the bearing tile.

The inner wall provides full depth of refractory wall thickness throughout, no metal members extending into the wall. This is particularly important in insulated wall structure of the kind shown wherein, due to the heat retaining action of the insulation, the outer face of the refractory wall is at much higher temperature than would be the case with an uninsulated wall.

The bearing tile provide effective ship-lap construction for all horizontal joints.

Independent support of each horizontal row of wall tile is provided, thus permitting independent expansion of each of these rows and furthermore, avoiding undue loading of the bearing tile. This advantageous construction is obtained with a metal supporting structure of extreme simplicity which is both cheap to manufacture and easy to assemble. Individual wall tile and/or supporting tile, and sections of the refractory wall structure may readily be independently removed without disturbing any of the metal supporting parts.

Adequate space for a full depth of insulating material is readily obtained.

In the form shown in Figs. 3 to 5, the weight of special castings required is reduced to a minimum, the major portion of the supporting structure being of standard forms of structural steel, and in this latter form of construction it is possible to utilize the bearing tile to provide cantilever support for the wall tile adjacent any openings that may be required in the wall such as doors and the like. This latter feature is indicated in Fig. 4 wherein the bearing tile 20b is shown supported so as to project past the clip 50a, thus enabling the projecting portion to support wall tile in the manner of a cantilever beam.

It will be evident that many changes and modifications may be made in the specific design without departing from the spirit and scope of the invention as defined in the appended claims.

What I claim is:

1. A furnace wall structure comprising an outer framework and including a series of vertically spaced supporting members having upwardly and inwardly inclined flanges, refractory bearing tile supported by said members and projecting upwardly and inwardly therefrom, and rows of refractory wall tile supported by said bearing tile, the outer faces of said wall tile being recessed for the reception of said bearing tile, and portions of said wall tile being disposed between the inner faces of said bearing tile and the furnace.

2. A furnace wall structure comprising an outer framework, vertically spaced refractory bearing tile independently supported by said framework and projecting upwardly and inwardly therefrom, and rows of refractory wall tile supported by said bearing tile, the outer faces of said wall tile being recessed to provide recesses terminating short of the inner face of the wall tile for the reception of said bearing tile and said bearing tile extending into the recesses inwardly of the centers of gravity of the wall tile.

3. A furnace wall structure comprising an inner refractory wall consisting of a series of superposed horizontal rows of refractory wall tile, said tile being notched at their outer corners to provide horizontally extending channel-like recesses in the outer face of the refractory wall, said recesses terminating short of the inner face of the refractory wall and extending upwardly and inwardly of said wall, a series of horizontally extending refractory bearing tile extending into said recesses, said bearing tile projecting outwardly of the refractory wall, and an outer framework including supporting members for supporting said bearing tile.

4. A furnace wall structure comprising an outer framework including a series of vertically spaced supporting members having vertically spaced bearing flanges, a series of refractory bearing tile supported between the flanges of the several supporting members and having bearing surfaces projecting inwardly and upwardly therefrom, and an inner refractory wall comprising a series of superposed horizontal rows of refractory wall tile, said wall tile being recessed and said bearing tile extending into the recesses inwardly of the centers of gravity of the wall tile but short of the inner faces of the wall tile and the inner ends of said bearing tile being protected by refractory material from exposure to the furnace.

5. A furnace wall structure comprising an outer framework including a series of vertically spaced supporting members having vertically spaced bearing flanges, a series of refractory bearing tile supported between the flanges of the several supporting members and having bearing surfaces projecting inwardly and upwardly therefrom, and an inner refractory wall comprising a series of

superposed horizontal rows of refractory wall tile, said wall tile being notched at their outer corners and the notches of the adjacent rows of tile registering to provide a series of channel-like recesses at the outer edges of the joints between the adjacent rows of wall tile and said bearing tile extending into said recesses to support the wall tile and to provide a ship-lap joint between the inner and outer faces of the refractory wall.

6. A furnace wall construction comprising a row of spaced vertical columns, a series of vertically spaced horizontally extending castings carried by said columns and having horizontally extending substantially continuous flanges projecting inwardly and upwardly of the wall, a series of elongated bearing tile supported in the channels between said flanges and projecting inwardly and upwardly therefrom to provide substantially continuous refractory bearing shelves, and a plurality of vertically superposed rows of refractory wall tile having their outer faces notched to provide channels for the reception of said bearing tile, there being a separate supporting shelf for each of said rows of wall tile.

7. A furnace wall structure comprising a row of spaced vertical columns, a series of vertically spaced horizontal supporting members carried by said columns, bearing tile carried by said supporting members and projecting inwardly and upwardly therefrom, and a series of superposed horizontal rows of wall tile recessed to receive and supported by said bearing tile, said supporting members and said bearing tile forming substantially continuous horizontal shelves extending inwardly from said columns and bridging the space between the columns and the wall tile, and said supporting members and bearing tile being perforated to provide communication between the spaces above and below the several shelves.

8. A furnace wall structure comprising an outer framework including a row of spaced vertical columns and a series of vertically spaced horizontally extending channels carried by and extending inwardly of said columns, cast clip members carried by said channel members, said clip members being horizontally spaced and having inwardly and upwardly extending flanges, refractory bearing tile carried by said clip members and projecting inwardly and upwardly therefrom and bridging the spaces between adjacent clip members in the same horizontal row, and a plurality of superposed rows of refractory wall tile recessed to receive and deriving their support from said bearing tile.

9. In a furnace wall structure, a series of horizontal superposed rows of refractory wall tile, the outer faces of said tile being recessed to provide for the reception of supporting tile, a plurality of elongated horizontally extending refractory bearing tile, said bearing tile being arranged to provide a series of vertically spaced substantially continuous horizontally extending shelves, said shelves extending upwardly and inwardly into the recesses in the wall tile and projecting outwardly therefrom, a plurality of horizontally spaced clip members supportingly engaging said bearing tile and an outer metal framework carrying said clip members.

10. In a furnace wall structure, an inner refractory wall comprising a series of vertically superposed horizontally extending rows of wall tile, said tile being generally diamond shape to provide upwardly and inwardly inclined joints between the several rows of tile and said wall tile being notched at their upper and lower outer corners to provide horizontally extending channels in the outer face of the refractory wall, said channels having upwardly and inwardly inclined upper and lower faces, elongated horizontally extending bearing tile of diamond shape cross-section extending into said recesses and projecting outwardly from the face of the refractory wall, and metal supporting members having portions for supportingly embracing the projecting outer portions of said bearing tile.

11. In a furnace wall structure, a series of vertically superposed horizontally extending rows of refractory wall tile, said tile being generally diamond shaped and having notches formed in their lower outer corners, a series of rows of horizontally extending bearing tile of diamond shape cross-section, each of said rows of bearing tile independently supporting a different row of wall tile and extending into the notches of the wall tile inwardly of the centers of gravity thereof and projecting outwardly of the refractory wall, and metal supporting members embracingly engaging the projecting outer portions of said bearing tile.

12. In a furnace wall structure, a series of vertically superposed horizontally extending rows of refractory wall tile, said tile being generally diamond shaped and having notches formed in their lower outer corners, a series of rows of horizontally extending bearing tile of diamond shape cross-section, each of said rows of bearing tile independently supporting a different row of wall tile and extending into the notches of the wall tile inwardly of the centers of gravity thereof and projecting outwardly of the refractory wall, cast clip members embracingly engaging the projecting outer portions of said bearing tile at horizontally spaced intervals, and an outer metal framework carrying said clip members.

13. In a furnace wall structure, a series of vertically superposed horizontally extending rows of refractory wall tile, said tile being generally diamond shaped and having notches formed in their lower outer corners, a series of rows of horizontally extending bearing tile of diamond shape cross-section, each of said rows of bearing tile independently supporting a different row of wall tile and extending into the notches of the wall tile inwardly of the centers of gravity thereof and projecting outwardly of the refractory wall, cast clip members embracingly engaging the projecting outer portions of said bearing tile at horizontally spaced intervals, and an outer framework including a series of vertically spaced horizontal channel members, said clip members being removably secured to and supported by said channel members.

14. For use in refractory furnace wall structure, a pair of like wall tile of generally diamond shape arranged in vertically superposed relation, the outer faces of said tile being notched at their upper and lower ends, the notch at the upper end of the subjacent tile and the notch at the lower end of the superjacent tile cooperating to provide a recess situated partially in each of said tile and extending inwardly of the centers of gravity of the tile.

15. For use in refractory furnace wall structure, a pair of like wall tile of generally diamond shape arranged in vertically superposed relation, the outer faces of said tile being notched at their upper and lower ends, the notch at the upper end of the subjacent tile and the notch at the lower end of the superjacent tile cooperating to provide a recess situated partially in each of said

tile and extending inwardly of the centers of gravity of the tile, the upper and lower faces of said recess being inclined upwardly from the outer faces of the tile toward the inner faces thereof.

16. For use in refractory furnace wall structure, a pair of like wall tile of generally diamond shape arranged in vertically superposed relation, the outer faces of said tile being notched at their upper and lower ends, the notch at the upper end of the subjacent tile and the notch at the lower end of the superjacent tile cooperating to provide a recess situated partially in each of said tile and extending inwardly of the centers of gravity of the tile, the upper and lower faces of said recess being inclined upwardly from the outer faces of the tile toward the inner faces thereof, and parallel to the upper and lower faces of the tile.

17. For use in refractory furnace wall structure, a refractory tile of generally diamond shape having parallel upper and lower faces inclined with respect to the inner face of the tile, the outer face of the tile being notched at its upper and lower ends, said notches extending from said outer face inwardly of the center of gravity of the tile, and having inclined faces parallel to said upper and lower faces.

18. For use in refractory furnace wall structure, a refractory tile of generally diamond shape having parallel upper and lower faces inclined with respect to the inner face of the tile, the outer face of the tile being notched at its upper and lower ends, each of said notches having a face parallel to said upper and lower faces and a face parallel to said inner face.

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