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2,854,842

MOUNTING FOR INTERLOCKED REFRACTORY WALLS

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2 Sheets-Sheet 1

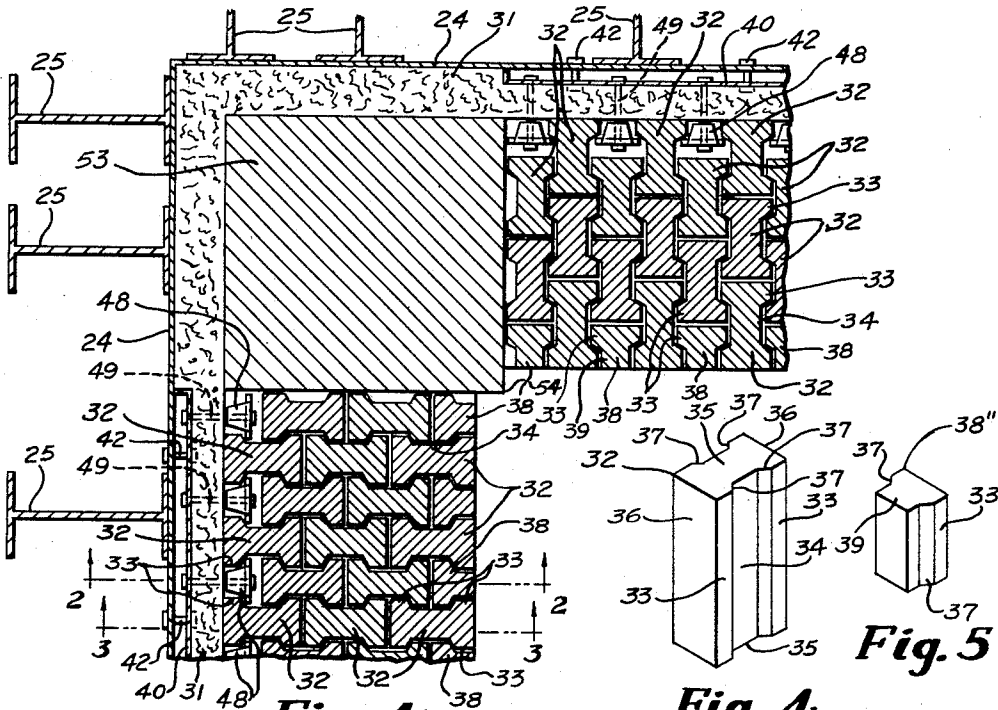


Fig. 1

Fig. 4

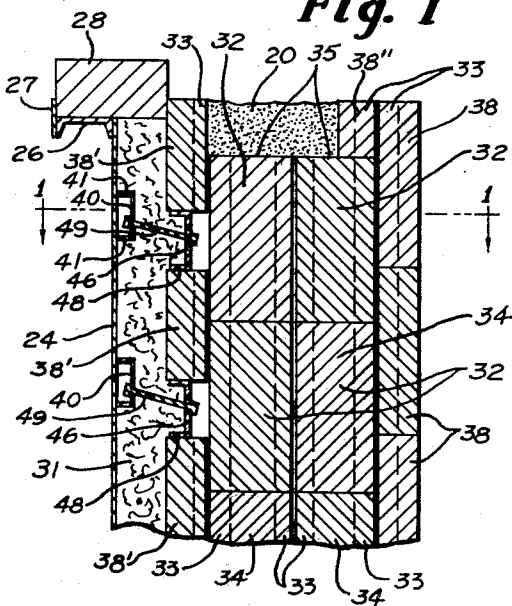


Fig. 2

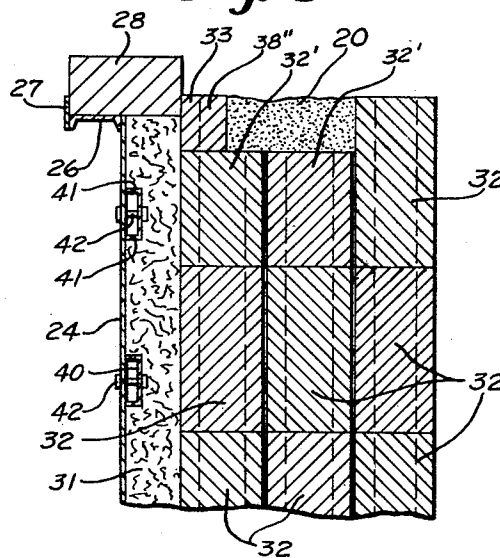


Fig. 3

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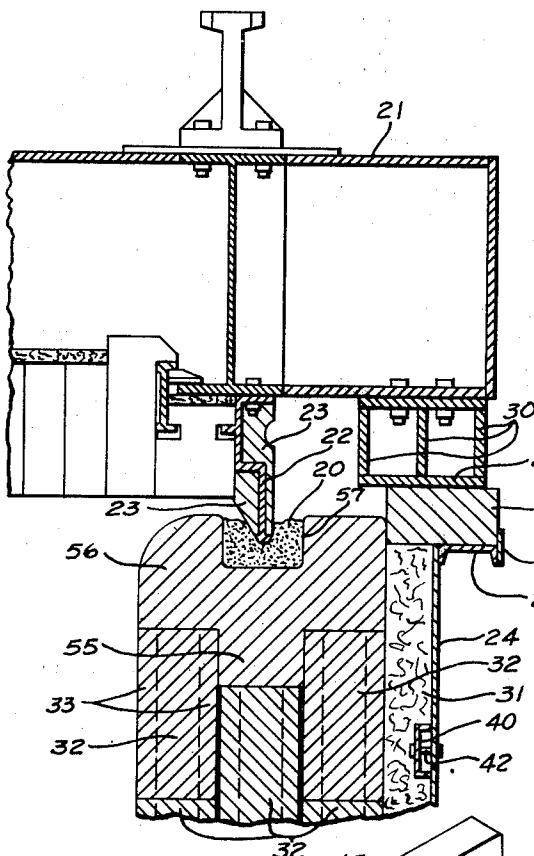


Fig. 6

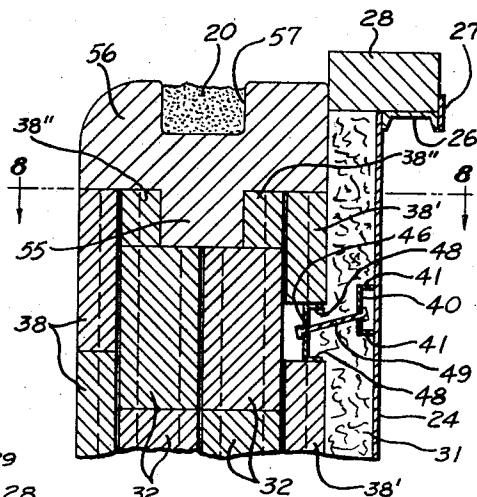


Fig. 7

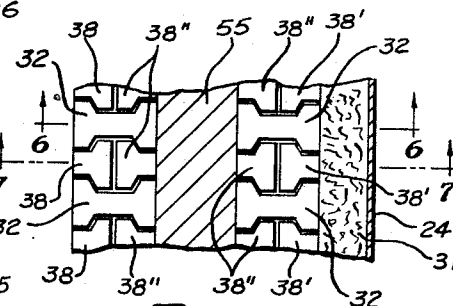


Fig. 8

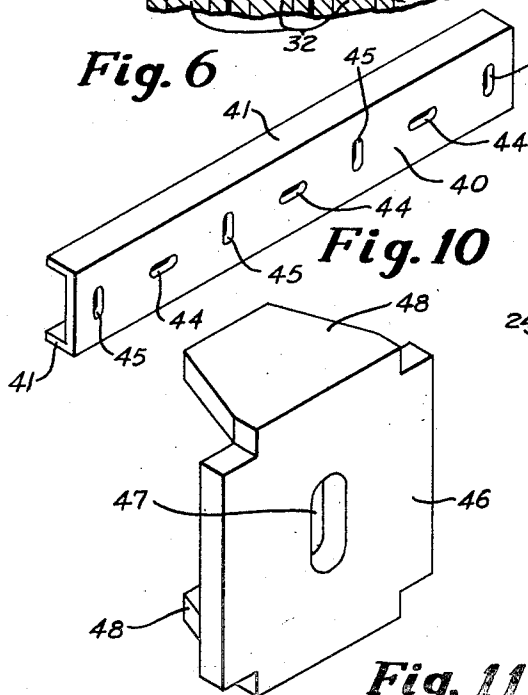


Fig. 10

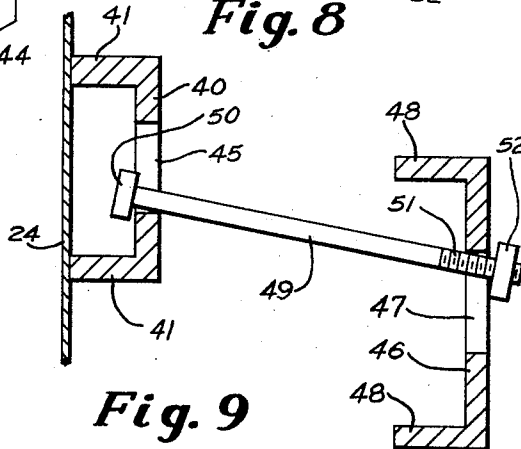


Fig. 9

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Fig. 11

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MOUNTING FOR INTERLOCKED REFRACTORY WALLS

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2 Claims. (Cl. 72-101)

Our invention relates to mountings for interlocked refractory walls, and more particularly to means for securing a wall comprising interlocked refractories to a metallic wall.

It has been found desirable to make walls of soaking pits and similar structures of refractory members that are interlocked transversely of said wall. In such structures the outer side thereof is provided with a metallic wall, which is ordinarily mounted on suitable structural members. It has been found desirable to make either the major portions of the wall of a soaking pit, or at least a substantial portion thereof, of such refractory members that are interlocked transversely of the wall. In order to maintain the position of said refractory members relative to the metallic outer wall or shell, it is necessary to secure certain of the refractories to said metallic wall or shell. However, in view of the fact that the position of the refractories relative to the wall and relative to each other changes during heating and cooling of the wall, the means for securing or mounting the refractory members on the metallic wall must be of such a character that the expansion and contraction resulting in the structure due to differences in temperature can take place without putting any undue stresses on the securing devices.

In a wall of the above referred to character the refractories are arranged in rows transversely of the wall and the refractories of one such transverse row are interlocked with the refractories of the adjacent transverse rows so that only limited movement of said refractories transversely of said wall can take place. However, the refractories in the wall are all free to move vertically to such an extent as may be necessary, the refractories of the higher rows being supported on the refractories of the lower rows, but there being no interlock between the refractories in a vertical direction. In view of this interlocking arrangement it is only necessary to secure or anchor the outermost refractories of alternating rows to the metallic wall or shell portion.

It is an important purpose of our invention to provide means for securing such transversely interlocked refractories to a metallic wall comprising anchor members engaging certain of said refractories and means for connecting said anchor members with the metallic wall in such a manner that movements of the refractory members relative to the metallic wall can take place due to expansion and contraction of said refractory wall.

More specifically our invention comprises anchor members that engage certain of said refractories, and mounting members on the metallic wall that are connected together by means that provides a loose swinging connection between said means and said anchor members and mounting means to permit relative vertical movement of said anchor members and mounting means. Said anchor members preferably comprise a main body portion that engages the adjacent refractories of the interlocked refractory structure to hold the same against

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movement away from the metallic wall, and flanges that are narrower than said main body portion of said anchor members. The mounting means preferably comprise a member that is angular in cross section, such as a channel member, that is secured to the metallic wall with the flanges thereof in engagement with the inner face of said wall and which is provided with vertically extending slots through which the members extend that connect said mounting members with the anchor members. In order to provide for the loose swinging connection that is desirable in order to permit the expansion and contraction in the structure to take place without undue stress on the mounting means, a vertical slot is also provided in the main body portion of each of the anchor members, and headed securing elements with long shank portions are provided as the connecting means between said anchor members and said mounting means.

The above referred to mounting means is particularly adapted for use in conjunction with walls having the refractories therein arranged in transverse rows made up of vertically elongated refractories that are flanged, with the flanges of each transverse row of refractories interlocked with the flanges of horizontally adjacent transverse rows. Said refractories are I-shaped in horizontal section except at certain locations at the ends of certain of said transverse rows, where the same are T-shaped in horizontal section, in order that the rows have their ends vertically aligned.

It is another purpose of our invention to provide a soaking pit construction in which there is a corner portion of ordinary rectangular refractories that are not interlocked and walls that extend perpendicularly to each other from said corner portion, that are made up of the transverse rows of interlocked refractories, connected with the metallic wall or outer housing portion in the manner above referred to.

Other objects and advantages of our invention will appear as the description of the drawings proceeds. We desire to have it understood, however, that we do not intend to limit ourselves to the particular details shown or described, except as defined by the claims.

In the drawings:

Fig. 1 is a fragmentary horizontal sectional view of a corner portion of a soaking pit and the wall portions extending therefrom made up of transversely interlocked refractories, said section being taken substantially on the line 1-1 of Fig. 2.

Fig. 2 is a vertical section taken on the line 2-2 of Fig. 1, the lower portion of the structure being broken away.

Fig. 3 is a similar vertical sectional view taken on the line 3-3 of Fig. 1.

Fig. 4 is a perspective view of one of the interlocking refractories.

Fig. 5 is a similar view of another of said refractories.

Fig. 6 is a vertical sectional view through a fragmentary portion of a soaking pit cover and a fragmentary portion of a slightly modified wall construction, said section being taken on a plane corresponding to the line 6-6 of Fig. 8.

Fig. 7 is a fragmentary vertical sectional view through the wall shown in Fig. 6, taken on the line 7-7 of Fig. 8.

Fig. 8 is a fragmentary horizontal sectional view taken on the line 8-8 of Fig. 7.

Fig. 9 is a vertical sectional view of the mounting means for the interlocking refractories, showing a fragmentary portion of the metallic wall in vertical section.

Fig. 10 is a perspective view of the channel member comprising the mounting means secured to the metallic wall, and

Fig. 11 is a perspective view on an enlarged scale of one of the anchor members.

Referring in detail to the drawings, Figs. 1 to 3 inclusive, show one form of wall structure to which our invention is applied, and Figs. 6 to 8 inclusive, show a slightly modified form of wall structure to which our invention is applied. The walls are shown as being those of a soaking pit and the upper end portion of the walls in either case is provided with a channel or depression that extends lengthwise of the wall for receiving loose material, such as sand, indicated at 20, for providing a seal between a cover shown somewhat diagrammatically in Fig. 6 at 21, the details of structure of which are not part of this invention, but which comprises frame members, portions of which are shown in Fig. 6, and which frame members have depending sealing flanges comprising a metallic member 22 secured to the metal framework of the cover and an outer covering 23 of refractory material, said sealing member entering the loose material 20, above referred to, to provide the seal. The soaking pit walls are made of refractory material and are provided with an outer metallic wall or housing 24, which is mounted in a suitable manner on suitable framework, some of said frame members being shown at 25 in Fig. 1, and preferably said wall has a flanged metallic member 26 at the upper end thereof, to which an up-standing retaining member 27 is secured in fixed position for mounting refractory members 28 thereon, with which suitable depending means on the cover 21 engages so that the cover is supported from the framework that includes the members 25, a plate 29 connected with the main portion of the framework of the cover 21 by means of the members 30 being shown in Fig. 6 as engaging said refractory members 28. Between the metallic walls 24 and the refractory soaking pit walls is a filling of heat insulating material 31.

Referring to Figs. 1 to 3 inclusive, refractory members 32 are shown as being provided in said soaking pit walls, which refractory members are substantially I-shaped in horizontal section, having laterally projecting flanges 33 at opposite ends thereof and a connecting portion 34 between said ends. Said I-shaped in horizontal section refractory members 32, one of which is shown in perspective in Fig. 4, are thus I-beam-like in cross section and are elongated in a vertical direction, as will be obvious from Figs. 1 to 4 inclusive. Said members 32 have flat top and bottom faces 35 and flat end walls 36 which extend vertically when in the soaking pit wall. Inclined portions 37 connect the flat faces of the connecting portion 34 and the flat outer faces of the flanges 33. The flanges 33 are of such a thickness that a pair thereof will loosely occupy the space between the lateral flanges on each side of another of the same shaped refractories, as will be obvious from Fig. 1. All of the refractory members 32 are of the same cross sectional shape. The purpose of the flanged construction of the refractories 32 is to provide for an interlocking arrangement between the refractories in a course of said refractories in a wall, in a direction transversely of the wall. While any desired number of refractories may be used transversely of the wall, dependent upon the thickness of wall that is desired, the arrangement shown in the drawings is that of a wall in which each wall is the thickness of a row of three of said refractories 32, as shown in Fig. 3.

However, in order that the wall will have a substantially flat vertical face on the inner side thereof and a substantially flat vertical face on the outer side thereof except where the securing or anchoring means is provided therein, alternating rows of the refractories are made up of a pair of refractories 32 that are I-shaped in cross section and other refractories 38 that are T-shaped in cross section, having laterally projecting flanges 33 that are the same as those previously described, and narrower body portions 39 that are the same thickness as

the portions 34 of the members 32. The members 38 are preferably of the same length as the members 32 in a vertical direction, as will be obvious from Fig. 2, and may be arranged so that the joints thereof stagger with those of the refractories 32 in the same row. Shorter refractories 38', that are the same in cross sectional shape as the refractories 38, are provided on the outer side of the wall, and these are of exactly the same cross sectional shape as the refractories 38 and are interlocked with the refractories 32 in the same manner as are the refractories 38. Preferably said refractories 38' overlap the joints between the horizontal rows of refractories 32 as shown in Fig. 2. Inasmuch as the refractories 38 are arranged in staggered relation to the refractories 32, means is provided at the top of the wall for filling the space between the top surfaces 35 of the refractories 32 and the top surfaces of the refractories 38 so as to form a channel for the loose material 20, said means comprising short refractories 38'', said short refractories 38'' being the same in cross sectional shape as the refractories 38, and one of said refractories 38'' is shown in Fig. 5.

It will be noted upon reference to Fig. 3 that in order to provide said channel filled with the loose material 20 the uppermost row of I-shaped in cross-section refractories includes a full length refractory 32 and a pair of refractories 32' that are the same in cross sectional shape as the refractories 32 but are reduced in length. The refractories 38' are mounted in the same manner in the wall as the refractories 38, that is, with their reduced portions 39 directed toward the marginal portions of the wall and the heads or flanged portions 33 thereon inwardly. The refractories 38'' are arranged with their head portions or flanges 33 adjacent the flanges 33 of the refractories 38 so that the flanges 33 of the refractories 38'' and 38 will be interlocked or interfitted with a refractory 32 of the next adjacent row, as will be obvious from Figs. 1, 2 and 3. The short refractories 38'' are also provided in vertical alignment with the outer refractories 32' for completing the channel for the loose material 20, said refractories 38'' being arranged with their flanged portions 33 toward the outer face of the wall so that these will interfit with the refractories 38' of the next adjacent row. It will thus be seen that all of the refractories are interlocked transversely of the wall so that the refractories of one transverse row cannot shift transversely of the wall relative to the refractories of the next adjacent transverse rows on each side thereof.

Anchoring means is provided for the refractories of alternating rows so that said anchoring means will hold said alternating rows of refractories from movement transversely of the wall except to a very limited extent, but will permit vertical movement of the refractories to allow for changes in the position thereof due to differences in temperature that will exist in the wall when the soaking pit is in operation and not in operation. Said anchoring means comprises a channel member 40 which is mounted with the flanges 41 thereof in engagement with the inner face of the wall 24, being secured in position on the wall by means of bolts 42, as clearly shown in Fig. 3. Said bolts 42 extend through longitudinally extending slots 44 arranged in a row lengthwise of the channel member 40 whereby some adjustment of the channel 40 on the wall lengthwise thereof is possible. The web portion of the channel member 40 is also provided with slots 45 that extend transversely of said web portion or at right angles to the slots 44. The arrangement of slots in said channel member is clearly shown in Fig. 10.

Said anchoring means further comprises an anchor member 46, which has a flat substantially rectangular body portion having a central vertically elongated opening 47 therein and having a pair of flanges 48 thereon that are narrower than the body portion 46 and taper in a direction away from the body portion, as will be obvious from Fig. 11. The tapering flanges 48 are of such

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size that they will fit between a pair of flanges 33 on members 32 of transverse rows of said refractories that are on each side thereof, but the body portions 46 of said anchor members are wide enough so that these will engage with said lateral projections or flanges 33 in the manner clearly shown in Fig. 1 of the drawings. The channel member 40 and a plurality of the anchoring members 46 are connected by means of elongated connecting members 49, which are provided with enlargements or heads at opposite ends thereof, said elongated connecting members 49 being shown more in detail in Fig. 9 and are shown as being long bolts that have heads 50 thereon that are mounted within the channel 40 with the shank portions of said bolts extending through the slots 45 and which have threaded portions 51 provided with nuts 52, which nuts 52 are located on the side of the body portion 46 remote from the flange 48 with the shank of the bolt extending through the slot 47 in each of said members. This permits swinging movement in a vertical direction of the connecting member 49 and thus relative vertical movement of the members 46 with respect to the channel member 40 with which they are connected.

It will accordingly be seen that the refractory blocks 32 that are I-shaped in horizontal section of alternating rows extending transversely of the walls are held from movement inwardly toward the interior of the soaking pit by the anchoring members due to engagement of the wide body portions 46 with the flanges or projections 33 of the members 32. It will also be noted that the members 32 alternating with said members so anchored are held from such movement due to the interlocking of the projections or flanges 33 thereon with the projections 33 of the members 32 that are engaged by the anchoring members. Also it will be noted that the members 38, 38' and 38'' being interlocked with members of adjacent rows in the manner described will also be held from such movement transversely of the wall.

While there is a certain amount of space between the refractory members, as will be obvious from the drawings, these spaces between the refractory members may be filled with refractory cement if desired. While the upper portion including the channel forming or coping portion of the wall is shown as being made up of said refractory members that are interlocked transversely of the wall and secured in position with the flexible mounting, above described, on the metal wall 24 by said anchoring means, it is not intended to limit the application of our invention to just the upper part of a wall nor to a coping portion, nor a portion that has a channel formed therein that is filled with loose material, such as sand 20. The refractory members that are interlocked may have any desired extent in the wall vertically and thus may extend considerably below the points shown in Figs. 2 and 3, if this is desired. Preferably the corner portions of the soaking pit are made up of ordinary rectangular block-like refractories of the usual character, similar to brick, said corner portion in Fig. 1 being indicated by the numeral 53. It is neither necessary that this corner portion be made of such interlocked refractories, nor is it desirable, as by not providing any interlock in the corner portion 53 there is no possibility of the movements of the refractories in the one wall extending therefrom in any manner having any undesirable effect on the refractories in the wall extending at right angles to said first mentioned wall in the shift of the refractories, the expansion and contraction lengthwise of the wall being taken care of by the corner portion 53 due to the fact that the refractories therein are not in any manner interlocked. It will be noted that the inner corner 54 of said corner portion of ordinary refractory blocks of a rectangular flat faced character extends inwardly beyond the inner faces of the walls that extend therefrom at right angles to each other.

Instead of running the interlocked refractories to the top of the wall and forming a channel for the loose fill

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material 20 therein, the arrangement of refractories in the wall shown in Figs. 6, 7 and 8 may be utilized, in which the same anchoring means is employed as in the form above described, the same reference numerals being applied to the anchoring means as in the form shown in Figs. 1 to 3 inclusive, and Figs. 9 to 11. The refractories 32 shown in Figs. 6, 7 and 8 are the same as those previously described, the mounting in the wall being, however, slightly different. It will be noted that in the arrangement shown in Figs. 6, 7 and 8 the middle row of refractories 32 is at a lower level than the refractories 32 at the inner and outer margins of the wall to thus provide a channel between said refractories, into which a keying portion 55 of a cast refractory coping 56 having a channel 57 therein for loose material 20, is mounted. The refractory members 38' are provided in the same manner as previously described and are located as are the refractory members 38' in Figs. 1 to 3 inclusive, for accommodation of the anchoring members between the same, as will be evident from Figs. 2 and 7. Refractory members 38 are also provided that alternate with the refractory members 32 along the inner marginal portion of the wall, as in the previously described form. In order to provide a channel of uniform width for the keying of the coping portion 56 to the wall of refractory blocks that are interlocked, the refractory members 38'' are provided, which interlock with the refractory members 32 in the manner shown in Fig. 8.

While the last mentioned form of the invention is described in order to show that a variation in the arrangement of the refractory blocks in the wall may be provided without departing from the invention, it will be obvious that channels either for keying portions or for loose fill material forming sealing means, such as the sand 20, can be formed in any other desired manner from the two types of refractories described, of the various lengths that may be utilized, dependent upon the width of the wall and the number of refractories 32 that are required to reach across the transverse dimension of the wall.

The heat insulating material 31, it will be noted, extends around substantially all of the metallic parts of the anchoring means except the flanges 48, which are in engagement with refractory members 38 above and below the same. It will further be noted that the anchoring means limits movement inwardly of all of the refractory members that are in the wall portions in which said refractory members are interlocked transversely of the wall, but will permit up and down movement of the refractories relative to the metal wall without any possibility of any binding which might cause breakage of any of the refractories.

By way of explanation, it can be considered that the refractories are arranged in vertical courses, each course being free to move in a vertical direction independent of other vertical courses. These vertical courses are arranged in a plurality of series, the courses which are transversely adjacent to each other making up a single series, as shown in Fig. 3. In other words, the number of courses in each series determines the thickness of the wall, and the number of series which are laterally adjacent to each other determines the length of the wall.

These series are of two types, the first type being shown in Fig. 3, and the second type being shown in Fig. 2. The securing means engage only the outermost course of each series of the first type, and are located opposite the outermost course of each series of the second type, as shown in Fig. 1.

The transverse interlocking referred to above is between the courses of the first series and the courses of the second series, with the result that even though only the outermost course of each series in the first type constitute the only courses that are directly supported from or secured to the wall, nevertheless all courses of both types of series are held against transverse movement by the inter-

locking relationship, but each course is free to expand in a vertical direction.

What we claim is:

1. The combination with a metallic wall, of a refractory wall extending parallel thereto comprising refractories arranged in independently vertically movable vertical courses, said vertically independently movable courses of refractories being arranged in rows extending transversely of the plane of said refractory wall and said rows being adjacent longitudinally of said refractory wall, the refractories of each row being staggered relative to the refractories of the adjacent row, the refractories of each row having laterally projecting flanges, said flanges of each row being vertically slidably mounted between the flanges of rows longitudinally adjacent thereto, whereby the refractories of each row are interlocked transversely of the plane of said refractory wall and vertically slidably connected with the refractories of the two rows adjacent thereto longitudinally of said refractory wall, and means for securing the outermost courses of longitudinally alternate rows of refractories to the inner face of said metallic wall, said means comprising anchor members located between the outermost refractories of said alternating rows, and each member having a substantially rectangular vertically extending body portion having a vertically elongated opening therein, an outwardly projecting horizontal flange on the upper and lower edge of said body portion, said horizontal flanges having their side edges inwardly offset from the vertical edges of said body portion to provide vertical wing-like extensions on said anchor member projecting laterally beyond the flanged portion thereof, said vertical wing-like extensions of each anchor member engaging laterally projecting flanges of said refractories between which said anchor members are mounted, said anchor members being mounted between refractories of an outer vertical course with the bottom flange of each anchor member mounted on the refractory of said last mentioned course below the same and the refractory of said course above the same mounted on the top flange of said anchor member, a channel member fixed to the inner face of said metallic wall and extending horizontally therealong with its flanges directed outwardly toward said metallic wall, the web portion of said channel member having vertically elongated openings therein, and retaining elements each having a shank portion extending through said opening in an anchor member and through one of said openings in said web portion and enlargements at opposite ends of said shank portion engaging the inner face of said anchor member body portion and outer face of said web portion.

2. Means for connecting horizontally spaced refractories having vertically extending laterally projecting flanges thereon with a metallic wall for movement up and down relative to said wall, comprising anchor members adapted to be located between a pair of said refractories, each anchor member having a substantially rectangular body portion and a flange extending perpendicularly to said body portion from a pair of opposed edges of said body portion, said flanges having side edges inwardly offset from the edges of said body portion that extend perpendicularly to said flanged edges thereof to provide wing-like extensions perpendicular to said flanges on said anchor member projecting laterally beyond the flanged portion thereof on each side of said flanged portion, the flanged portion of said anchor member body portion having an opening therein elongated in a direction perpendicular to said flanges, said wing-like extensions being adapted to be engaged with the flanges on said refractories with the flanges on said anchor members located in a horizontal position between the flanges of said refractories, a channel member adapted to be fixed to the inner face of said metallic wall to extend horizontally therealong with the flanges thereof engaging said metallic wall, said channel members having openings therein elongated transversely of said web portion and a retaining element having a shank portion extending loosely through one of said elongated openings in said channel member and said elongated opening in said anchor member body portion, and enlargements at opposite ends of said shank portion engaging the face of said anchor member opposite that from which said flanges extend and the face of said web portion from which the flanges of said channel member extend, said openings in said anchor member being elongated in a direction parallel to the direction of elongation of said openings in said channel member when said anchor members are in position between said refractories.

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