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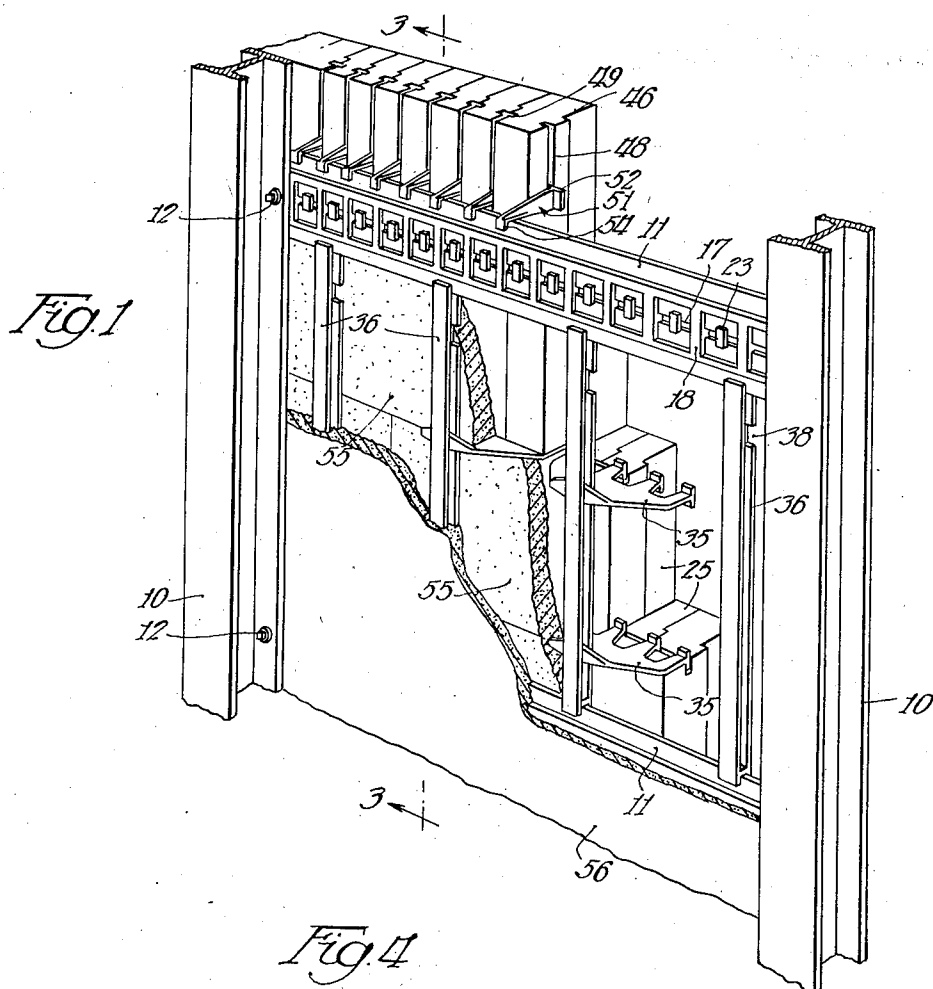
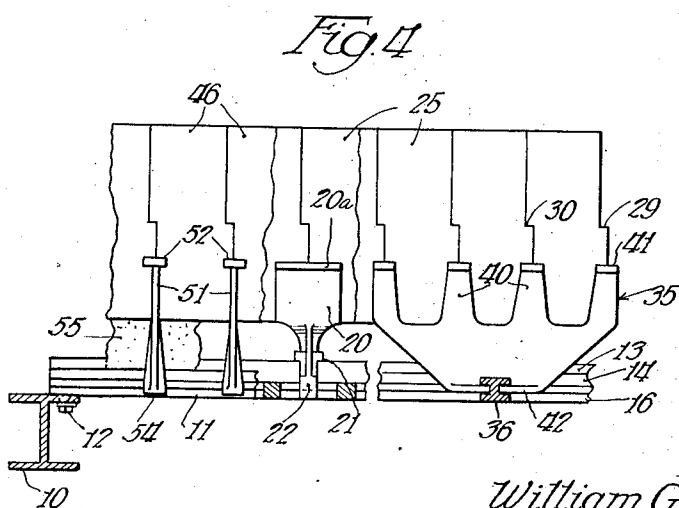
W. G. YOUNG

2,369,100

FURNACE WALL

Filed July 17, 1943

3 Sheets-Sheet 1



Inventor
William George Young
By:
Jabel Carlson, Gritzbaugh & Wells, Attys.

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W. G. YOUNG

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Fig. 2

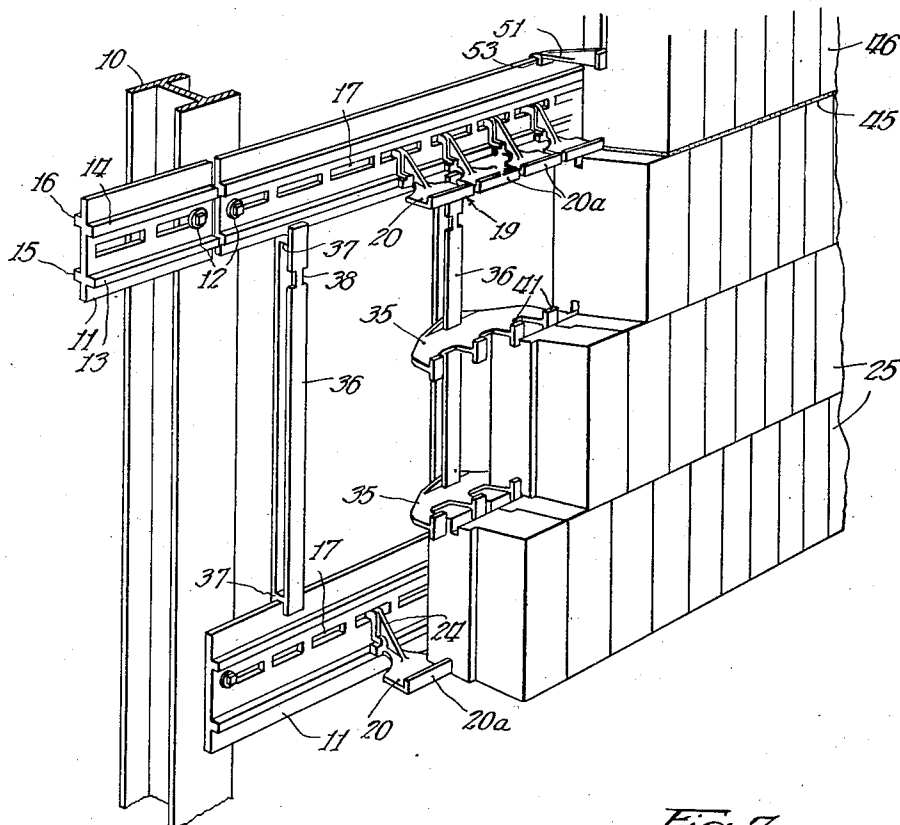


Fig. 6

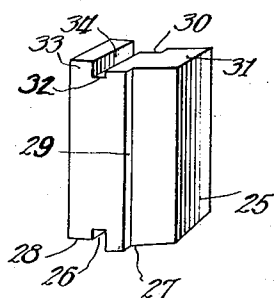
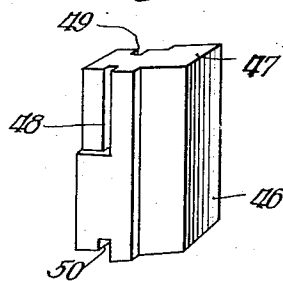


Fig. 7



Inventor
William George Young
By
Zabel Carlson Fritzbaugh & Wells, Attys.

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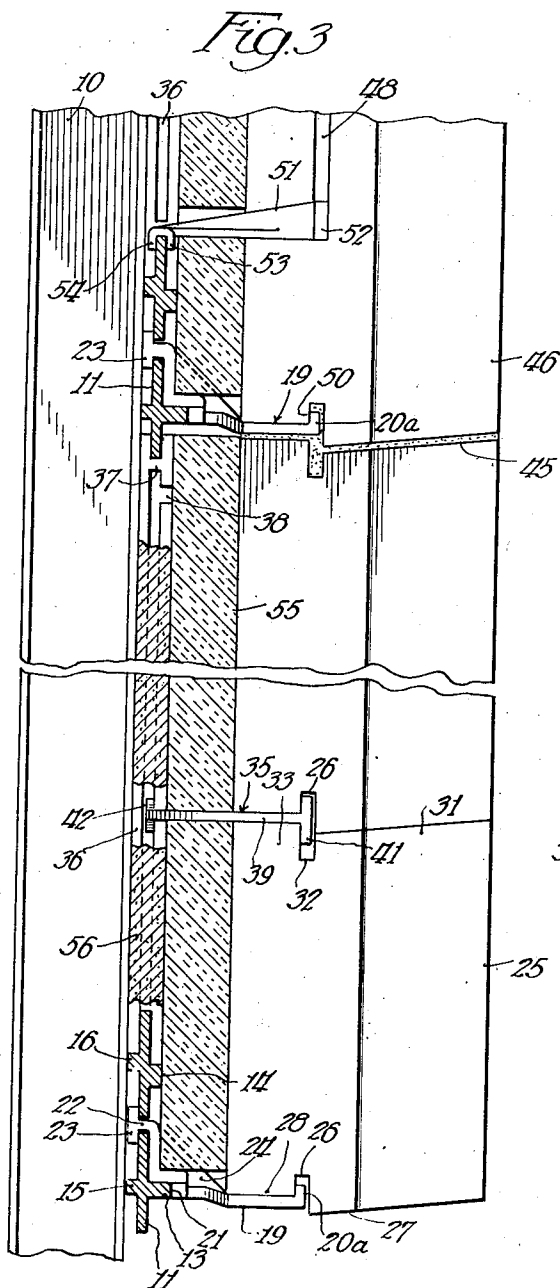
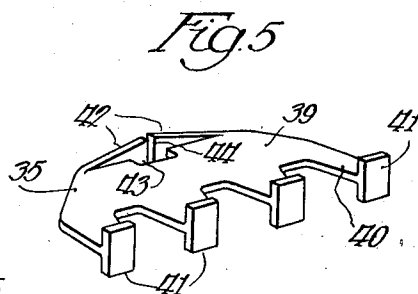
W. G. YOUNG

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3 Sheets-Sheet 3



Inventor
William George Young
By:
Zabel Carlson Gritzbaugh & Wells, Attys.

UNITED STATES PATENT OFFICE

2,369,100

FURNACE WALL

William George Young, Oak Park, Ill., assignor to
Chicago Fire Brick Company, Chicago, Ill., a
corporation of Illinois

Application July 17, 1943; Serial No. 495,223

9 Claims. (Cl. 72-101)

The present invention relates to furnace wall constructions and is particularly directed to a novel suspended type of insulated wall construction wherein flexibility in application of the wall to industrial furnaces, power boilers, oil stills and the like is obtained. The furnace wall construction is simplified to an extent where it is necessary to have only one shape of refractory tile for 90% of the wall and only a minor variation from this shape for the balance of the wall. The supporting of the refractory tile provides an interlock on all four sides with adjacent tile, and flexibility in the retention of said tile so that the tile and the supporting members are free to expand and contract thus permitting "breathing" with temperature changes.

The invention contemplates a suspending refractory wall wherein the refractory elements themselves are supported from vertical steel columns spaced along the wall by means of heat resistant horizontal supporting members interconnecting the steel columns and heat resistant retaining members. It is a feature of the construction that the retaining members are free to move horizontally and vertically as the installation is built up and they retain this freedom of movement sufficiently in the final structure to take care of expansion and contraction in all directions. The retaining members function also to provide supporting means for insulation on the outside of the refractory tile as well as a basis for securing a finishing coat on the outside of the completed insulation. The wall has the advantage of being substantially heat-tight with a smooth hard exterior surface which is weather-proof.

The features and advantages of the invention will appear more fully from the following description, reference being made to the accompanying drawings wherein a preferred form of the invention is shown. It should be understood however that the drawings and description are illustrative only and are not to be taken as limiting the invention except insofar as it is limited by the claims.

In the drawings:

Fig. 1 is a fragmentary perspective view with parts broken away, illustrating the wall construction as viewed from the exterior;

Fig. 2 is a similar perspective view illustrating the wall from the interior of the furnace;

Fig. 3 is an enlarged sectional view taken substantially on the line 3-3 of Fig. 1;

Fig. 4 is a plan view looking down on the struc-

ture shown in Fig. 1 with certain of the tile being removed to illustrate the various retaining members;

Fig. 5 is a perspective view of an anchor member which is employed between the individual supporting brackets;

Fig. 6 is a perspective view of the standard tile employed throughout most of the furnace wall; and

Fig. 7 is a perspective view of the slightly modified tile that is used for the top layer of a furnace wall.

Referring now in detail to the drawings, the present invention is embodied in a furnace wall which may be of any particular length or height desired, wherein the main supporting structure comprises spaced vertical steel columns 10. These supporting columns are I-shaped in cross section as illustrated clearly in Fig. 1. They are connected together at vertically spaced points by a plurality of horizontal supporting members 14 which are bolted to the flanges of the columns 10 by bolts indicated at 12.

The horizontal supporting members are desirably made of iron castings of sufficient weight and strength safely to carry a section of the furnace wall some 30 inches in height. Each horizontal casting is provided with ribs 13, 14, 15 and 16 which give added strength thereto. The horizontal castings are also provided with spaced horizontally running slots 17 separated by vertical webs 18. The slots 17 serve to mount individual supporting brackets 19 that bear against the ribs 13 as will be presently explained.

Each individual supporting bracket 19 has a flat shelf portion 20 with an upturned flange 20a along one edge thereof. The bracket extends upwardly and away from the flat shelf portion 20 where it then is provided with a shoulder 21 for engagement with the rib 13 as illustrated in Figs. 2 and 3. From the shoulder 21 the supporting bracket extends inwardly and upwardly to a rounded neck portion 22 and is adapted to extend through one of the slots 17. An elongated head 23 is provided on the end of the neck portion. The horizontal width of this head as shown in the drawings is just sufficient to pass through the slot 17 and the vertical length of the head is great enough that when the supporting bracket is turned in the position shown it will prevent the neck from coming out of the slot 17. This supporting bracket 19 is preferably made of a casting of a suitable alloy capable of withstanding the temperatures to which it will be subject in the

operation of the furnace. For example, the alloy sold under the trade name of Meehanite is a satisfactory alloy for this purpose. The supporting bracket is strengthened by a rib 24 which extends diagonally upward from the edge of the surface 20 to the neck 22.

A row of refractory tile 25 is supported on several of the supporting brackets as indicated in Fig. 2 and the supporting brackets are of such width at the shelf portion 20 as to be spaced from each other somewhat to allow for adjustment and for expansion under heat. The tile is shown in perspective in Fig. 6. It is provided with a groove 26 in its lower surface to receive the flanges 20a of the brackets 19. The lower end of the tile is sloped forwardly from the groove 26 as shown at 27 and that portion of the lower end of the tile 28 which is adapted to rest on the shelf 20 is above the portion 27 so that the portion 27 extends down in front of the bracket 19 to protect it and the flange from direct heat through any cracks that may exist between adjacent upper and lower courses of tile. The tile is provided with lateral offsets as indicated at 29 and 30 so that two laterally adjacent tile overlap each other in the manner shown in Fig. 2. This further prevents direct heat reaching any of the retaining structure through the vertical cracks between the tile. The tile 25 also have top surfaces 31 which slope downwardly toward the rear as shown in Fig. 6. A groove 32 is cut in the top of the tile at the rear edge of the sloping surface 31, and a portion 33 of the tile rearwardly of the groove 32 extends up above the level of the surface 31 as shown to provide a vertical shoulder 34 for engaging an anchor casting 35.

In a normal construction the tile 25 are supported in about three layers, one upon the other, by each row of the supporting brackets 19. The number of layers of course may be varied but it has been found that this proportion is proper for the load to be carried. In order that the three horizontal courses may be tied back at the top and bottom the anchor castings 35 are provided and they in turn are tied back to the horizontal members 11 by vertical retainer members 36.

The vertical retainer members are substantially H-shaped in cross section as illustrated best in Fig. 4. At the top and bottom ends of these members transverse webs 37 are provided and the longitudinal webs are cut out so as to provide recesses that will engage upon the upper and lower edges of two adjacent horizontal members 11 in the manner shown in Fig. 2. The retainer members 36 are castings of iron and they are free to slide horizontally along the space between two vertically adjacent horizontal members 11. Each of the castings 36 is notched as indicated at 38 to permit mounting of the anchor castings 35 thereon.

The anchor casting 35 (see Fig. 5) comprises a horizontally extending body portion 39 which is divided into a plurality of prongs 40 extending forwardly. Each of these prongs has upwardly and downwardly extending lugs 41 on its free ends, which lugs are adapted to engage in the recesses 26 and 32 of two vertically adjacent tile 25. At the rear edges the anchor castings 35 are flanged as indicated at 42 and cut away as indicated at 43. The flanges 42 are separated by a slot 44 that is wide enough to permit the anchor casting to be pushed through the notch 38 on the retainer member 36 after which it can

slide down on the retainer member. Fig. 2 illustrates two of the anchor castings in place on the retainer member 36 and in engagement with the adjacent tile 25. Each anchor member will of course engage a plurality of tile due to the several lugs 41 thereon.

It is desirable to provide expansion joints between the several horizontal courses of the tile at the point of support by the supporting brackets 19. Such an expansion joint is shown at 45 in Figs. 2 and 3. The expansion material fills the space between the separately supported sections of the wall and in addition fills the recesses 32 in the top course of each individual supported section. The joint which is filled with the expansion material extends downwardly from the fire exposed face to the recesses 32 and then of course the back part of the tile sections extends upwardly above that portion of the expansion joint which lies inwardly of the recesses. The net result of this construction is that the material used in the expansion joint is trapped in place and cannot work out under the continuous expansion and contraction of the wall. Where expansion joints run horizontally from the fire exposed face to the outer wall the material which fills the expansion joint is made to work inwardly to the fire exposed face and eventually all of it is lost. With the present invention that difficulty is avoided since the slope of the expansion joint causes the material to tend to work away from the fire exposed face and the vertical offset back of the recess 42 prevents the material from working out at the back of the wall. Expansion joints are also provided at the ends of a wall where the wall joins and overlaps with an adjacent wall meeting it at an angle. If the length of a wall is sufficient to justify it vertically running expansion joints may be provided in accordance with established practice.

The top course of tile must usually be held back in a different fashion than the main wall section. For this purpose a special tile 46 is provided (see Fig. 7). This tile is precisely like the tile 25 except that it is provided with a flat top 47 and with two channels 48 and 49 extending downwardly from the top surface along the side edges thereof for about half the depth of the tile. These channels are vertically in line with a bottom groove 50 that corresponds to the groove 26 in the tile 25. The portion of the tile rearwardly of the channels 48 and 49 is reduced in width somewhat so as to accommodate the thickness of a tie-back casting 51 (see Fig. 2). This tie-back casting has a lug 52 projecting laterally at its inner end so as to engage two adjacent tile 46, and at its rear end the tie-back casting has two spaced depending flanges 53 and 54 adapted to receive the upper edge of the top horizontal member 11.

The furnace wall is insulated by inserting rectangular blocks 55 of insulation between the rear faces of the tile 25 and 46 and the vertical retaining members 36. These blocks of insulation are cut to the same vertical depth substantially as the tile so as to fit between two vertically adjacent anchor castings 35 in the manner shown in Fig. 1. The anchor castings and the retaining members thus serve not only to retain the tile but also to retain the insulation in place as well. The insulation actually extends downwardly to cover the inner faces of the horizontal members 11 except where the brackets 19 are interposed. Since the insulation is usually soft

it can be forced downwardly to cause the reinforcing flanges 24 to cut into it or it may be notched to receive these flanges if desired.

When the insulation is in place and the wall, including the tile, has been installed, a hard finish, outer layer 56 may be applied over the framework and against the insulation as illustrated in Figs. 1 and 3. This hard surface layer may be of any suitable plastic material that can be spread on and hardened in place. It should have insulating value as well as ability to resist deterioration due to exposure to the weather. A suitable material for this purpose is Soco-Coate.

From the foregoing description it is believed to be evident that a novel suspended type of insulated wall construction has been provided wherein the advantages of a flexible refractory suspended wall are obtained with a simple construction that also provides adequate support and mounting for insulation and an outer wall.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a sectionally supported furnace wall, a framework including vertically spaced horizontal supporting members, shelf brackets hung thereon in slightly spaced relation and movable horizontally along the supporting members a limited amount, retaining members extending between vertically adjacent supporting members and slidably engaged therewith along horizontal lines spaced from the horizontal lines along which the brackets engage said members whereby they may move lengthwise of the supporting members without striking the shelf brackets, anchor members slidable vertically on said retaining members, each of said anchor members having upwardly and downwardly directed, tile anchoring, lugs, and refractory tile having top and bottom grooves whereby to receive the lugs of an anchor member between vertically adjacent tile, the tile having the portion forwardly of the grooves offset downwardly with respect to the portion rearwardly of said grooves.

2. In a sectionally supported furnace wall, a framework including vertically spaced horizontal supporting members, shelf brackets hung thereon in slightly spaced relation and movable horizontally along the supporting members a limited amount, retaining members extending between vertically adjacent supporting members and slidably engaged therewith along horizontal lines spaced from the horizontal lines along which the brackets engage said members whereby they may move lengthwise of the supporting members without striking the shelf brackets, anchor members slidable vertically on said retaining members, each of said anchor members having upwardly and downwardly directed, tile anchoring, lugs, and refractory tile having top and bottom grooves whereby to receive the lugs of an anchor member between vertically adjacent tile, the tile having the portion forwardly of the grooves offset downwardly with respect to the portion rearwardly of said grooves and said tile having a part of the downwardly offset portion also offset laterally whereby all tile are vertically and horizontally overlapped.

3. In a sectionally supported furnace wall, a framework including vertically spaced horizontal supporting members, shelf brackets hung thereon in slightly spaced relation and movable horizontally along the supporting members

a limited amount, retaining members extending between vertically adjacent supporting members and slidably engaged therewith whereby they may move lengthwise of the supporting members, anchor members slidable vertically on said retaining members, each of said anchor members having upwardly and downwardly directed, tile anchoring, lugs, refractory tile having top and bottom grooves whereby to receive the lugs of an anchor member between vertically adjacent tile, and insulating blocks fitting in the space between said refractory tile and said retaining members and carried by said brackets and anchor members.

4. In a sectionally supported wall for furnaces, horizontal rows of refractory tile having anchoring grooves extending across the top and bottom faces thereof with the facing grooves of vertically adjacent tile in substantial alignment, the tile having the portions thereof on one side of the grooves offset vertically with respect to the portions on the other side of the grooves.

5. In a sectionally supported wall for furnaces, horizontal rows of refractory tile having anchoring grooves extending across the top and bottom faces thereof with the facing grooves of vertically adjacent tile in substantial alignment, the tile having the portions thereof on one side of the grooves offset vertically with respect to the portions on the other side of said grooves, the portions on one side of said grooves having top and bottom faces sloping upward from the grooves.

6. In a sectionally supported wall for furnaces, horizontal rows of refractory tile having anchoring grooves extending across the top and bottom faces thereof with the facing grooves of vertically adjacent tile in substantial alignment, the tile having the portions thereof on one side of the grooves offset vertically with respect to the portions on the other side of said grooves, the portions on one side of said grooves having top and bottom faces sloping upward from the grooves and said last named portion having a part offset laterally whereby to longitudinally overlap the tile in a row.

7. In a sectionally supported furnace wall, a framework including vertically spaced horizontal supporting members, shelf brackets hung thereon in slightly spaced relation and movable horizontally along the supporting members a limited amount, retaining members extending between vertically adjacent supporting members and slidably engaged therewith along horizontal lines spaced from the horizontal lines along which the brackets engage said members, whereby they may move lengthwise of the supporting members without striking the shelf brackets, anchor members slidable vertically on said retaining members, each of said anchor members having upwardly and downwardly directed, tile anchoring, lugs, and refractory tile having top and bottom grooves whereby to receive the lugs of an anchor member between vertically adjacent tile.

8. In a sectionally supported furnace wall, a framework including vertically spaced horizontal supporting members, shelf brackets hung thereon in slightly spaced relation and movable horizontally along the supporting members a limited amount, retaining members extending between vertically adjacent supporting members and slidably engaged therewith whereby they may move lengthwise of the supporting members, anchor members slidable vertically on said retaining members, each of said anchor members having

upwardly and downwardly directed, tile anchoring, lugs, and refractory tile having top and bottom grooves whereby to receive the lugs of an anchor member between vertically adjacent tile, the horizontal members having horizontally elongated spaced slots therein and the brackets having neck portions received in said slots and head portions retaining the neck portions in said slots.

9. In a sectionally supported wall for furnaces, horizontal rows of refractory tile having anchoring grooves extending across the top and bottom faces thereof with the facing grooves of vertically

5 adjacent tile in substantial alignment, the tile having the portions thereof on one side of the grooves offset vertically with respect to the portions on the other side of said grooves, the portions on one side of said grooves having top and bottom faces sloping upward from the grooves, and expansion material between certain rows of refractory tile, the expansion material being trapped in place by the upwardly sloping portions 10 of the tile on one side of the grooves and the vertical offset on the other side thereof.

WILLIAM GEORGE YOUNG.