

July 24, 1923.

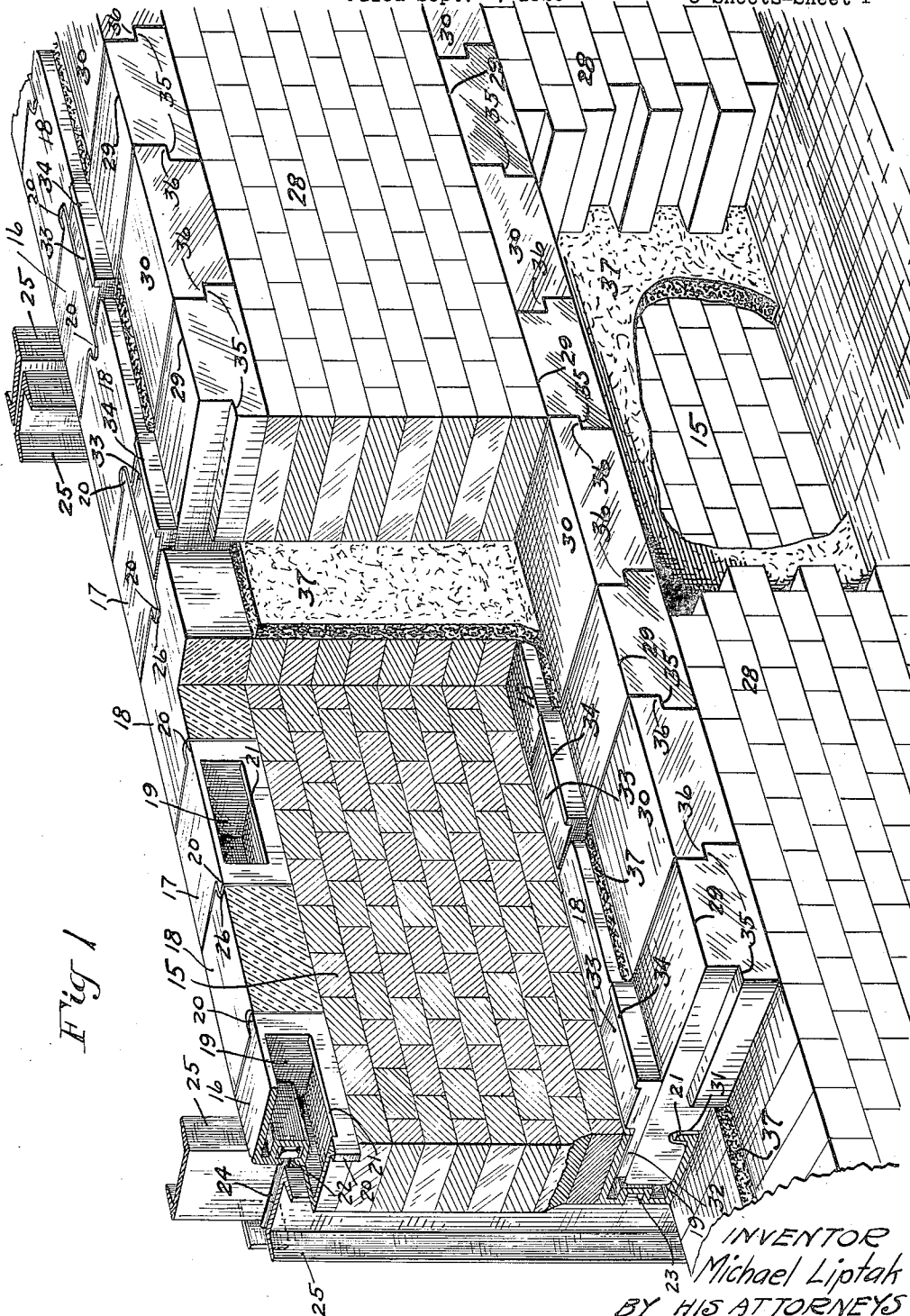
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M. LIPTAK

FURNACE WALL STRUCTURE

Filed Sept. 7, 1920

5 Sheets-Sheet 1



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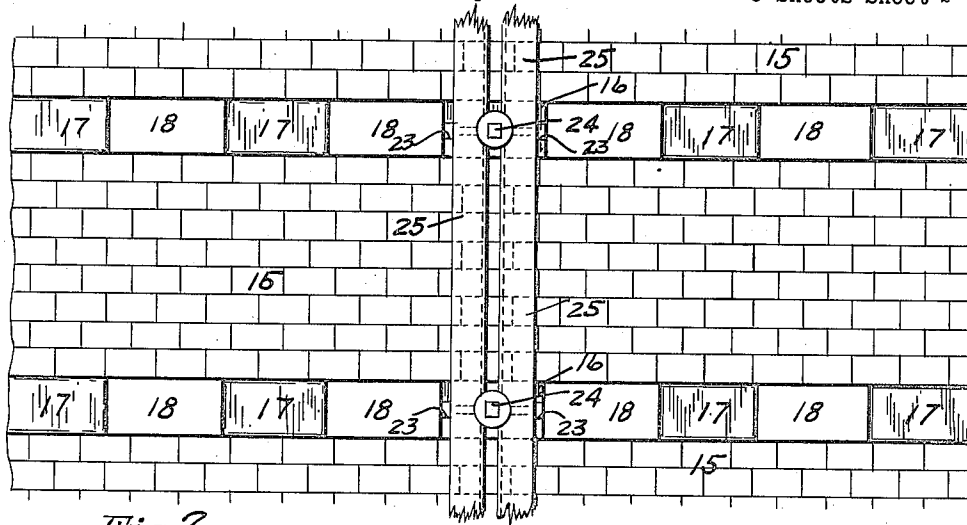


Fig. 2

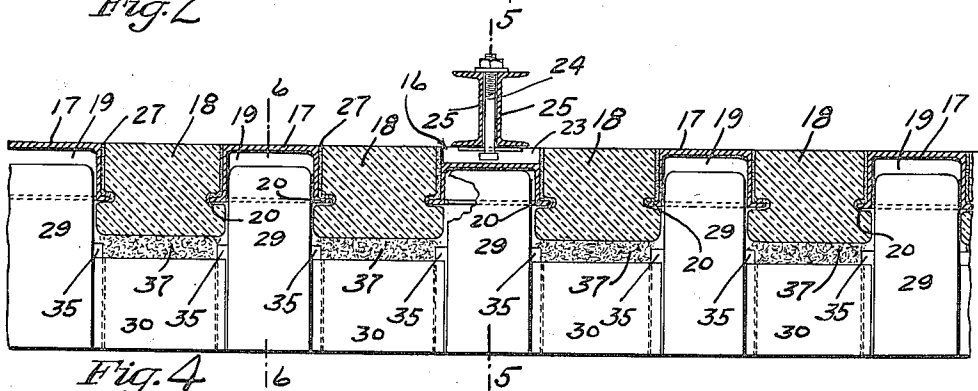


Fig. 4

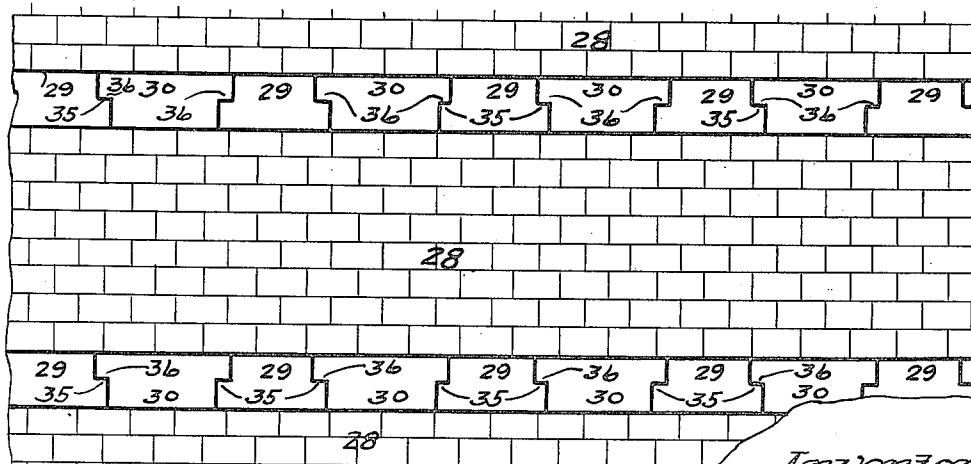


Fig. 3

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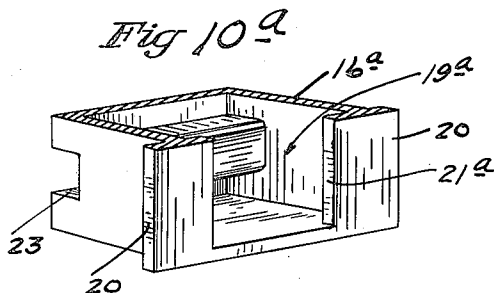
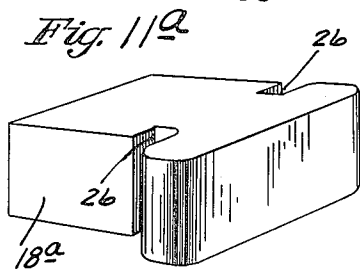
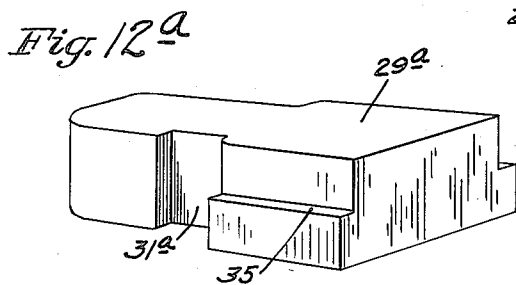
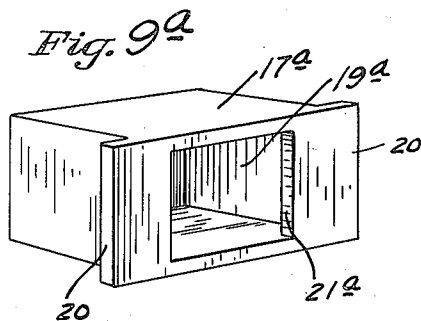
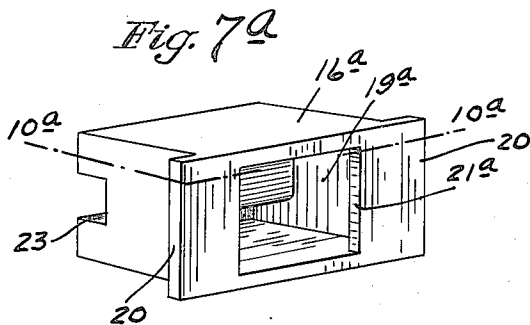
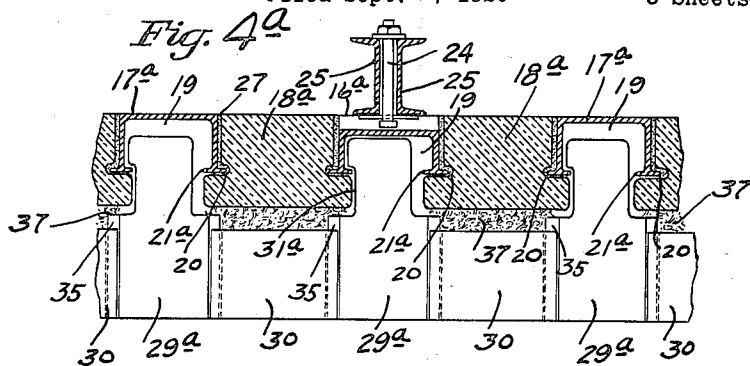
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*Fig. 5*

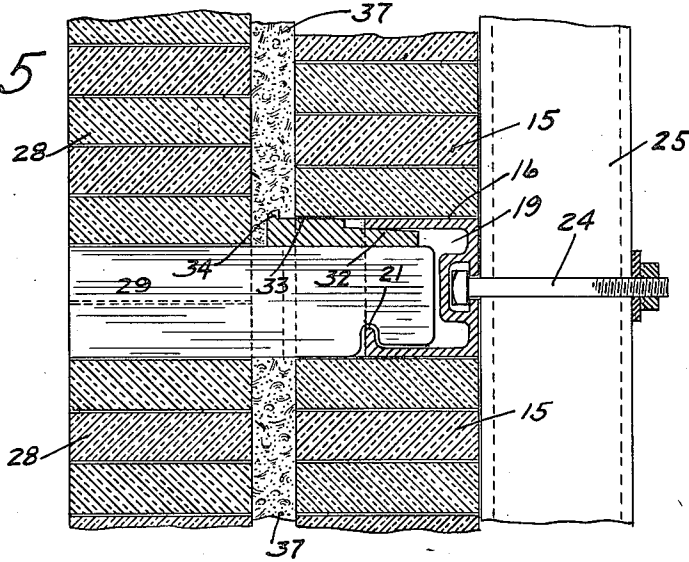
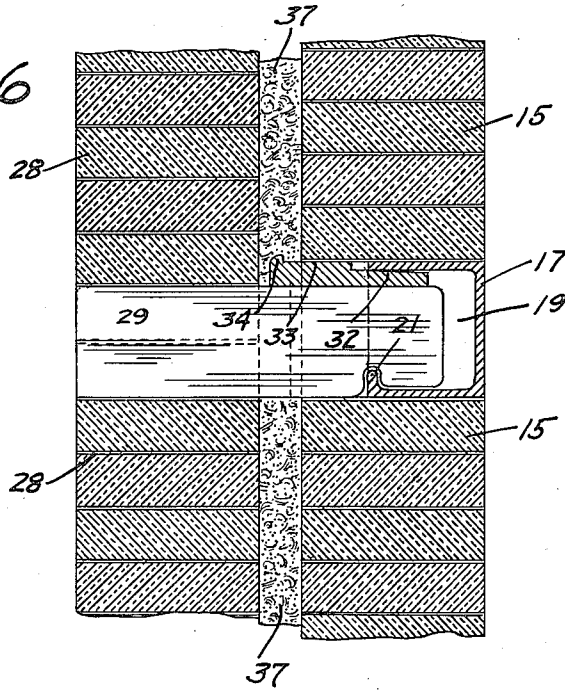


*Fig. 6*



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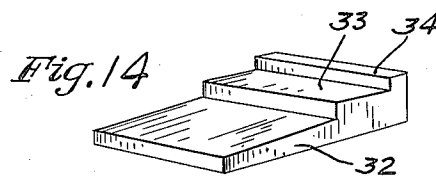
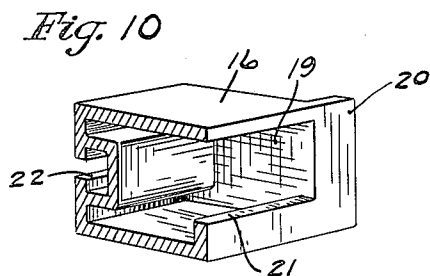
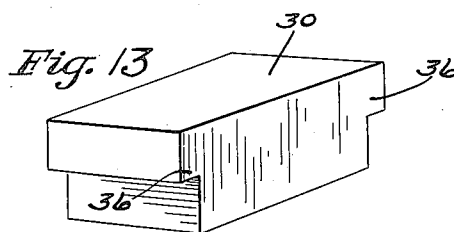
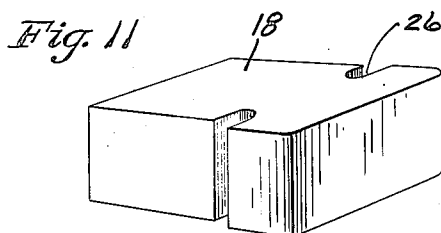
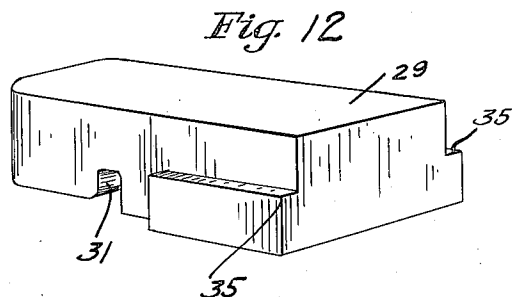
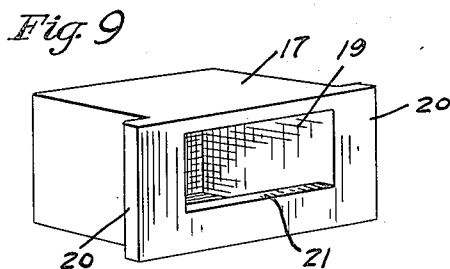
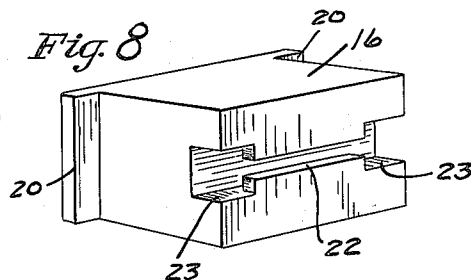
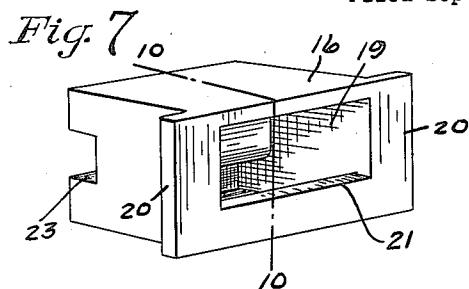
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5 Sheets-Sheet 5



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# UNITED STATES PATENT OFFICE.

MICHAEL LIPTAK, OF ST. PAUL, MINNESOTA, ASSIGNOR TO A. P. GREEN FIRE BRICK COMPANY, OF MEXICO, MISSOURI, A CORPORATION OF MISSOURI.

## FURNACE-WALL STRUCTURE.

Application filed September 7, 1920. Serial No. 408,698.

*To all whom it may concern:*

Be it known that I, MICHAEL LIPTAK, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Furnace-Wall Structures; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to the construction of furnace wall structures and is directed to a modified form of the wall disclosed and broadly claimed in my companion application filed of even date herewith under S. N. 408699 and entitled "Furnace wall."

The present invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a fragmentary perspective of the wall, some parts thereof being sectioned and some parts being removed;

Fig. 2 is an outside elevation of a portion of the wall;

Fig. 3 is an inside elevation of a portion of the wall;

Fig. 4 is a horizontal section taken approximately on the line 4—4 of Fig. 3;

Fig. 5 is a vertical section taken on the line 5—5 of Fig. 4, some parts being shown in full;

Fig. 6 is a horizontal section taken on the line 6—6 of Fig. 3, some parts being shown in full;

Fig. 7 is a perspective of one of the metallic anchor boxes shown in section in Fig. 5, looking at the inner face thereof;

Fig. 8 is a perspective of the anchor box shown in Fig. 7, looking at the outer face thereof;

Fig. 9 is a perspective of one of the anchor boxes shown in section in Fig. 6, looking at the inner face thereof;

Fig. 10 is a section taken on the line 10—10 of Fig. 7;

Fig. 11 is a perspective of one of the tiles of the outer wall;

Fig. 12 is a perspective of one of the anchoring tiles of the inner wall;

Fig. 13 is a perspective of one of the shelf-forming tiles of the inner wall;

Fig. 14 is a perspective of one of the wedge-shaped keys used in connection with the anchor boxes shown in section on Figs. 5 and 6;

Fig. 4<sup>a</sup> is a view corresponding to Fig. 4, but illustrating a modified construction;

Fig. 7<sup>a</sup> is a perspective corresponding to Fig. 7, but illustrating a modified form of the anchor box shown in Fig. 7;

Fig. 9<sup>a</sup> is a perspective corresponding to Fig. 9, but illustrating a modified form of the anchor box shown in Fig. 9;

Fig. 10<sup>a</sup> is a horizontal section on the line 10<sup>a</sup>—10<sup>a</sup> of Fig. 7<sup>a</sup>;

Fig. 11<sup>a</sup> is a perspective corresponding to Fig. 11, but illustrating a slightly modified form of the outer wall tile shown in Fig. 11; and

Fig. 12<sup>a</sup> is a perspective corresponding to Fig. 12, but illustrating a modified form of the shelf-forming anchor tile of the inner wall.

The outer or permanent wall, as preferably constructed, comprises horizontally extended wall sections made up of commercial brick 15 laid in a multiplicity of layers, and between the wall sections of commercial brick, interposed layers made up of metallic anchor boxes 16 and 17 and tiles 18. The metallic anchors afforded by the anchor boxes 16 and 17 may take different forms, but the box-like structures shown in the drawings are the best for many reasons, as will appear from the following detailed description of the construction and functions thereof. The anchor boxes 16 and 17 are alike in that each has a large front opening 19, laterally projecting vertically extended lock ribs 20 and horizontally extended lock ribs 21, the said ribs 20 and 21 being preferably flush with the inner faces of said anchor boxes. The said anchor boxes 16 and 17 differ in this, that the outer faces of the latter are preferably flat and smooth, while the said anchor boxes 16, in their outer faced portions, are formed with bolt head receiving channels 22 that are T-shaped in cross section and are enlarged at the sides of the anchor box 16 to entirely open up said channels as indicated at 23.

The numeral 24 indicates nut-equipped bolts, the heads of which are adapted to be inserted endwise through the end openings 23 and slid into interlocking engagement with the channels 22, even when the sides of

said anchor box 16 are abutted against adjacent outer wall tiles 18 in a manner presently to be noted.

By means of nut-equipped bolts 24, the anchor boxes 16 are adapted to be firmly locked and anchored to buckstays or vertical wall reinforcing girders 25. These buckstays 25, as shown, are of standard or well known construction, each comprising a pair of channel beams set back to back, but spaced apart far enough to permit the bolts 24 to be passed between them. With this arrangement, as is evident, close setting of the anchor boxes 24 in any particular position longitudinally, or vertically at the outer wall, is not necessary, because the bolts 24 may move upward and downward in the buckstays and horizontally in the channels 22. Of course, when the nuts of the bolts 24 are tightened, the anchor boxes 16 will be tightly clamped against the buckstays.

The anchor boxes 16 will be used in places where they will align with the buck stays, but between the buckstays, the anchor boxes 17 are used. These anchor boxes 16 and 17 are laid in a layer or course on the flat upper surface of the underlying commercial brick wall section, but are spaced apart so that the outer wall tiles 18 are interposed between the same. The anchor boxes 16 and 17 and the tiles 18 are of the same vertical thickness and the tiles 18, in their sides, a considerable distance from their inner ends, are formed with vertical lock grooves 26 that receive and interlock with the vertical lock ribs 20 of the anchor boxes 16 and 17. Cement, indicated at 27, in Fig. 4, preferably placed in the joints between said tiles and anchor boxes.

It is important to note that in a horizontal direction crosswise of the wall, the tiles 18 project far inward beyond the inner faces of the anchor boxes 16 and 17. The outer faces of the said tiles and anchor boxes are preferably laid flat. The outer wall construction proper, in its preferred arrangement, has now been described.

The inner wall is made up of horizontal wall sections of fire brick masonry 28 laid in a multiplicity of horizontal courses, and between these fire brick wall sections, horizontal layers of the anchoring tiles 29, shown in detail in Fig. 12, and supplemental shelf-forming tiles 30 shown in detail in Fig. 13. The tiles 29 and 30 are of the same vertical thickness, but are of slightly less vertical thickness, say one-half inch less in thickness, than the anchor boxes 16 and 17 and tile 18 of the outer wall.

The so-called anchor tiles 29 are of such length that they extend entirely through the inner wall and into the anchor boxes 16 and 17 that are aligned therewith in the outer wall. On their undersides, said tiles 29 are

provided with lock notches 31, which, when the outer ends of said tiles 29 are inserted into the lock boxes 16 or 17, as the case may be, and are dropped down to position on the flat upper surface of the underlying fire brick wall section 28 underlying the same, will interlock with the horizontal lower lock flanges 21 of the said anchor boxes.

To firmly lock the anchoring tile 29 within the anchor boxes, slightly wedge shaped lock keys 32, shown in detail in Fig. 14, but see also Figs. 1, 5 and 6, are forced into the upper portions of said boxes immediately on top of said tile. The outer portions of these keys 32 are formed with slightly raised ledges 33 and with lips 34. The raised ledges 33 will come flush with the tops of the boxes 16 and 17, while the lips 34 afford means for withdrawing keys, by the use of a suitable tool when making repairs.

Those portions of the tiles 29 that extend through the inner wall, are provided at their sides with outstanding shoulders or ledges 35 that engage with outstanding shoulders 36 of the tiles 30 to support the latter, in such manner that the tiles 29—30 that are laid in the same course, form a complete shelf supported from the outer or permanent wall and adapted to support fire brick wall sections that are superimposed thereon. Here it is important to note that the fire bricks 28 which form the several fire brick wall sections, except for the lock tiles 29, are not tied to the outer wall, or so interconnected therewith, as to prevent their independent replacement. In fact, any one of the several fire brick inner wall sections, may be replaced in whole, or in part, independently of any other fire brick wall section, and without disturbing the permanent outer wall, and, moreover, without disturbing any one of the shelves formed by the tile 29—30.

In some instances, the fire brick of the inner wall may be laid closely against the inner surface of the outer wall, but preferably, and as shown, the brickwork of the inner and outer walls are separated so as to use a space adapted to be filled in with a suitable insulating material, such as asbestos or mineral wool, or the air space could be left empty. The wedge-acting keys 32 not only keep the tile 29 positively interlocked with the anchor boxes of the outer wall, but they perform an even more important function in that they hold the said tile 29 horizontally extended, and prevent sagging thereof, under the weight of the superimposed fire brick wall section.

By reference particularly to Figs. 1, 5, and 6, it will be noted, that the inner ends of the common brick 15 of the outer wall project over or onto the raised ledges 33 of the keys 32, and that the projecting ends of said keys are embedded in an insulating material 37.

It must now be evident that with a wall constructed as above illustrated, there is no possibility of the inner and outer walls pulling apart laterally, because if there is any movement, even of the inner or outer wall, the two walls must move or sway together, and moreover, both walls must move with the buckstays and the buckstays must move with the walls, if there is any lateral swaying or movement of the wall structure, due to the intense expansion or contraction incident to the uses to which furnace walls are subjected.

Not only is the wall structure described easily erected, in the first instance, but it may be quickly repaired at a minimum of cost. As already stated, any one of the fire brick wall sections of the inner wall may be replaced independently of the other. Moreover, if any of the tile 29 or 30 are burned or damaged so that they require replacement, they may be very easily replaced. Replacement of the tile 30 only requires that the old tile be removed and a new tile applied. Replacement of one of the anchoring tiles 29 with the construction above described in detail, of course, require first, that a co-operating key 32 be removed, but this, as it evident, may be easily and quickly accomplished.

The metallic anchor boxes 16 and 17 are not only protected by the inner wall and by the insulating material 37, when the latter is used, but also by the inner end portions of the outer wall tiles 18 that project beyond the notches 26, and by the lower portions of the anchoring tiles 29 that are just outward of the notches 31. There is no possibility, therefore, of the metallic anchor boxes ever being burned out, because the inner wall must always be replaced before cavities are burned through the inner wall and into the outer wall.

At the lower right hand portion of Fig. 1, fire bricks of the lower section of the inner wall have been removed to illustrate the manner in which the shelf-forming tiles 29 and 30 will support an upper or superimposed fire brick wall section, while the lower section is being repaired or replaced.

I will now describe the modified construction illustrated in Figs. 4<sup>a</sup>, 7<sup>a</sup>, 10<sup>a</sup>, 11<sup>a</sup>, and 12<sup>a</sup>, and will first note certain features, wherein the elements differ in some respects from those of corresponding elements of the wall structure above fully described. The anchor boxes 16<sup>a</sup> are like the previously described anchor boxes 16, except that the lower lock rib 21 is omitted at the front opening 19<sup>a</sup> and vertical inwardly projecting lock ribs 21<sup>a</sup> are provided at the vertical sides of said opening.

The anchor boxes 17<sup>a</sup> are like the anchor boxes 17, except that the lower lock rib 21 is omitted at the opening 19<sup>a</sup> and the same

kind of vertical lock ribs 21<sup>a</sup> that are provided on the boxes 16<sup>a</sup> are provided on the anchor boxes 17<sup>a</sup>. Said boxes 16<sup>a</sup> and 17<sup>a</sup> are provided with the outstanding lock ribs 20, the same as the boxes 16 and 17.

The tiles 18<sup>a</sup>, one of which is shown in Fig. 11<sup>a</sup>, and several of which are shown in Fig. 4<sup>a</sup>, are almost identically like the tiles 18, but at their inner ends, beyond the lock grooves 26, they are made slightly wider than are the blocks 18. The lock grooves 26 engage with lock ribs 20, the same as in the outer wall previously described, and the anchor boxes 16<sup>a</sup> are anchored to the buckstays in the same manner and with the same means as has already been described.

The supplemental shelf-forming tiles 30 in the wall shown in Fig. 4<sup>a</sup>, are just like the tiles 30 of the wall previously described, and the inside ends of the anchoring tiles 29<sup>a</sup> are just like the corresponding ends of the tiles 29, being provided with the ledges 35 for supporting the supplemental tiles 30, in the manner before described.

The anchoring tiles 29<sup>a</sup>, however, at their outward extended ends, differ from the corresponding ends of the tiles 29 in that, instead of having the lock grooves 31 in their undersides, are formed with vertical lock grooves 31<sup>a</sup> at one side for interlocking engagement with one or the other of the vertical lock ribs 21<sup>a</sup> of the lock boxes 16<sup>a</sup> and 17<sup>a</sup>. Also, at the sides opposite to the notches 31<sup>a</sup>, the outwardly extended end of the tiles 29<sup>a</sup> are slightly reduced in horizontal width, so that the notches 31<sup>a</sup> can be moved into and out of interlocking engagement with the lock rib 21<sup>a</sup>, when a tile 30, at the reduced side of the outer end or neck portion of said tile 29<sup>a</sup> is removed. When all of the tiles 29<sup>a</sup> and 30 are assembled to form a shelf, as shown in Fig. 4<sup>a</sup>, the shoulders or heads formed by the notches 31<sup>a</sup> at the ends of the tiles 29<sup>a</sup> will be held interlocked to the co-operating ribs 21<sup>a</sup>, so that the inner and outer walls will be anchored or tied together.

What I claim is:

1. A wall structure comprising a permanent outer wall and a replaceable inner wall, said outer wall having metallic anchoring boxes built therein, and said inner wall having built therein, anchoring tiles with ends that project into and are interlocked to said anchoring boxes by movements transversely of their length, outer wall tiles associated with and interposed between said anchoring boxes and forming therewith, vertically spaced courses, and wall sections of brick masonry interposed between said course of anchoring boxes and tiles.

2. A wall structure comprising a permanent outer wall and a replaceable inner wall, said outer wall having metallic an-

choring boxes built therein, and said inner wall having built therein, anchoring tiles with ends that project into and are interlocked to said anchoring boxes, by movements transversely of their length, outer wall tiles associated with and interposed between said anchoring boxes and forming therewith, vertically spaced courses, and wall sections of brick masonry interposed between said course of anchoring boxes and tiles, supplemental tiles supported by said anchoring tiles and therewith forming vertically spaced shelves, and fire brick wall sections supported by the shelves thus formed and filling the space between same.

3. A wall structure comprising a permanent outer wall and a replaceable inner wall, said inner wall including main and supplemental shelf-forming tiles laid in horizontal courses and forming a shelf, said main shelf-forming tiles being extended into and supported by said outer wall, said supplemental tiles being supported by said main tiles independently of the outer wall, said inner wall including also brick work laid in wall sections and supported on the

shelf formed by said main and supplemental tiles.

4. A wall structure comprising a permanent outer wall and a replaceable inner wall, said outer wall including horizontally spaced anchoring boxes and horizontally interposed blocks, and said inner wall having built therein anchoring tiles with projecting ends that are detachably anchored within the anchor boxes of said outer wall and afford supporting shelves for elements of the inner wall.

5. The structure defined in claim 4 in further combination with buckstays anchored to certain of the anchor boxes of said outer wall.

6. The structure defined in claim 4 in which the anchor boxes of said outer wall are integral cast metal structures.

7. The structure defined in claim 4 in further combination with key blocks inserted into said anchor boxes and holding said shelf-forming tiles interlocked to said boxes.

In testimony whereof I affix my signature.  
MICHAEL LIPTAK.