Jan. 31, 1928.

1,657,453

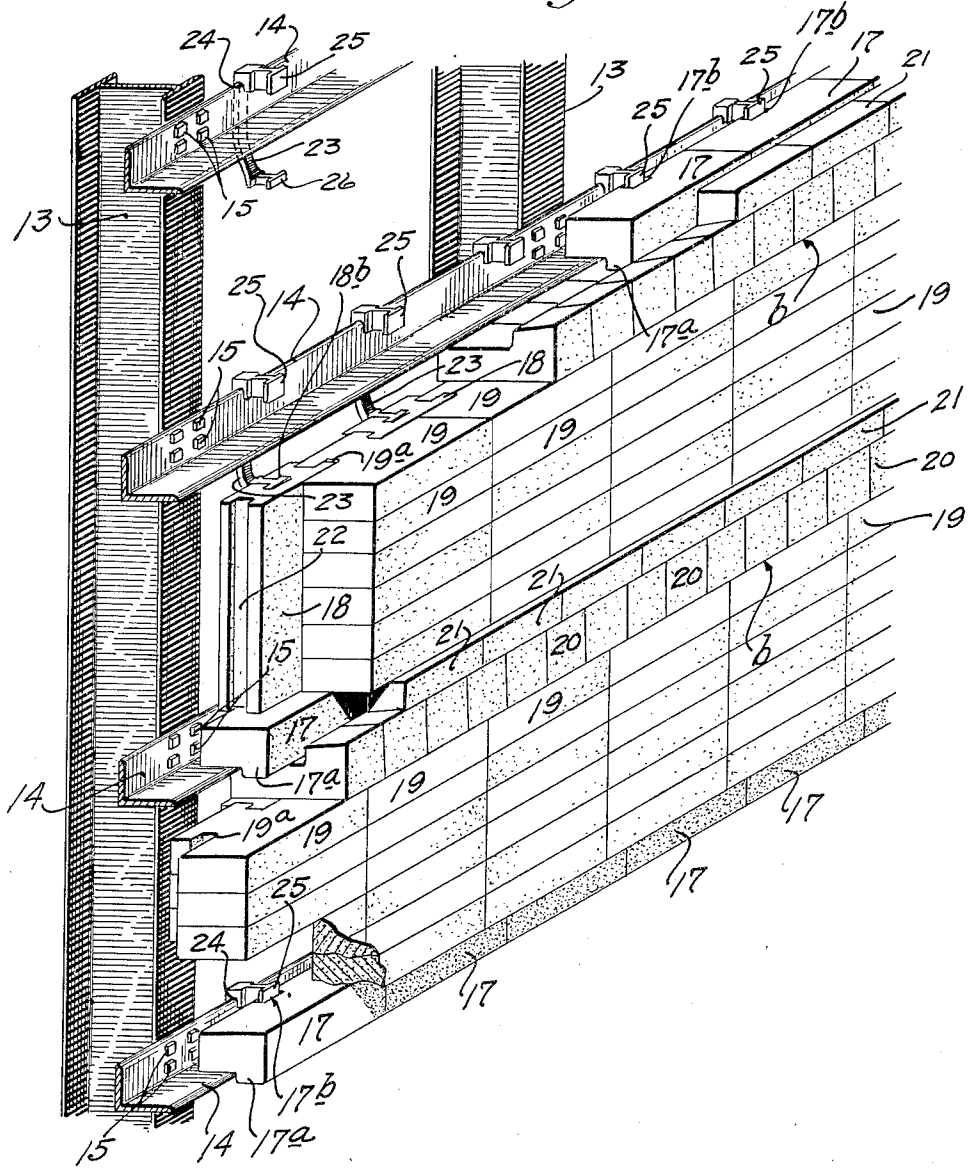
W. H. BOYD

FURNACE WALL

Filed March 21, 1927

3 Sheets-Sheet 1

Fig. 1



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Fig. 2

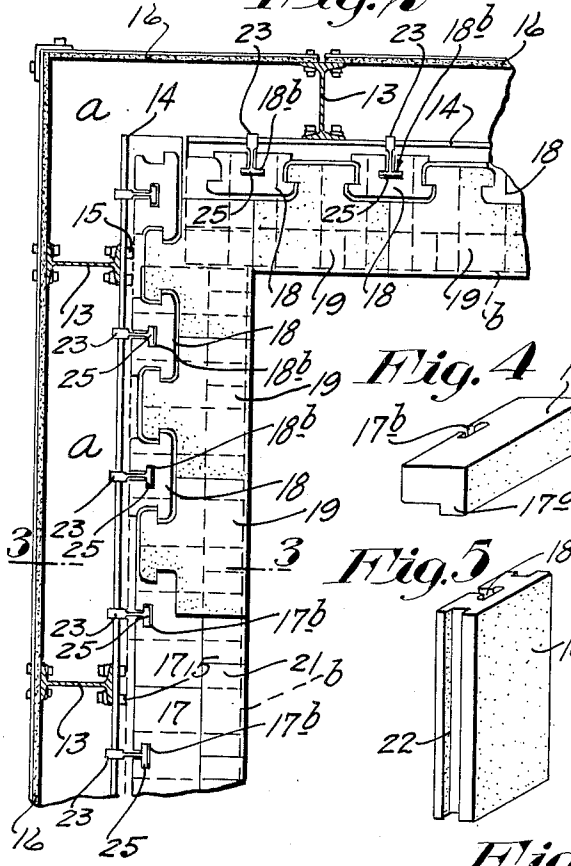


Fig. 3

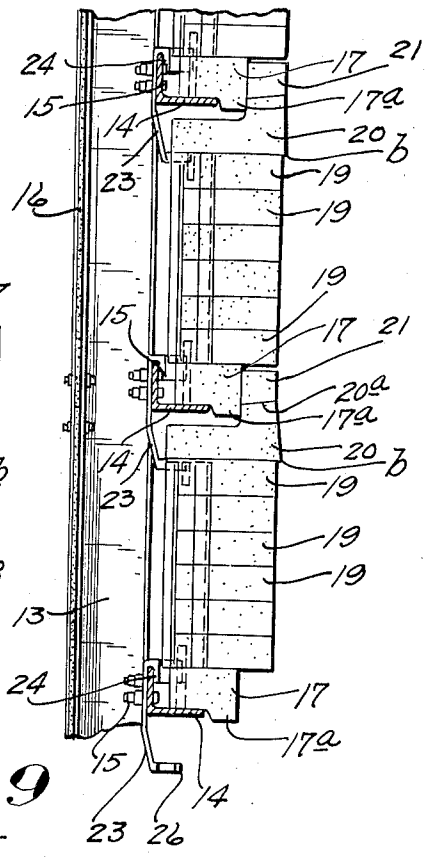


Fig. 4

Fig. 5

Fig. 9

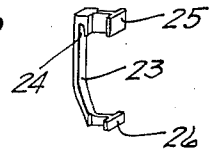


Fig. 6

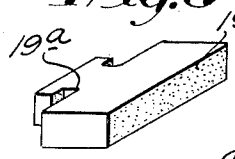


Fig. 7

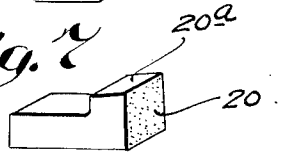
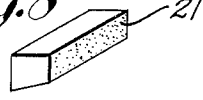


Fig. 8



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Fig. 11

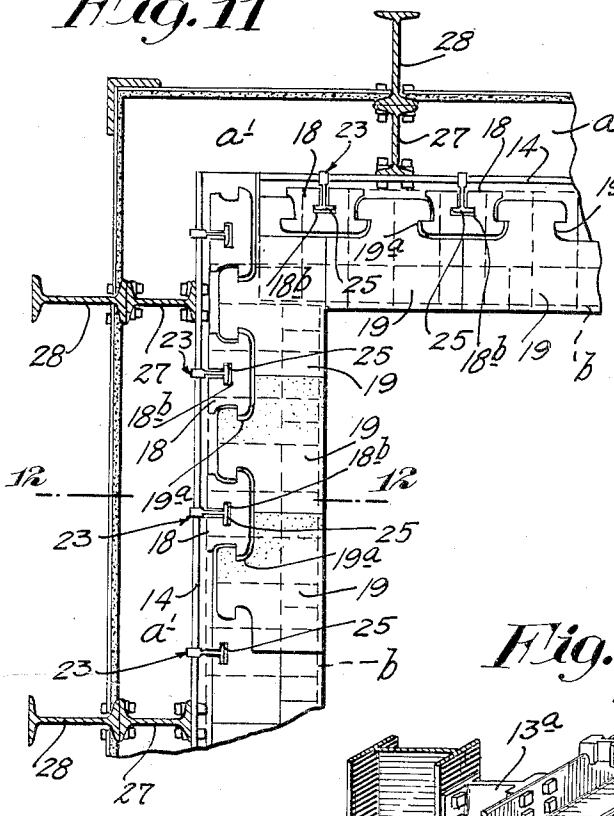


Fig. 12

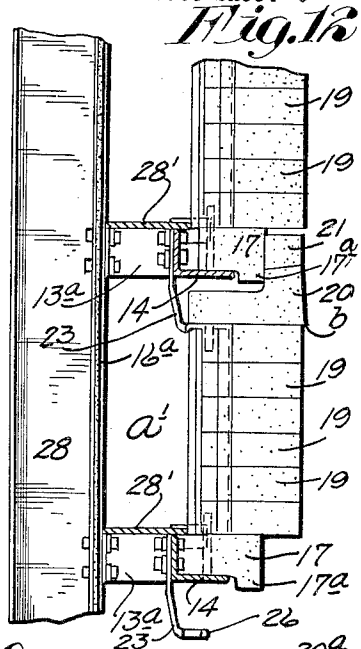
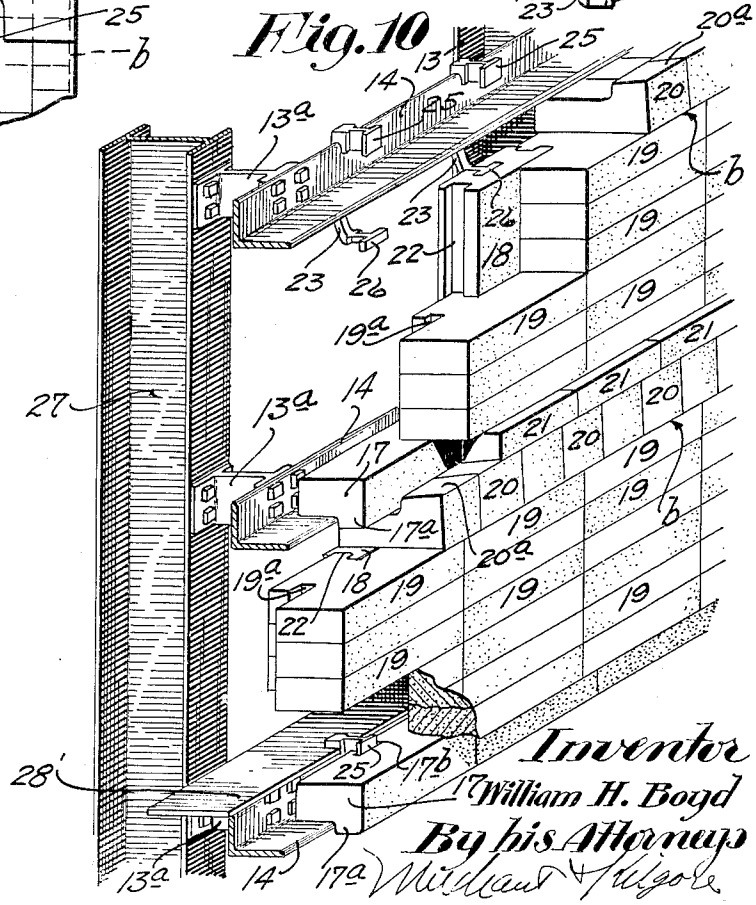


Fig. 10



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Patented Jan. 31, 1928. 1,657,453

UNITED STATES PATENT OFFICE.

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FURNACE WALL.

Application filed March 21, 1927. Serial No. 177,011.

This invention provides certain highly important improvements in furnace walls or walls that are to be subjected to high temperatures and in which certain blocks or refractories require quite frequent replacement; and, generally stated, the invention consists of the novel devices, combinations of devices and arrangement of parts hereinafter described and defined in the claims.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a fragmentary perspective illustrating the improved wall structure, some parts being broken away and some parts being removed;

Fig. 2 is a horizontal section illustrating the wall shown in Fig. 1 and showing a corner portion of said wall;

Fig. 3 is a fragmentary view, some parts being in vertical section on the line 3—3 of Fig. 2 and some parts being shown in full;

Figs. 4, 5, 6, 7 and 8 are detail views in perspective showing the refractories that make up the refractory portion of the wall illustrated in Figs. 1, 2 and 3;

Fig. 9 is a perspective showing in detail one of the metallic anchors or block-anchoring brackets;

Fig. 10 is a view corresponding to Fig. 1, but illustrating a somewhat modified construction;

Fig. 11 is a horizontal section showing a corner portion of the wall illustrated in Fig. 10; and

Fig. 12 is a fragmentary vertical section on the line 12—12 of Fig. 11, some parts being shown in full.

The wall illustrated in Figs. 1 to 9, inclusive, will first be described and, as shown, is as follows:

The outer structure of the wall includes upright beams or columns 13, preferably rolled steel channel beams, and flanged horizontally extending shelf-forming beams 14, which latter are L-shaped in cross-section and the vertical flanges of which are rigidly secured to the adjacent flanges of the columns 13 by nut-equipped bolts or rivets 15. An outer casing 16, preferably made up of metal-covered asbestos sheets, are rigidly secured by bolts or rivets to the outer flanges of the columns 13, so as to form vertical air spaces *a* between said columns and between said outer casing 16 and the refractory portion of the wall.

In this preferred arrangement, the refractory tile or fire-resisting portion of the wall is made up of sill blocks 17, anchoring blocks 18, inner or face blocks 19, and filler blocks 20—21. The sill blocks 17 are laid on the horizontal flanges of the shelf-forming beams 14 and, inward of said flanges, have thickened and depending portions 17^a that protect the said metallic shelf-forming beams from the direct action of heat from the furnace. At the central portions of their rear edges, the sill blocks are formed with T-shaped notches or pockets 17^b, for an important purpose which will presently appear.

The anchor blocks 18 are placed with their lower ends on the underlying sill blocks 17 and they are of such vertical length that their upper ends will then be spaced below the underlying sill block far enough to permit the filler blocks 20 to be freely inserted between the same and the immediately overlying sill block and anchor beam. In their vertical edges, the anchor blocks 18 are formed with lock grooves 22. The inner or face blocks 19, on their rear edges, are provided with T-shaped lock heads 19^a, the flanges of which are engageable with the grooves 22 of the anchor blocks 18; and here it should be noted that the anchor blocks 18 are so spaced that the heads 19^a of said blocks 19 will freely slide vertically into interlocking engagement with the grooved edges of immediately adjacent anchor blocks. In their upper and lower ends, the anchor blocks 18 are formed with T-shaped notches or pockets 18^b for an important purpose which will presently appear. The inner or face blocks 19 are of such vertical dimensions that a plurality or stack thereof (in the structure illustrated 6), will be placed on the underlying sill blocks and

interlocked to the same pair of spaced anchor blocks 18.

The filler blocks 20, at their inner ends, are thickened so that they have upstanding inner end portions 20^a, which, when the filler blocks are applied in the wall, will vertically overlap the inner end portions 17^a of the sill blocks 17, but with clearance between the two blocks so as to provide for vertical expansion and contraction of the several horizontal belts of refractories, but to always maintain a lapped joint that will prevent the flames from reaching the metallic beams. The blocks 21 really constitute supplemental parts of the filler blocks 20. Their under surfaces are beveled so that their exposed inner ends are thinner than their opposite ends. The upper surfaces of the block portions 20^a are beveled to correspond to the engaging beveled portion of the block 21. By reference to Fig. 3, it will be noted that there is clearance between the tops of the blocks 21 and the overlying portions of the vertically adjacent block 19, but that this clearance is less than sufficient to allow the blocks 21 to be removed while the blocks 20 are in position. This prevents the blocks 21 from being accidentally displaced from the wall. Also, it will be noted that the exposed inner end surfaces of the filler blocks 20 are slightly beveled and so arranged that their lower inner edge portions project at *b* slightly inward of the vertical face of the underlying group of blocks 19, thereby forming a slag drip so that any slag running from the face of the wall, when reaching these beveled portions, will be carried away from the wall and dropped from the face thereof.

By reference to Figs. 1 and 3, it will be noted that the distance between a top block 19 of any particular stack and the overlying sill block is such that when an interposed filler block 20 has been removed, the blocks 19 in the stack may be raised into the opening afforded by such removal and may then be removed endwise from the wall and, of course, they may be applied in interlocking engagement with the anchor block 18 by a reverse operation.

Means for locking the refractories or blocks above described to the supporting metallic framework is, of course, highly important. As a simple means for accomplishing this result, I provide metallic anchors in the form of brackets 23, which, at their upper ends, are formed with crotches or lock notches 24 and with projecting T-heads 25 and at their lower ends are provided with projecting T-heads 26. The crotches 24 adapt these brackets to be engaged with the upstanding flanges of the shelf-forming beams 14 and to be suspended from said beams. The T-heads 25 are arranged for interlocking engagement with the T-shaped notches 17^b of the sill blocks 17 and with the T-shaped notches 18^b in the lower ends of the anchor blocks 18, while the T-heads 26 are arranged for engagement with the T-shaped notches 18^b in the upper ends of said anchor blocks 18. By reference to Figs. 1 and 3, it will be noted that the T-heads 25, when applied in the notches of the sill blocks 17, project above said sill blocks so that they will engage the notches in the lower ends of the blocks 18, as just above described, and will anchor both of the said blocks and hold the same against shifting movements in any direction in a horizontal plane, the one in respect to the other. These anchor brackets, therefore, positively hold the refractory portion of the wall interlocked to the metal frame work while the shelf-forming beams 14 support the refractory wall in a plurality of horizontally extended belts, the one positioned over the other with freedom for independent expansion and contraction.

With the above described arrangement, it is an easy matter to replace any of the refractories of the wall. The blocks, which are exposed to the most intense heat and, hence, require most frequent replacement, are made relatively small as compared with the anchor blocks 18, which latter will very seldom require replacement. By making the anchor blocks relatively long or deep in a vertical direction, as compared with the inner blocks, the said anchor blocks may be utilized to hold a stack or plurality of inner blocks, and the matter can be replaced one at a time without removing the anchor blocks. Not only can the wall be rapidly installed in the first instance, but it may be quickly repaired by replacement of any damaged or burned-out blocks.

The outer wall structure formed by the beams 13 and outer casing 16 affords the vertical air spaces *a*, which not only constitute good insulation to the furnace wall, but permit the furnace walls to be kept cool by the circulation of air forced through said air spaces; and the air thus pre-heated may be introduced into a furnace to support combustion.

The construction illustrated in Figs. 10, 11 and 12 is like that described, except that in lieu of the vertical beams or columns 13, the I-beam sections 13^a are bolted or riveted to the vertical flanges of the shelf-forming beams 14, and the outer flanges of said angle sections 13^a are bolted or riveted to the inner flanges of vertical I-beams or columns 27; and horizontal separating plates 28 are placed on the sections 13^a so as to afford horizontal air spaces *a'* between the refractory wall and the outer casing 16^a, which latter, in this arrangement, is interposed between the beam sections 13^a and said columns 28.

From what has been said, it will be under-

stood that the invention described is capable of various modifications and rearrangement of parts, all within the spirit of the invention as herein disclosed and claimed.

Not only is the complete wall structure herein disclosed claimed, but certain of the elements, features and portions thereof are deemed to be novel and are herein claimed as a new article of manufacture.

By reference particularly to Fig. 1, it will be noted that each group of surfacing blocks 19 is made up of a plurality of flat rectangular blocks of greater length and width, and that the plurality of blocks assembled in a group form a rectangular structure that is of greater depth than length or width. The length of the blocks forming the group will, in practice, the distance between centers of adjacent anchoring blocks 18 and the depth of the group or stack of blocks corresponds to the vertical length or depth of said anchoring blocks. At their backs, said blocks 22 are formed with T-shaped heads that adapt them for sliding engagement with the grooved or flanged edges of the anchoring blocks. In this way, a large number of thin surfacing blocks may be assembled in a group to form a composite block or wall section of very considerable depth or of a depth limited only by the length or vertical dimension of the cooperating anchoring blocks.

What I claim is:

1. In a wall structure, anchoring blocks and means supporting the same in vertically and horizontally spaced relation, and surfacing blocks arranged in stacks and having vertical sliding interlocking engagement with said anchoring blocks and individually removable therefrom by vertical sliding movement to extreme position above the cooperating anchor blocks.

2. In a wall structure, a metallic framework including columns and rigidly connected thereto shelf-forming beams, anchoring blocks supported by said shelf-forming beams and anchored to said framework, surfacing blocks having vertical sliding interlocking engagement with said anchoring blocks and removable therefrom one at a time by vertical sliding movement to an extreme position above said anchoring blocks.

3. In a wall structure, anchoring blocks and means supporting the same in vertically and horizontally spaced relation, surfacing blocks arranged in stacks and having vertical sliding interlocking engagement with said anchoring blocks and individually removable therefrom by a vertical sliding movement to extreme position above the cooperating anchor blocks, the said anchor blocks and surfacing blocks forming independent belts in the wall, and filler blocks interposed between the belts.

4. In a wall structure, a metallic framework including columns and rigidly connected thereto shelf-forming beams, anchoring blocks supported by said shelf-forming beams and anchored to said framework, surfacing blocks having vertical sliding interlocking engagement with said anchoring blocks and removable therefrom one at a time by vertical sliding movement to an extreme position above said anchoring blocks, the said anchor blocks and surfacing blocks forming independent belts in the wall, and filler blocks interposed between the belts.

5. In a wall structure, anchoring blocks and means supporting the same in vertically and horizontally spaced relation, surfacing blocks arranged in stacks and having vertical sliding interlocking engagement with said anchoring blocks and individually removable therefrom by vertical sliding movement to extreme position above the cooperating anchor blocks, the said anchor blocks and surfacing blocks forming independent belts in the wall, and filler blocks interposed between the belts, the said filler blocks being spaced from the overlying surfacing blocks to form expansion joints.

6. In a wall structure, anchoring blocks and means supporting the same in vertically and horizontally spaced relation, surfacing blocks arranged in stacks and having vertical sliding interlocking engagement with said anchoring blocks and individually removable therefrom by vertical sliding movement to extreme position above the cooperating anchor blocks, the said anchor blocks and surfacing blocks forming independent belts in the wall, and filler blocks interposed between the belts, the said filler blocks being spaced from the overlying surfacing blocks to form expansion joints, and having detachable sections engaging therewith by surfaces inclined toward the outer side of the wall.

7. A wall structure comprising vertical column-forming beams and horizontal shelf-forming beams rigidly secured thereto, sill blocks laid on said shelf-forming beams, relatively deep anchoring blocks laid on said sill blocks and spaced from the overlying shelf-forming beams, and relatively shallow surfacing blocks arranged in stacks having vertical interlocking sliding engagement with said anchoring blocks, the space between the upper ends of said anchoring blocks and the overlying shelf-forming beams being such as to permit said surfacing blocks to be removed or applied one at a time.

8. A wall structure comprising vertical column-forming beams and horizontal shelf-forming beams rigidly secured thereto, sill blocks laid on said shelf-forming beams, relatively deep anchoring blocks laid on said sill blocks and spaced from the overlying shelf-forming beams, relatively shallow surfacing blocks arranged in stacks having ver-

tical interlocking sliding engagement with said anchoring blocks, the space between the upper ends of said anchoring blocks and the overlying shelf-forming beams being such as to permit said surfacing blocks to be removed or applied one at a time, and filler blocks interposed between the upper surfacing blocks and the overlying sill blocks and forming expansion lap joints with the latter.

9. A wall structure comprising vertical column-forming beams and horizontal shelf-forming beams rigidly secured thereto, sill blocks laid on said shelf-forming beams, relatively deep anchoring blocks laid on said sill blocks and spaced from the overlying shelf-forming beams, relatively shallow surfacing blocks arranged in stacks having vertical interlocking sliding engagement with said anchoring blocks, the space between the upper ends of said anchoring blocks and the overlying shelf-forming beams being such as to permit said surfacing blocks to be removed or applied one at a time, and filler blocks interposed between the upper surfacing blocks and the overlying sill blocks and forming expansion lap joints with the latter. said filler blocks at their inner ends having beveled detachable supplemental sections spaced from the overlying surfacing blocks.

10. A wall structure comprising vertical column-forming beams and horizontal shelf-forming beams rigidly secured thereto, sill blocks laid on said shelf-forming beams, relatively deep anchoring blocks laid on said sill blocks and spaced from the overlying shelf-forming beams, relatively shallow surfacing blocks arranged in stacks having vertical interlocking sliding engagement with said anchoring blocks, the space between the upper ends of said anchoring blocks and the overlying shelf-forming beams being such as to permit said surfacing blocks to be removed or applied one at a time, and anchoring brackets interlocked to said shelf-forming beams and having interlocking engagement with said anchoring blocks.

11. A wall structure comprising vertical column-forming beams and horizontal shelf-forming beams rigidly secured thereto, sill blocks laid on said shelf-forming beams, relatively deep anchoring blocks laid on said sill blocks and spaced from the overlying shelf-forming beams, relatively shallow surfacing blocks arranged in stacks having vertical interlocking sliding engagement with said anchoring blocks, the space between the upper ends of said anchoring blocks and the overlying shelf-forming beams being such as to permit said surfacing blocks to be removed or applied one at a time, and anchoring brackets interlocked to said shelf-forming beams and having interlocking engagement with said anchoring blocks, and also having interlocking engagement with said sill blocks.

12. The structure defined in claim 7 in which said sill blocks have T-shaped notches and said anchor blocks have T-shaped notches both in upper and lower ends, and in further combination with anchor brackets interlocked to and hung from said shelf-forming beams and having upper and lower T-heads, said upper T-heads engaging the T-shaped notches in said sill blocks and in the lower ends of said anchor blocks and said lower T-heads engaging the T-shaped notches in the upper ends of said anchor blocks.

13. The structure defined in claim 7 in which said sill blocks have T-shaped notches and said anchor blocks have T-shaped notches both in upper and lower ends, and in further combination with anchor brackets interlocked to and hung from said shelf-forming beams and having upper and lower T-heads, said upper T-heads engaging the T-shaped notches in said sill blocks and in the lower ends of said anchor blocks and said lower T-heads engaging the T-shaped notches in the upper ends of said anchor blocks, and filler blocks interposed between the upper surfacing blocks and overlying sill blocks and forming expansion lap joints with the latter.

14. As an article of manufacture, a furnace wall portion comprising relatively deep flanged anchor blocks and a group of relatively shallow flanged surfacing blocks having T-shaped back flanges arranged for sliding interlocking engagement therewith.

15. The structure defined in claim 7 in which said sill blocks have T-shaped notches and said anchor blocks have T-shaped notches both in upper and lower ends, and in further combination with anchor brackets interlocked to and hung from said shelf-forming beams and having upper and lower T-heads, said upper T-heads engaging the T-shaped notches in said sill blocks and in the lower ends of said anchor blocks and said lower T-heads engaging the T-shaped notches in the upper ends of said anchor blocks, and filler blocks interposed between the upper surfacing blocks and overlying sill blocks and forming expansion lap joints with the latter, said anchor blocks in their ends having T-shaped lock notches for interlocking engagement with metallic anchors.

16. As an article of manufacture, a furnace wall portion comprising sill blocks, anchor blocks and surfacing blocks, said sill blocks in their upper faces having T-shaped lock notches, said anchor blocks at their upper and lower ends having T-shaped lock notches, said surfacing blocks having sliding interlocking engagement with said anchor blocks and being relatively shallow so that a group thereof with one anchor block may be placed on a sill block and interlocked with

an anchor block by vertical sliding movement.

17. As an article of manufacture, a furnace wall portion comprising a group of flat rectangular surfacing blocks having T-shaped heads adapted for sliding engagement with flanged edges of cooperating anchoring blocks, said blocks individually having less vertical depth than horizontal length, the group of assembled blocks forming a rectangular structure that has greater vertical depth than horizontal length.

In testimony whereof I affix my signature.

WILLIAM H. BOYD.