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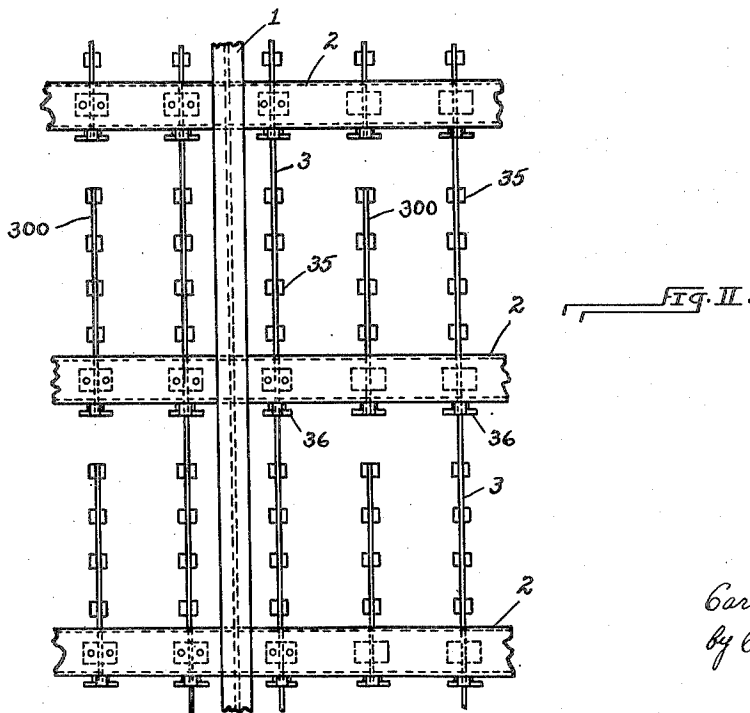
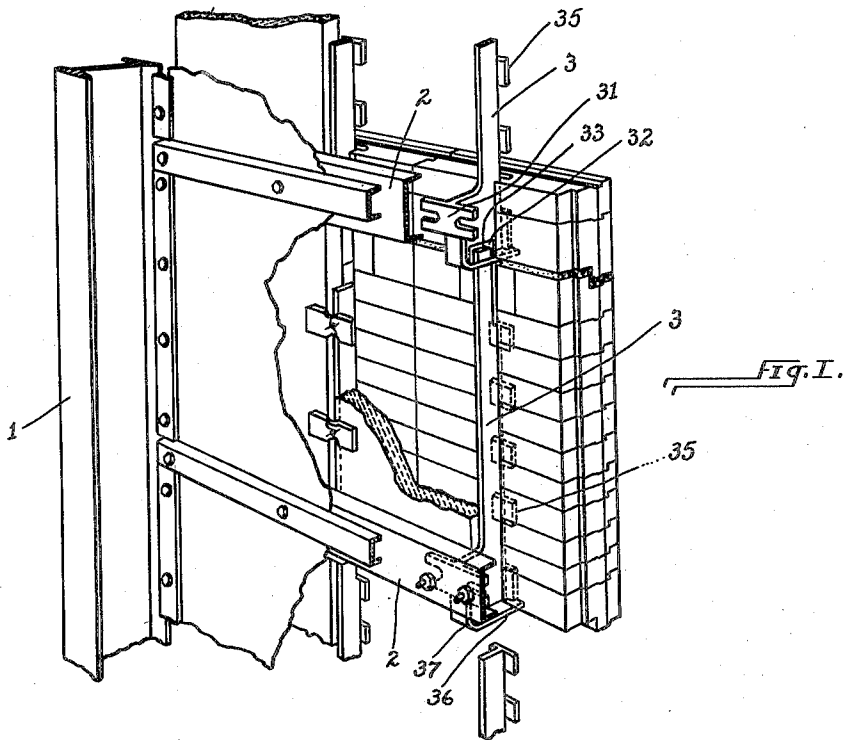
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2,235,740

FURNACE WALL STRUCTURE

Filed Aug. 26, 1939

2 Sheets-Sheet 1



INVENTOR

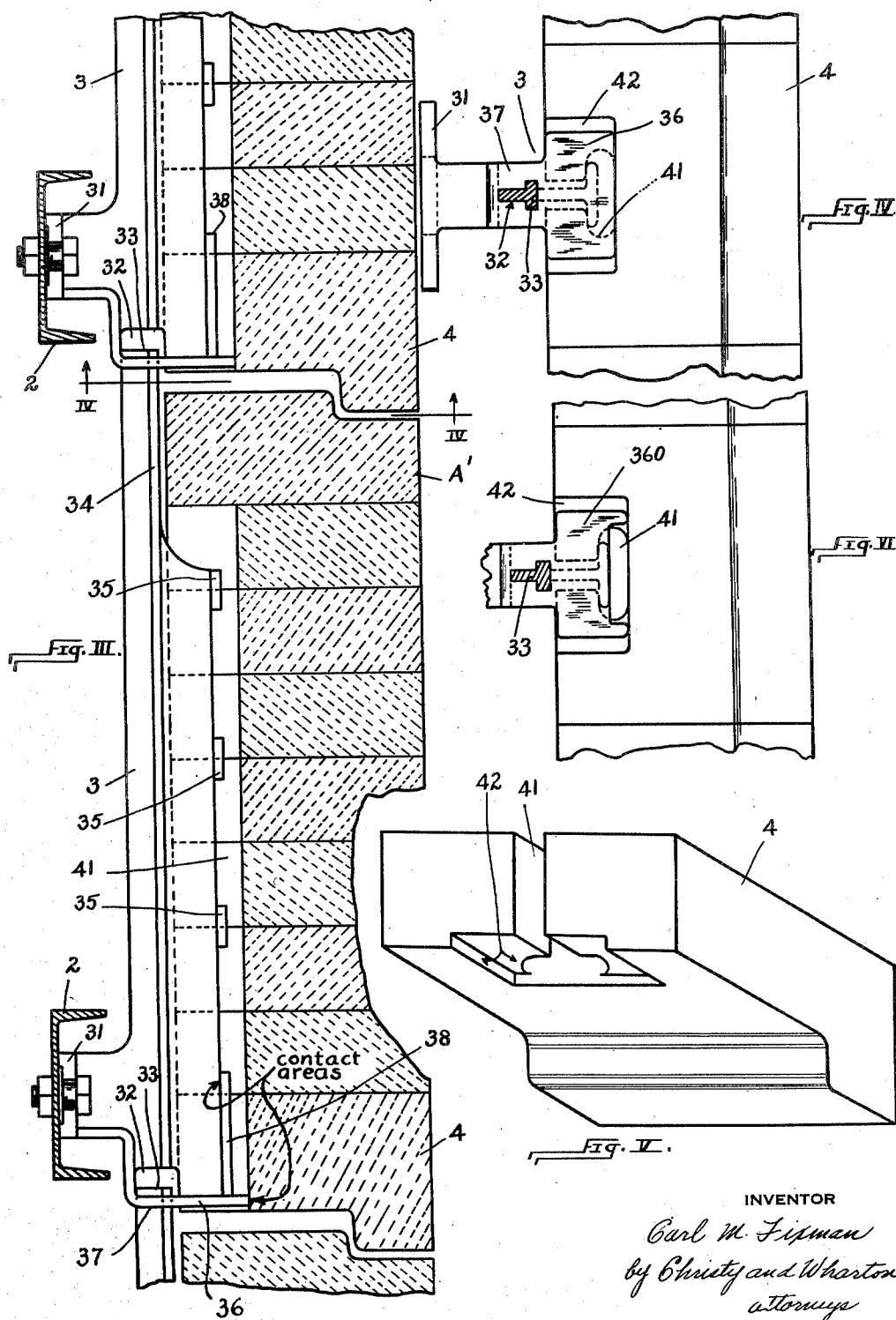
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FURNACE WALL STRUCTURE

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3 Claims. (Cl. 72-101)

This invention relates to furnace wall structure, and particularly to the vertically extending side walls of furnaces, formed essentially of refractory tiles carried on ferrous castings by an exterior framework of steel. The objects in view are simplicity and economy of structure, and adequacy and durability under the wide temperature ranges incident to building and continued service.

In the accompanying drawings Fig. I is a fragmentary view in perspective of the furnace wall of the invention seen from the outside and looking inwardly, the wall broken away to reveal its structure. Fig. II is a fragmentary view of the metal framework of the wall, seen in elevation from the outside. Fig. III is a fragmentary view of the wall in vertical section; Fig. IV is a view in plan, looking from beneath upwardly, of the structure analysed on the plane indicated by the broken line IV-IV, Fig. III; Fig. V is a view in perspective of the lowermost of a succession of tiles that is carried by each of the hangers of the framework. Fig. VI is a view corresponding to Fig. IV, and showing a modification in detail.

The wall of the invention consists of a supporting framework of steel, brackets in the form of ferrous castings, and a supported curtain of tiles of refractory material. The framework consists of vertical columns, here shown as I-beams 1, that may be understood to stand in suitably spaced lateral succession; and horizontal beams, here shown as channel beams 2, extending in suitably spaced vertical succession across the faces of columns 1, and secured to columns 1. The ferrous brackets 3 are secured to the horizontal beams 2.

It is in the specific structure of the brackets and in complementary features of shape of bracket and tile that the present invention is found. These features give to the brackets rigidity against twisting stress and afford a certain play vertically between aligned brackets, in consequence of which the assembled wall may expand under the influence of heat and contract again, without fault.

The brackets 3 are secured to the horizontal beams 2 and are arranged in vertical alignment. Each is secured to one and once only of the beams 2, and (with a qualification presently to be described) each is engaged by an adjacent hanger in the line. The bracket is formed of suitably chosen temperature-resistant ferrous metal, ordinarily a casting. It consists essentially of a plate-like body of a length approximately

equal to the space interval between succeeding beams 2, provided at its lower end with a foot 31 by which it is secured to one of the beams 2, as in the drawings it is shown to be. When so secured, the plate-like body of the casting (to which the numeral 3 is immediately applied) extends in a vertical plane, perpendicular to the face of the wall of which it forms part. Vertically succeeding brackets are adapted to engage one another in an engagement permissive of relative movement as under temperature variations the brackets expand and contract, but an engagement that secures the line of brackets in their vertical assembly. Such adaptation is found in forming the brackets of a length slightly exceeding the space interval between the beams 2, and in causing one of the brackets at one end to extend vertically into a recess in the next bracket in the line. In the instance shown each bracket at its lower end is recessed, as indicated at 32, and into this recess, when the parts are assembled, the upper end 33 of the adjacent bracket extends.

It will be perceived that, in consequence of the securing of the bracket at its lower end and the providing for vertical play at its upper end, thermal expansion and contraction of each iron bracket is free, and that the thermal expansion and contraction of each bracket has no substantial effect upon the position within the curtain wall of the set of tiles supported by that bracket.

The plate-like bracket may be reenforced by vertically extending flanges 34. This, however, is a feature of engineering only, and is not a feature of the invention.

The vertically extending inner edge of the bracket is provided with a succession of transverse and vertically extending flanges 35, spaced apart, and severally of small vertical extent. A greater or smaller number of these is provided, depending upon the length of the bracket and the number of and the thickness of the supported tiles. The bracket at its lower end is provided with a transverse flange that forms at the inner edge of the bracket a tile-supporting horizontal ledge 36, and that is prolonged outwardly in a horizontal extension 37. The extension 37 overlies the recess 32 and through it an orifice is formed to receive snugly the upper end 33 of the next underlying bracket in the assembly. Beyond this orificed extension 37 the flange is continued and meets the foot 31. The lowermost of the flanges formed upon the inner edge of the bracket (the flange 38) is at its upper end remote from the ledge 36 at an interval adequate

to the tile supporting function presently to be described, and ordinarily this interval will be approximately equal to and preferably somewhat greater than the vertical thickness of the tile when in place. This flange 38 may be of greater vertical extent than the others, and may extend to the shelf 36. Such greater vertical extent of flange 38 is not, however, essential.

In Fig. V a single tile 4 is shown, and in Fig. III a set of nine tiles is shown, assembled upon a single bracket 3. The tile of Fig. V is the lowermost of the set. All of the tiles of the set are alike, in that they are of rectangular shape and of dimensions suited to the assembly. The top and the bottom tiles of the set are conveniently somewhat greater in thickness than the intermediate tiles, and the intermediate tiles are conveniently uniform in thickness. Each tile of the set (excepting only the uppermost) is provided with a T-shaped slot 41, adapting it to be strung upon the flanged inner edge of the bracket; and the lowermost tile is additionally provided in its lower face with a recess 42, adapted snugly to receive the ledge 36 upon the bracket, as will clearly be perceived on comparing Figs. III and IV. When the lowermost tile 4 is in place it rests upon the ledge 36; the vertical inner face of recess 42 opposes and is in position for immediate abutment upon the inner edge of ledge 36; the vertically extending outer surfaces of the arms of the T-shaped slot 41 similarly oppose the outer vertical surfaces of the flange 38. The tile then rests upon the ledge 36, and it is held from drooping by the simultaneous engagement of vertical surfaces already described and indicated in Fig. III by the legend Contact areas.

The intervals at which the flanges 38, 35, 35, etc., stand apart is conveniently sufficient to allow the introduction of a tile laterally between any two of them, and the interlock of flange and slot by the subsequent vertical movement of the tile. It will be remarked of the assembly shown in Fig. III that, while the intervals between the flanges are greater than the thickness of any single tile, the proportions are such that, when assembly has been effected, every tile in the set (excepting only the uppermost) is interlocked with one of the flanges of the bracket. The lowermost tile resting on ledge 36 carries the weight of the superjacent tiles of the set and, being itself secured against inward drooping, holds all in horizontal position.

The interval between the highest of the flanges 35 and the ledge 36 of the next higher bracket in the assembly is greater than the thickness of any single tile. Thus while all of the tiles of each set but the uppermost are secured by the flanges of the bracket that carries them, the uppermost tile of each set is merely inserted in its place, resting on the tile immediately beneath it but not interlocked with a flange upon the bracket. It need not, therefore, be provided with a flange-engaging slot. This uppermost tile A' of the set is however stepped on its upper surface, and the lowermost tile of each set is stepped on its lower surface in complementary shape, and thus in the assembly the uppermost tile of the set is secured against displacement inwardly.

It is manifest, on consideration of Fig. III, that in the building of the wall the tiles may, one after another, be applied from the inside; but that, when once the wall has been completed, there is, in the showing of Fig. III, no other way of removing and replacing damaged tiles

than by taking down the wall as it was built, beginning at the top. Referring however to Fig. II, it will be observed of the brackets of the successive vertical lines that, while the brackets of certain lines extend to engagement in the manner described with the adjacent brackets of the line, certain others (300) are cut short, and that a space is left between the upper end of the bracket 300 and the next beam 2 above. That space is sufficient to permit the withdrawal and insertion from the outside of the topmost tile of the set carried by bracket 300. The removal of an uppermost tile of a set in an otherwise complete wall gives access, for removal of the remaining tiles of the set, and of tiles of the immediately adjacent sets, beginning with the topmost tile of the adjacent set. If, then, the brackets of every third line be short brackets 300 (an arrangement indicated in Fig. II), it is manifest that any tile in the wall may be reached for replacement from the outside by removal of, at most, the sets of tiles borne by two lines of brackets. Such a curtailment of the brackets of every third line, leaving them secured at their bases only, will not materially weaken the structure as a whole, nor render it liable to more rapid deterioration.

Referring again to the stepped formation of the uppermost tile of a set on its upper surface and of the lowermost tile of a set on its lower surface, it will be remarked that, as shown in Fig. III, the step is downward and inward. Such is the preferred, though not the necessary, arrangement. The step might be upward and inward. The building of such a wall in horizontally separate bands or sections, and the forming of the sections with such stepped edges of union is known, the object being the maintenance of effective continuity under such movements between the bands or sections as attend the temperature changes incident to service. In the vertical seams between the sets of tiles upon the brackets, and in the horizontal seams between successive belts or horizontal sections of the wall expansion joint filler may be used. Such being the structure, the wall expands and contracts under heating and cooling. Particularly it will be observed that the ledges 36 of the brackets extending within the recesses 42 of the tiles are protected from exposure to flame and from excessive heating.

In a furnace wall built as described, thermal expansion in service does not cause distortion of the supporting frame nor of any part thereof. The telescopic connection between vertically aligned brackets and the use of expansion joint filler mortar are provisions that take up expansion and contraction and prevent the transmission of stresses that might otherwise cause distortion from reaching the frame as a whole.

The modification illustrated in Fig. VI concerns only the shape of the tile-carrying ledge at the lower end of the bracket. As here shown, the ledge 360 at its inner edge is recessed immediately, leaving only the two ends, upon which the applied tile will make droop-resisting abutment, in the manner described.

I claim as my invention:

1. A furnace-wall structure having a framework that includes two horizontally extending beams arranged in parallelism one vertically above the other, and two vertically aligned tile-carrying brackets, one borne by each of the said beams, the lower of the two brackets being mounted at its lower end upon the lower of the

said beams and engaging at its upper end the upper bracket in a union that admits of relative movement in vertical direction.

5 2. A furnace-wall structure that includes a supporting bracket and a supported tile, the bracket including in its structure a vertically extending web, a horizontally extending ledge, and a vertical flange extending transversely from
10 said web, such flange being spaced at an interval outwardly from the inner edge of said ledge and extending through an interval spaced upwardly from the surface of said ledge, and the tile being
15 provided with a T-shaped vertically extending slot in its outer face and with a ledge-receiving recess in its nether face, whereby it may be applied to and engaged by the flanged bracket with
20 movability in vertical direction, and having been brought to rest with the ledge of the bracket within its nether recess the double engagement

of the outer surfaces of the T-shaped slot with flange of the bracket and of the inner vertical surface of the recess with the edge of the ledge secures the tile against drooping.

3. A furnace-wall structure having a frame- 5 work that includes two horizontally extending beams arranged in parallelism one vertically above the other and a plurality of tile-carrying brackets borne by each of said beams, certain of the brackets borne by the lower beam being 10 aligned with brackets borne by the upper beam and engaging the aligned brackets of the upper beam, and certain other of the brackets borne by the lower beam being of less extent vertically 15 than those first named and terminating at their upper end at an interval from the upper beam, whereby tiles may be applied to and removed from position upon the brackets.

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