

May 26, 1931.

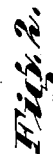
S. H. LANYON

1,806,809

FURNACE CONSTRUCTION

Filed May 21, 1925

6 Sheets-Sheet 1



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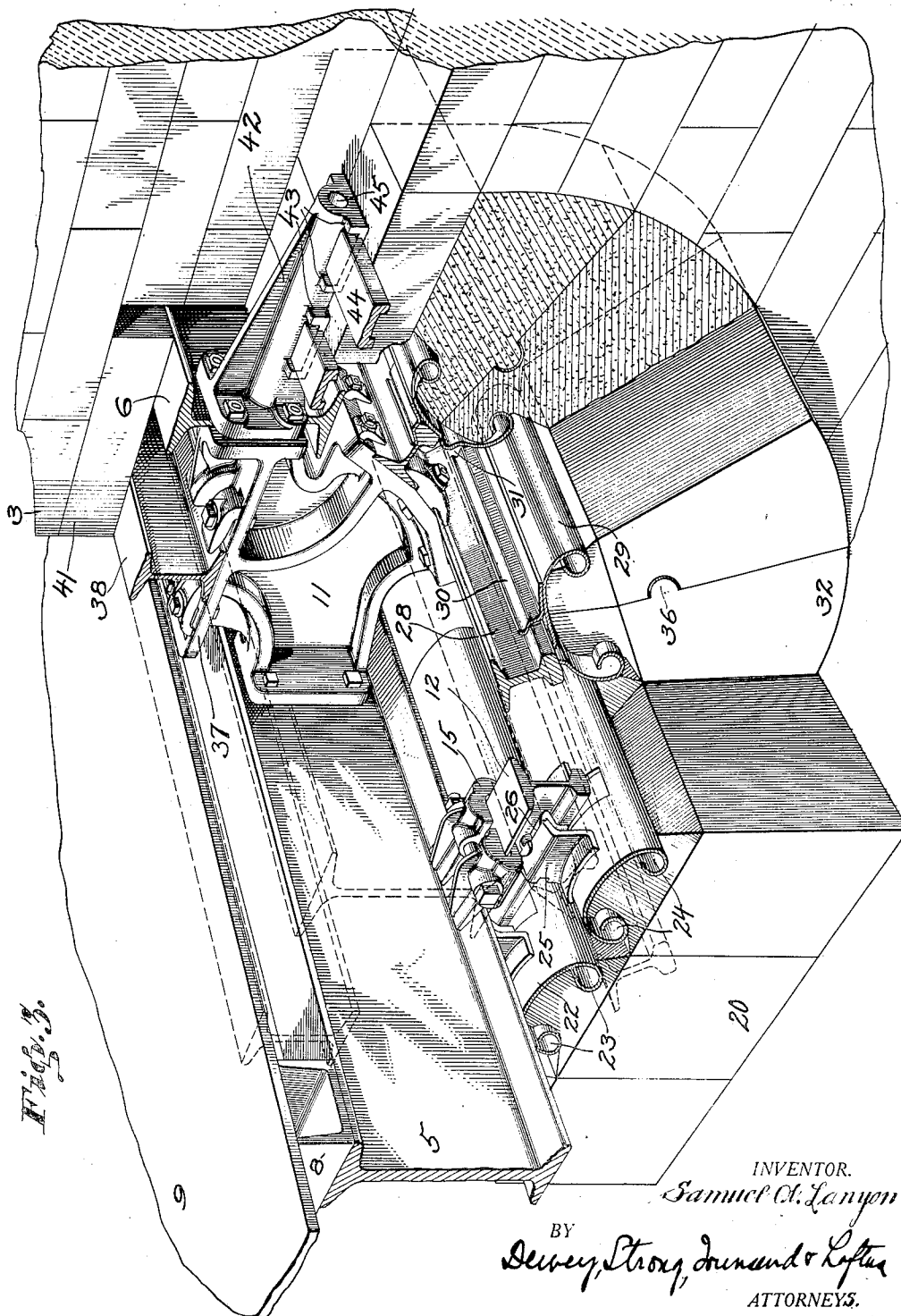
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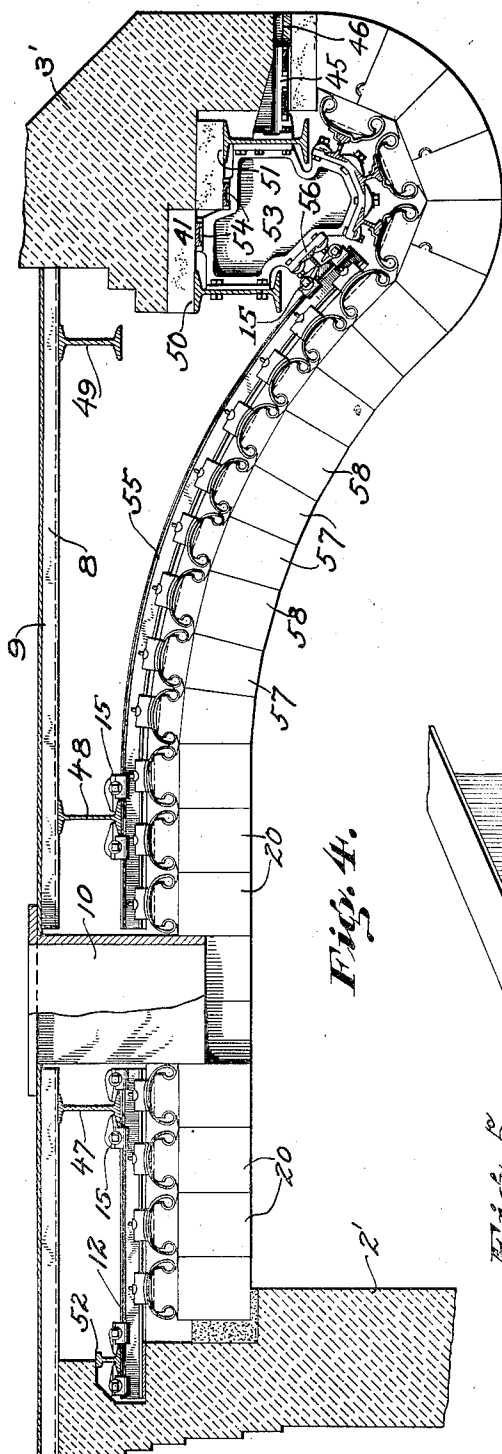


Fig. 4.

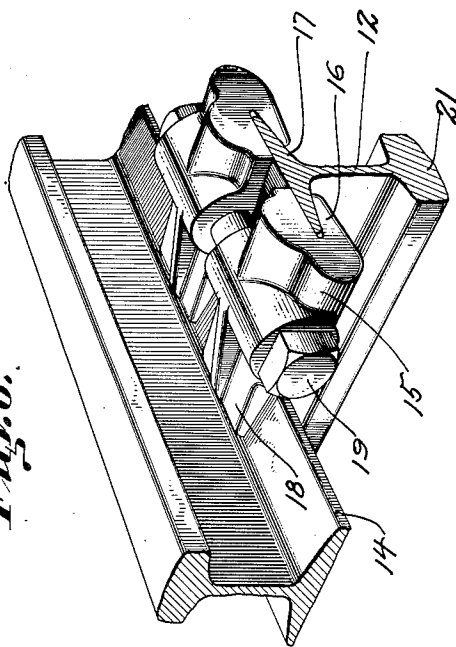


Fig. 6.

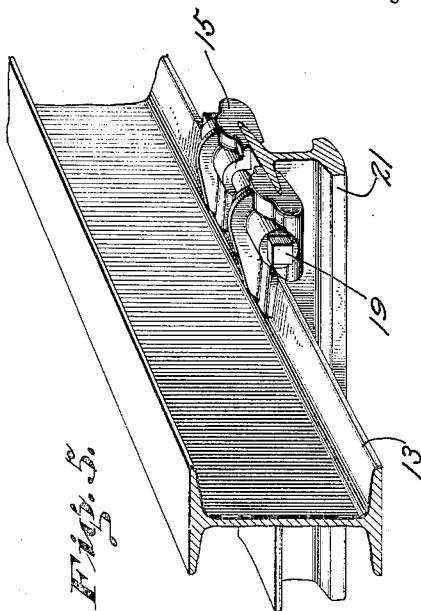


Fig. 5.

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Fig. 14.

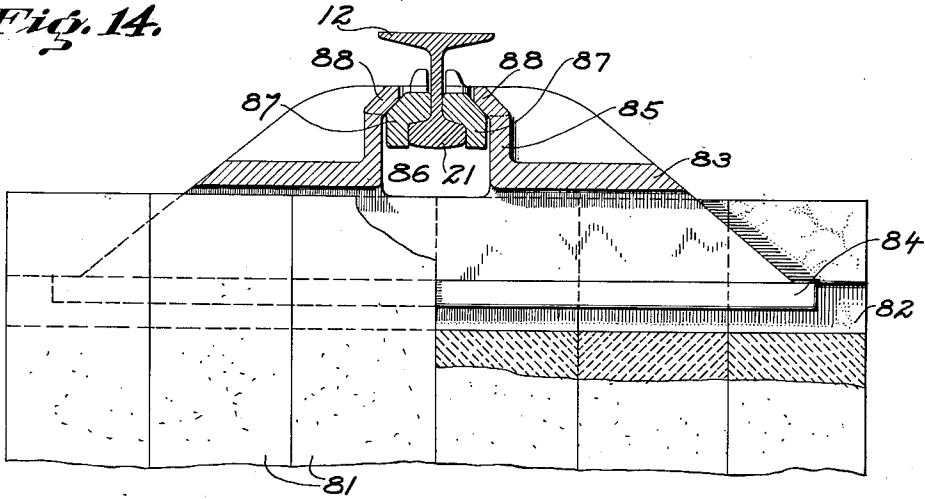


Fig. 15.

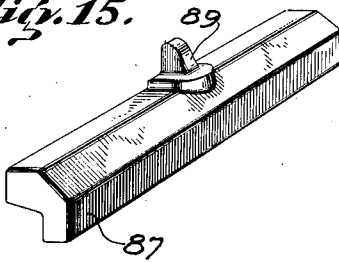


Fig. 16.

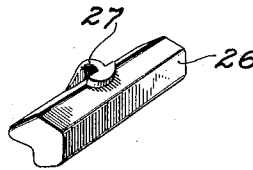
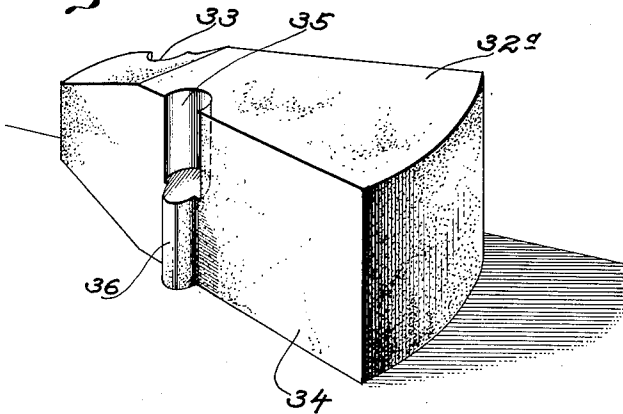


Fig. 17.



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Fig. 7.

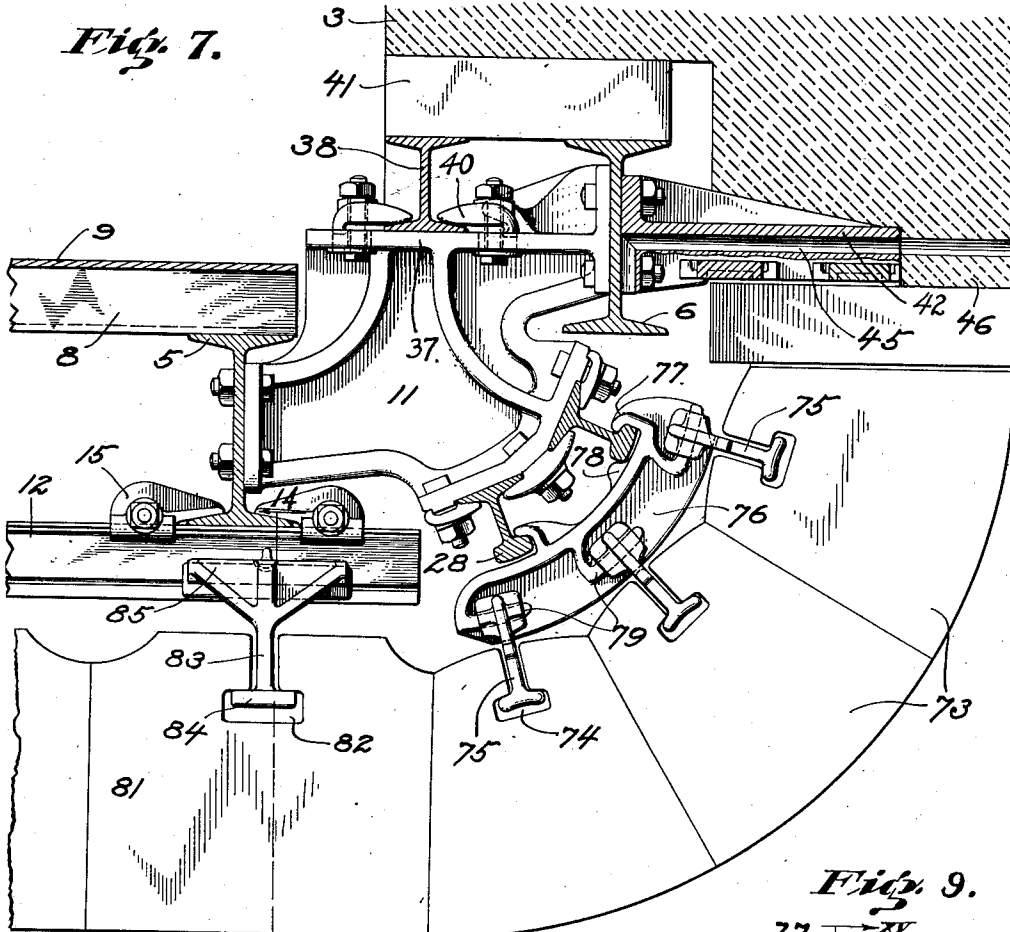


Fig. 8.

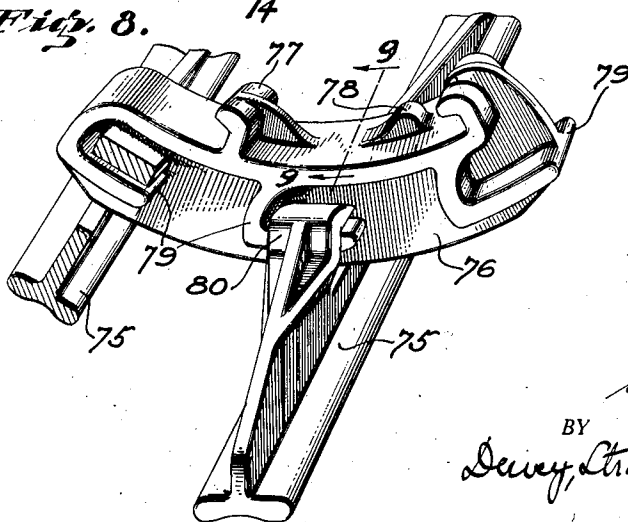
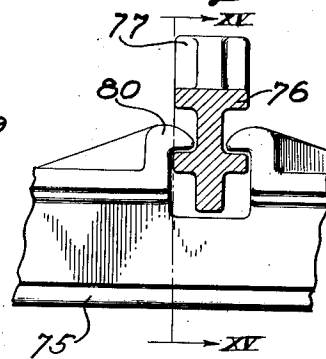


Fig. 9.



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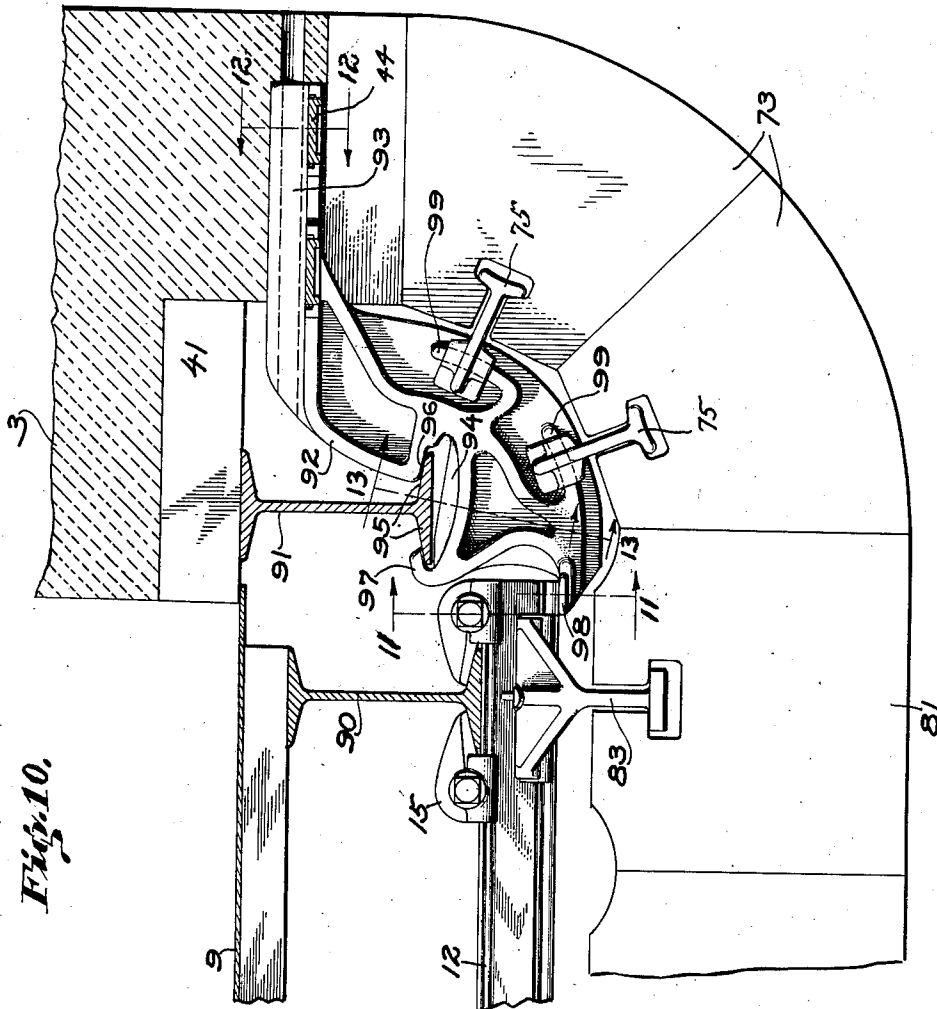


Fig. 10.

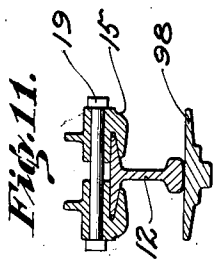
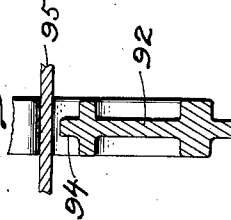


Fig. 11.

Fig. 12.



Fig. 13.



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UNITED STATES PATENT OFFICE

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FURNACE CONSTRUCTION

Application filed May 21, 1925. Serial No. 31,737.

This invention relates to furnace linings and particularly to an improved furnace roof construction. The roofs of large furnaces are usually made of or lined with fire brick or tiles and the supporting of these tiles requires special construction particularly adapted to reliably support but arranged to permit ready removal of the tiles and repair of the walls and roof. It is the primary object of my invention to provide an improved construction of this type which embodies these several novel features and the several parts of which are interchangeable and can be readily assembled to provide a furnace of any size and construction desired.

As one feature of my invention, I provide the body portion of the roof with a plurality of longitudinally extending tile-supporting bars and the curved nose portion thereof with a plurality of transversely extending tile-supporting bars. All these bars are preferably supported by transversely extending beams having their ends suitably supported as in or on the side walls of the furnace. I preferably support the longitudinally extending bars on and beneath the beams by a novel type of removable clamps hereinafter described. The transversely extending bars at the nose or inner end of the furnace are preferably supported on a plurality of nose brackets carried by certain of the beams which may serve also as a curtain wall support. The provision of these several novel features, the construction and advantages of which will be hereinafter fully described, comprises a further object of my invention.

Among other objects of my invention is the provision of various novel features relating to the mounting of the tiles on their supporting bars. These features include a novel form of hanger adapted to be readily attached to and detached from the bar by a movement downwardly therefrom upon removal of a keeper by which it is retained on the bar.

In the drawings annexed hereto and forming a part of this specification, I have shown certain embodiments of my invention, but it will be understood that the invention can be otherwise embodied and that the drawings

are not to be construed as defining or limiting the scope of the invention short of its true scope in the art.

Referring to the figures of the drawings: Fig. 1 is a longitudinal sectional view through a furnace embodying certain features of my invention;

Fig. 2 is a transverse sectional view thereof looking from the right to the left in Fig. 1;

Fig. 3 is an enlarged fragmentary perspective view of the nose end of the furnace;

Fig. 4 is a longitudinal sectional view through a modified type of furnace embodying my invention;

Fig. 5 is an enlarged detail view showing my novel clamps for clamping the tile-carrying bars to their supporting beams;

Fig. 6 is a like view showing a bar clamped to a supporting rail;

Fig. 7 is a longitudinal section through a nose construction of modified form;

Fig. 8 is a fragmentary perspective view of the tile-holding members shown in Fig. 7;

Fig. 9 is a sectional view thereof taken on line 9—9 of Fig. 8;

Fig. 10 is a view similar to Fig. 8 showing a further modified construction;

Fig. 11 is a detail sectional view on line 11—11 of Fig. 10;

Fig. 12 is a sectional detail on line 12—12 of Fig. 10;

Fig. 13 is a sectional detail on line 13—13 of Fig. 10;

Fig. 14 is a detail on line 14—14 of Fig. 7;

Fig. 15 is a perspective view of one of the keepers shown in Fig. 14;

Fig. 16 is a perspective view of one of the keepers shown in Figs. 1 and 2, and

Fig. 17 is a perspective view of a nose tile such as shown in Figs. 1 and 4.

Referring more specifically to the drawings by reference characters, 1 indicates the side walls of a furnace, 2 the front end wall, and 3 the curtain wall. Extending transversely of the furnace and supported at their ends in the side walls are a plurality of I-beams 4, 5, and 6, and also two rails or rail-beams 7. A plurality of channel bars 8 on the I-beams support a steel deck cover

plate 9. A fuel chute 10 for pulverized fuel is carried by the cover plate and extends downwardly into the furnace. A plurality of nose brackets 11 are bolted to the I-beams 5 and 6 in a position at the rear margin or nose portion of the roof.

Supported on and beneath the I-beams 4 and 5 and the rail beams 7 are a plurality of bars 12 extending longitudinally of the furnace. These bars which form the tile-carrying members are supported by the bottom flanges 13 and 14 by my novel clamps 15 shown in detail in Figs. 5 and 6. Each clamp 15 comprises a body portion having an upwardly facing lug 16 engaging and supporting the flange 17 of the bar 12 and a downwardly facing lug engaging over the flange 13 or 14. A pair of clamps are provided on each side of each beam at each intersection of the bar and beam. This manner of supporting the bars on the beams permits adjustment of the bars to any position desired and the bars are held in such position by bolts 19 extending through each pair of clamps and drawing the same into firm engagement with the bar flanges.

The tiles 20 can be carried on the bar heads 21 in any manner desired. In Figs. 1 to 4 I have shown the same as carried by a resilient tile-holding clip combined with my detachable connecting and keeper means. As shown best in Fig. 3 this resilient clip comprises an elongated metal sheet 22 having the ends of the two sides thereof bent to one side of the sheet and curved into tile groove engaging members 23 which normally spring toward each other in a manner to snap into opposed grooves 24 in the tiles 20. As illustrated in the drawings, the clip is preferably made long enough to hold several tiles. The opposite side of each clip carries a pair of spaced jaws 25 with an intervening channel for receiving the bar head or flange 21. When the lugs are over the bar head a pair of keepers 26 are slid longitudinally into position between the jaws and bar head and serve to hold the clip and tiles to the head. Each keeper 26 is provided with a lug 27 for aiding in its insertion and removal and adapted to engage in a notch in the jaw to retain the keeper against longitudinal displacement relative thereto. This keeper arrangement is also illustrated in Fig. 14 hereinafter described.

The form of furnace nose construction shown in Figs. 1, 3, 4 and 7 includes a plurality of tile-supporting bars 28 extending transversely of the furnace. These bars are supported on the nose bracket 11 at different elevations, being secured by bolted clamps as best seen in Fig. 1. The nose tile supporting clips 29, as illustrated in Figs. 1 and 3, are like the resilient clips 22 except that the bar engaging portions thereof comprise a supporting flange 30 engageable over the upper

side of the bar head, the clips 29 being also bent outward at 31 to co-operate with the flange 30 in supporting the clips and tiles on the bar.

While each nose tile 32 may be of sufficient width to fill a clip, I preferably form them as complementary pairs, as seen in Figs. 3 and 7, the tiles of a pair preferably being exact duplicates. Each of the tile 32a, as seen in Fig. 17, comprises a segmental block grooved at its smaller end at 33. The co-operating face 34 of each segment is grooved partially across at 35 and formed with a symmetrical projection 36 in alignment therewith across the remaining portion of such face. Any two such blocks are readily assembled and held in such position by the co-engagement of the projections and grooves. Furthermore, the blocks being duplicates, only one type of block need be manufactured and kept in stock, which of course considerably cheapens and simplifies the same.

The nose brackets 11 and the co-operating members 5 and 6 not only serve to support the nose of the roof but they also serve to support the curtain wall 3. The upper portion of each nose bracket comprises a flat supporting surface 37, and an I-beam 38 is mounted on these surfaces parallel with the beam 6, the beam 38 being of a size to bring its top surface level with the top surface of the beam 6. The beam 38 is held in place by clamps 39. The surface 37 is provided with an integral laterally extending lug 40 which is adapted to engage over one flange of the beam 38 when a very large beam is used, it being understood that the size of beam 38 used necessarily varies with the size of the beam 6. A portion of the curtain wall 3 is supported on fire brick 41 mounted on the beams 6 and 38 as illustrated in Fig. 1.

A plurality of wall supporting brackets 42 are bolted to the web of beam 6, these brackets preferably being spaced about eighteen inches apart. As illustrated, the opposite sides of each bracket are provided with integral lugs or shoulders 43 adapted to receive and support the ends of shelf bars 44 therein. As illustrated in Figs. 2 and 3, two such shelf bars are suspended between each two adjacent brackets and these shelf bars, in conjunction with the fire brick 41, serve to support the curtain wall 3. Each bracket 42 is preferably provided with a hole 45 therethrough co-operating with a hole 46 through the curtain wall whereby cool air may enter to keep the bracket cool.

It should be understood that my invention contemplates a furnace roof composed of sectional parts so standardized that the same parts can be used in forming furnace roofs and walls of various designs. In Fig. 4 I have shown a slightly modified form of roof, several of the parts of which are the

same as those illustrated in Figs. 1, 2, and 3. The parts which are the same as those in Figs. 1, 2, and 3 are designated by the same reference characters.

5 In the construction shown in Fig. 4, transversely extending I-beams 47, 48, 49, 50, and 51 and a rail beam 52 form the roof-supporting members. The end wall 2' and the curtain wall 3' are substantially the same as the walls 2 and 3 of Fig. 1. The horizontal tile-supporting bar 12 which is the same as the bar 12 in Fig. 1 is supported by clamps on beams 47 and 52 and support tiles 20 as in Fig. 1.

15 A plurality of nose brackets 53 are supported on I-beams 50 and 51, the curtain wall 3' being supported on fire brick 41 on the I-beam 51 and a plate 54 on the nose brackets, and on shelf bars 44 carried on brackets 42 as in Fig. 1. The nose tile 32 are supported from the nose bracket in the same manner as described in reference to Fig. 1.

20 The curved tile supporting bars 55 of Fig. 4 are hung from I-beams 48 and a transverse member 56 mounted on the nose brackets 53, clamps being used for supporting the bars. The tiles 20, 57 and 58 are hung from the bars by my improved tile-supporting clips which are described in reference to Fig. 1.

25 It will be seen that the tiles 20 can be readily removed for repair by removing the keeper 26 and dropping the tiles downward. I also preferably form the tiles 57 and 58 of the concave portion of the roof of a shape to be readily removed in like manner. It will be noted that the tiles 57 are formed with the front and rear sides thereof converging downwardly while certain of the adjacent tiles 58 are formed with parallel front and rear sides or at least with the outer end thereof of no greater dimension than the inner end. By such construction the tiles 58 can be readily removed downwardly and the adjacent tiles 57 thereafter removed if desired.

30 It will be understood that the scope of my invention is not limited to the details illustrated in the drawings and above described, but that the same can be modified in various ways within the scope of the claims and the several novel features thereof combined as may be desired. In Figs. 7 to 13 I have illustrated certain modifications which I will now describe.

35 In Figs. 7, 8 and 9 I have illustrated the tiles as supported on the bars by means other than the resilient clips 29 heretofore described. The bar supporting structure of Fig. 7 is the same as that shown in Fig. 1 and is designated by the same reference characters.

40 In this arrangement the nose tiles 73 are each provided with a T-slot 74 through the middle portion of the outer end thereof. I have illustrated three rows of tiles 73 which are supported on hangers 75 engaging loosely in the T-slots as shown. These hangers can

be of any length and support as many tiles as desired. The hangers may be supported on spacer members 76, the inner face of each of which is provided with a pair of hooks 77 for engaging over the upper edge of the heads of the supporting bars 28. A lug 78 is also formed on each spacer member 76 for assisting in holding the member in place. A pair of flanges 79 is provided on the sides of the member 76 for each hanger to be supported and each hanger is provided with a pair of hook flanges 80 on the web portion thereof for engaging with the flanges 79.

This construction forms an effective support for the nose permitting its being easily assembled and disassembled. The hangers 75 can be formed of any desired length to accommodate a furnace of any size, as many of such hangers can be provided as desirable, and the members 76 can be provided with a corresponding number of hangers supporting flanges thereon. These several parts may therefore be standardized in a manner to be used in furnaces of varying sizes and designs.

The horizontal tiles 81 as shown in Figs. 7 and 14 are each formed with a T-slot 82 in the outer end thereof, like the T-slot 74 in tiles 75. The tile-supporting member 83 is preferably elongated to provide a T-head 84 engaging in the T-slots of several tiles strung thereon. The upper portion 85 of this member is elongated preferably in a direction at right angles to the T-head 84 and is provided with jaws 88 separated by a bar-receiving channel 86. Keepers 87 when slid into the channel between the bar head 21 and the jaws 88 support the member 83 and tiles on the bar 12. This keeper method of supporting the tiles on the rail 12 is substantially the same as that illustrated in Figs. 1 to 4 and heretofore described. The keepers 87 are each provided with a lug 89 thereon for aiding in their placing and removal and for engaging a notch in the jaw to hold the keeper against shifting longitudinally relative thereto.

In Figs. 10 to 13 I have shown a still further modified form of my invention. In this construction the nose portion of the roof is supported on an I-beam 91 extending transversely of the furnace and having its ends suitably supported. The cover plate 9, rails 12 and horizontal tiles 81 are supported on the beam 90 in the same manner as indicated in Fig. 7 and just described.

In this construction I provide the nose brackets supporting members 92 each having a curtain wall supporting arm 93 preferably integral therewith and a recess 94 therein for receiving the bottom flange 95 of the beam 91. The portion of the member adjacent the recess has a wide overhanging bearing surface 96 and a hook 97 for engaging the flange 95 as illustrated in Fig. 17. Another wide bearing surface 98 (Fig. 11) is provided

on the member for engaging the head of the bar 12. In assembling the member to the position illustrated, the member is tilted to the left (Fig. 10) and the recess is inserted over the flange 95. The hook 97 is thereafter engaged over the flange 95 as illustrated. The weight of the member is such that it normally tilts to the right (Fig. 10), the member thereby being supported by surface 96 and hook 97 on the flange 95, and the tilting of the member being limited by the engagement of the bearing surface 98 with the rail 12.

The nose tiles 73 are supported on hangers 75, the same as in Fig. 7, except that these hangers are supported directly on flanges 99 of the member 92. This construction eliminates the use of bars 28 and members 76 shown in Fig. 14. The supporting of the curtain wall 3' in this construction is substantially the same as heretofore described, the shelf bars 44 being supported on the brackets 93. This construction is exceedingly simple and eliminates the necessity for drilling and bolting and permits free adjustment of the various parts to any position along the beams.

It is believed that the construction and use of my invention will be clearly understood without further description herein. The invention relates particularly to furnace roof construction wherein are combined beams, bars, rails and other co-operating structure of a like nature. It is very obvious that beams, rails, bars, etc., are all similar in construction and one is ordinarily the equivalent of and can be substituted for the other without modifying or impairing the general furnace construction. I wish it clearly understood, therefore, that throughout this specification and claims these terms and terms of a like nature are not used in a limited sense, but are intended to cover any equivalent construction.

It will of course be understood that any of the various forms of my invention can be used and substituted for other forms illustrated in the drawings; for example, the straight furnace wall or roof blocks 20 and 81 can be made in two duplicate half sections in the same manner as the segmental half sections of blocks shown in Fig. 17 instead of making the blocks as independent units as shown in Figs. 4 and 14.

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

1. In a furnace construction, the combination of a plurality of beams extending transversely across the furnace, a plurality of longitudinally extending tile-supporting bars supported on and beneath the beams, a plurality of spaced nose brackets carried by certain of the beams at the nose end of the furnace, a plurality of transversely extending members carried by the nose brackets and

adapted to support the nose tiles, and means carried by the nose brackets for supporting the curtain wall of the furnace.

2. In a furnace construction, the combination of a tile-supporting bar having a flanged head on one edge thereof, a tile-hanger having means at one side thereof for engaging a tile and an opening at its other side movable transversely over the bar head, and a pair of keeper members slidable longitudinally in the opening at opposite sides of the bar between the bar head and hanger and adapted when in place to support the hanger on the bar.

3. A furnace arch construction comprising the combination of a plurality of nose brackets spaced transversely of the furnace, a plurality of bars connecting the brackets and extending transversely of the furnace, and a plurality of rows of tiles hung from the bars in a manner forming a convex arch nose.

4. In a furnace roof nose, the combination of a beam extending transversely of the furnace above the nose thereof, a plurality of spaced supporting brackets carried thereby, supporting lugs on opposite sides of the brackets, and means extending between the brackets and supported on the lugs for carrying the curtain wall of the furnace.

5. In a furnace roof nose, the combination of a beam extending transversely of the furnace above the nose, a plurality of spaced supporting brackets removably carried by the beam and extending horizontally outward therefrom, a pair of supports on each side of each bracket, and a pair of removable curtain wall supporting members carried on the supports between each two adjacent brackets.

6. In a furnace roof nose, the combination of a plurality of spaced supporting brackets, integral supporting lugs formed on opposite sides thereof, and means extending between the brackets and removably supported on the lugs for carrying the curtain wall of the furnace, the brackets each having an air hole formed therethrough and in communication with the exterior for cooling the brackets.

7. A furnace bracket comprising a body portion and a shelf portion, the body portion being adapted to be mounted on a supporting beam, and the shelf portion having integral supporting lugs on the opposite sides thereof, and a ventilating hole formed longitudinally therethrough.

8. A tile supporting shelf bracket comprising a body portion and a shelf portion, the body portion having means thereon adapted to automatically engage along any portion of the rail in a manner preventing downward movement of the bracket thereon, the shelf portion of the bracket being adapted to support a plurality of tiles thereon, and having a ventilating hole longitudinally therethrough.

9. A furnace arch construction comprising

the combination of a beam extending transversely of the furnace, a plurality of nose brackets mounted thereon in spaced relation, a plurality of bars at different elevations connecting the nose brackets, and refractories suspended from the bars to form an arch nose.

10. In furnace construction, the combination with a roof arch, of a beam extending transversely of the furnace adjacent the rear end of the roof arch, a plurality of nose brackets mounted on the beam in spaced relation, transversely extending members connecting the brackets and refractories suspended from said transversely extending members to form a convex nose at the rear end of the roof arch.

11. In furnace arch construction, the combination of a beam extending transversely of the furnace chamber, nose brackets mounted thereon in laterally spaced relationship, transversely extending bars disposed at different elevations connecting the nose brackets, and refractories suspended from said bars in relationships forming a convex arch nose.

12. In furnace arch construction, the combination of a beam extending transversely of the furnace chamber, nose brackets supported thereon in laterally spaced relationship, transversely extending bars connecting the nose brackets, hangers supported on the bars, and refractories suspended from said hangers to form an arch nose.

13. In furnace arch construction, the combination of a beam extending transversely of the furnace chamber, nose brackets supported on said beam in laterally spaced relationship, bars extending longitudinally of the furnace and supported at one end by the nose brackets, refractories suspended from said bars to form a roof arch, and nose refractories suspended from the nose brackets to form an arch nose.

14. In furnace construction, the combination with a flanged bar, of a retaining member having jaws spaced to afford an intervening channel with an open side accommodating introduction of the bar flange, a keeper insertable endwise into the channel between the bar flange and a jaw to a position preventing withdrawal of the bar through the open side of the channel, and a tile-holding member carried by the retaining member.

15. In furnace construction, the combination with a bar having a marginal flange, of a retaining member having jaws spaced to permit passage of the bar flange between them, a keeper insertable between the bar flange and jaws for engagement therewith to retain the retaining member on the bar, and a tile-holding member carried by the retaining member.

16. In furnace construction, the combination with a bar having a longitudinally extending flange, of a retaining member having oppositely disposed overhanging jaws spaced to permit passage of the bar flange be-

tween them, keepers insertable between the bar flange and overhanging portions of the jaws to retain the retaining member on the bar, and a tile-holding member carried by the retaining member.

17. In furnace construction, a combination as specified in claim 16, wherein the keeper members are provided with means to limit their movement relative to the retaining member longitudinally of the bar.

18. In furnace construction, the combination with a bar having a marginal flange, of a retaining member movable transversely of the bar into straddling relationship thereto, a keeper insertable between the bar flange and portions of the retaining member to connect the latter to the bar, and a tile-holding member carried by the retaining member, said retaining member being movable from the bar in a direction transversely of the latter upon removal of the keeper.

19. In furnace construction, the combination with a bar having a marginal flange, of a retaining member having jaws movable into straddling relationship with the bar flange in a direction transversely of the bar, a tile holder carried by the retaining member, and a keeper movable into overlapping relationship with and between the jaw members and bar flange to hold the retaining member against removal transversely of the bar, said keeper being slidable longitudinally on the bar flange with the retaining member.

20. In furnace arch nose construction, in combination, a supporting bracket, hangers supported on the bracket and extending therefrom in radial relationship, wedge-shaped tile arranged with their converging faces in abutment, said tile having T-shaped slots extending through the middle portion of their narrower ends transversely of the bracket, and the hangers having T-heads engaging in said slots to support the tile, the tile being slidable onto and off of the T-heads by movement in directions transversely of the bracket.

21. In furnace arch nose construction, in combination, a bracket having an arcuate portion provided with lateral flanges, hangers supported on said flanges and extending in diverging relationship from the bracket, wedge-shaped tile having T-shaped slots extending through the middle portion of their narrower ends with the arms of the T directed toward their converging faces, and the hangers having T-heads at their outer ends engaging in said slots to support the tile with their converging faces in abutment, said tile being removable from the hangers in a direction transversely of the bracket.

22. In a furnace arch nose, in combination, nose brackets arranged in spaced collateral relationship, hangers supported on the nose brackets and depending therefrom to different levels, said hangers having bar-like tile-retaining portions spaced from the margins

of the brackets and extending in directions transversely thereof, and wedge-shaped tiles provided in their medial portions adjacent their narrower ends with hanger-receiving openings extending through them from side to side and accommodating said tile-retaining portions so as to afford the tiles support thereon, a plurality of said tiles being movable off of said tile-retaining portions at either end thereof by movement longitudinally of the same.

23. In a furnace arch nose, in combination, nose brackets supported in spaced collateral relationship, hangers supported on the nose brackets and depending therefrom, said hangers having tile-retaining portions spaced from the margins of the brackets and extending transversely thereof at different elevations, and wedge-shaped tiles provided at the middle portion of their narrower ends with hanger-receiving openings extending from side to side and threaded on the tile-retaining portions, there being a plurality of said tiles so supported on each of said tile-retaining portions and movable off thereof at either end by movement of the tiles longitudinally of said tile-retaining portions.

24. In furnace arch nose construction, in combination, a nose bracket, a plurality of hangers demountably supported on said bracket and having tile-retaining portions depending therefrom at different elevations, said tile-retaining portions extending transversely across the lower margin of the bracket, and wedge-shaped tiles having transverse openings extending completely through the middle portion of their narrower ends, a plurality of said tiles being strung on each tile-retaining member with their upper ends clear of the margin of the bracket, whereby a plurality of said tiles may be moved off of each tile-retaining member at either end thereof by movement in a direction transverse of the bracket.

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