

March 25, 1930.

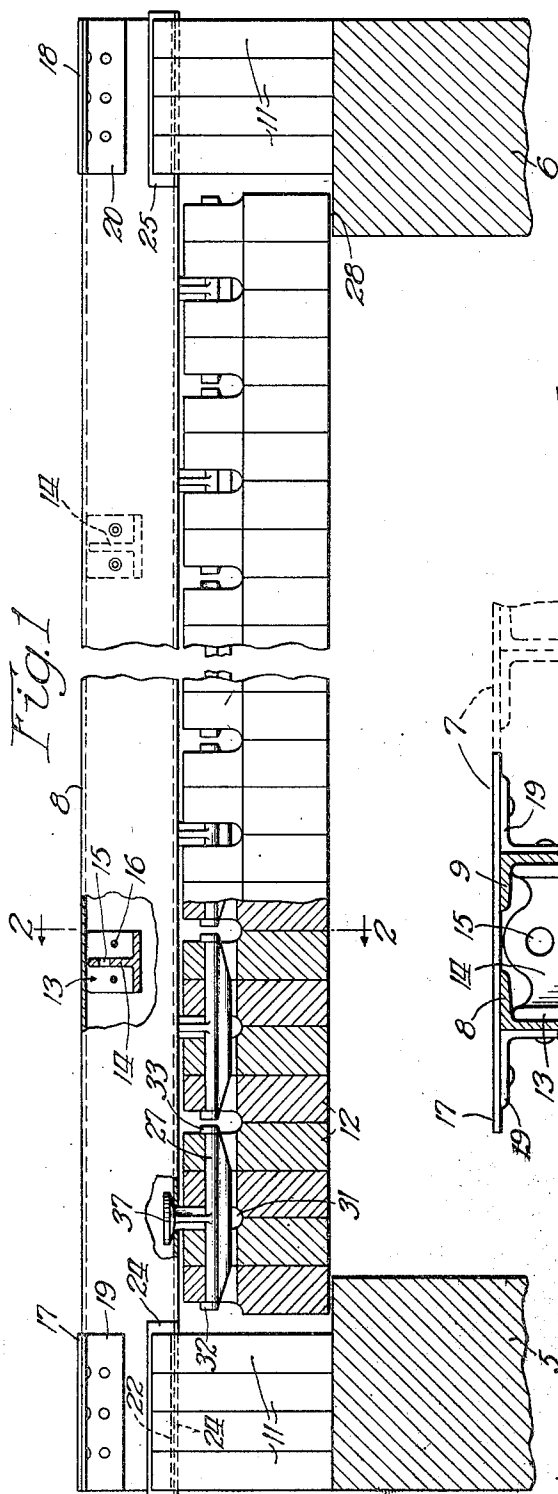
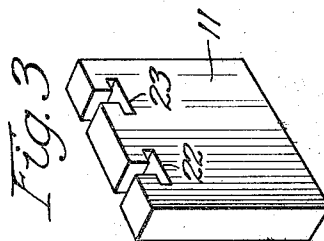
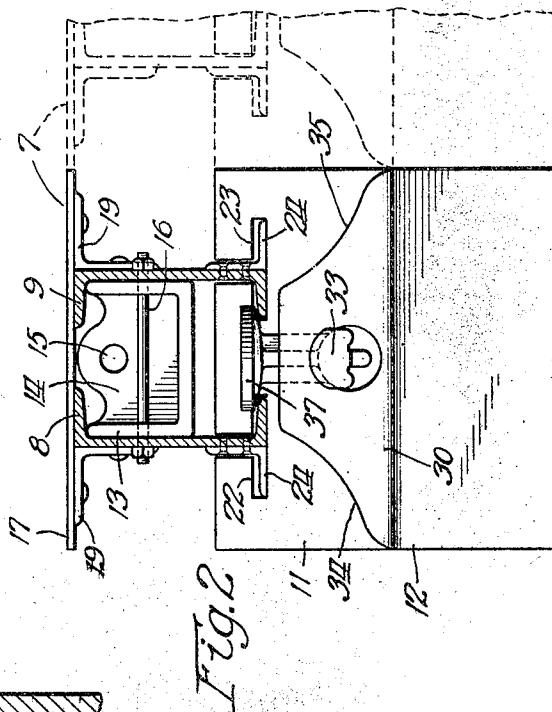
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1,751,675

REMOVABLE FURNACE ROOF

Filed March 17, 1927

2 Sheets-Sheet 1



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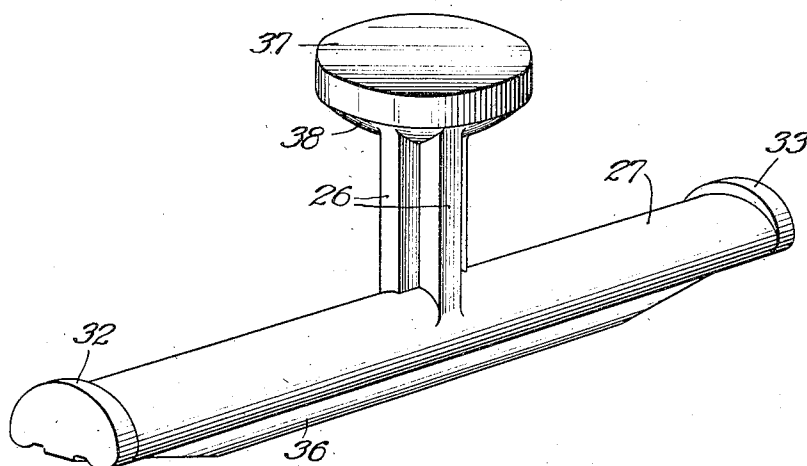
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Fig. 4



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UNITED STATES PATENT OFFICE

LYLE STOCKTON ABBOTT, OF CHICAGO, ILLINOIS

REMOVABLE FURNACE ROOF

Application filed March 17, 1927. Serial No. 176,090.

My invention relates to a covering or roof for a furnace and has for its principal object the provision of a furnace roof which is made up of independent units that may be readily lifted off and replaced independently of each other and which are supported on the vertical walls of the furnace.

Another purpose of the invention is to provide a roof of this character having units made up of refractory tile suspended from the cross beams so as to be freely adjustable relative to each other under expansion and contraction in any horizontal direction.

It is also a purpose of my invention to so support the tile in each unit as to enable them to adjust themselves about the supporting means as a pivot, and so as to be readily removable from the supporting means when a portion of the roof is removed from the furnace.

A further purpose of this invention is to provide means whereby the refractory tile which are directly exposed to the action of the heat within the furnace chamber are not subjected to any weight or pressure other than their own, and wherein the suspension means is fully protected from the action in the furnace by the said tile.

Other objects and advantages will appear as the description proceeds when taken in connection with the accompanying drawings. However, I wish it to be distinctly understood that I do not intend to limit myself to the exact details shown and described, but that I intend to avail myself of all such modifications as would occur to one skilled in this art and as fall within the scope of the claims.

In the drawings—

Fig. 1 is a transverse section through the furnace illustrating the manner in which the removable roof units are supported;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of one of the supporting blocks used to carry the roof units on the furnace walls;

Fig. 4 is a perspective view of the improved hanger bars used in this construction.

Referring now in detail to the drawings, the numerals 5 and 6 indicate the opposite vertical walls of the furnace upon which my

improved roof structure is supported. The roof structure as shown is made up of a plurality of units 7 which comprise a pair of channel beams 8 and 9 supported at opposite ends by the bricklike elements 11 and having suspended therefrom a plurality of refractory tile members 12. Any number of the units 7 may be supplied as is necessary to cover the furnace as each one is independent of the other and they are placed side by side with the tile members thereof abutting each other, as clearly shown in Fig. 2. The channel bars 8 and 9 are secured together in spaced relation by means of the spacing elements 13 and 14 which, as shown in Fig. 2, are heavy U-shaped metallic members having the web portion 14 connecting the legs of the U-shaped portion and provided with a relatively large opening 15 therethrough. The members 13 are secured to the channel bar by means of the bolts 17 and preferably have the upper ends of the portions in engagement with the channel bar engaging the top laterally extending portions of said channel bars. The purpose of this is to give a strong joint between the members 13 and the channel bars so that by connecting a hook or chain to the members 13 by means of the openings 15, a crane may be used to lift the entire unit and move it into place or out of place in the furnace roof. At the opposite ends of the channel bars they are also bound together by means of the flat plates 17 and 18 secured to the channel bars by means of the angle irons 19 and 20 which are riveted to both the plates 17 and 18 and the channel bars 8 and 9.

In order to provide means for supporting the opposite ends of the units upon the furnace walls without damaging the same, I provide the bricklike elements 11 having the T-shaped grooves 22 and 23 therein as shown clearly in Fig. 3, and I also provide at the opposite ends of the channel bars the angle irons 24 and 25 which combine with the lower webs of the channel bars to form T-shaped supports which extend through a plurality of the members 11 which in turn rest upon the top of the furnace walls. The members 11 may be constructed of any suitable material and since they are not exposed

to the direct heat of the furnace, they need not be of high grade refractory material, but may be so constructed as to give sufficient strength to prevent crushing under the weight of the roof unit. The refractory elements 12 as shown are supported in units of four by means of the hanger bars 27 and depend preferably a distance slightly less than the distance of the lower faces of the blocks 11 from the channel bars so that when the unit is placed upon the furnace walls the refractory elements where they extend over the top of the furnace walls as at 28, do not bear any of the weight of the roof, but fit close enough to substantially prevent any leakage of the gases within the furnace out between the side walls and the roof. The advantage of this lies in the fact that the refractory elements which have very little tensile strength and would crush very easily in weight, are free from any weight except their own. This also permits them to contract and expand and move during this expansion relative to the furnace walls without injury to the refractory elements.

The refractory elements each have one side face thereof recessed as at 30, and have the opposite faces thereof substantially plane. They are also provided with an opening through the thinner portion provided by the recess 30 through which the hanger bar 37 may extend.

In building up the units supported by the hanger bar the refractory elements 12 are placed thereon with the two center elements having the two recessed faces thereof directed toward each other and with the two outer elements having their plane faces engaging the plane faces of the two inner elements. This manner of assembly provides the open portion 31 through which the stem 26 of the hanger bar may extend upwardly, and also permits the projections 32 and 33 at opposite ends of the hanger bar to extend upwardly outside the recessed faces without coming beyond the outer faces of the main portions of the outer blocks. The thinner upper portions of the blocks 12 are provided with rounded shoulders as illustrated at 34 and 35 in Fig. 2, so that there are no sharp projections on this thinner portion which might be broken off in handling. The hanger bar 27 as shown clearly in Fig. 4, has a rounded upper portion conforming with the inner surface of the round openings through the blocks 12 so that they may pivot thereon, and the projections 32 and 33 are of sufficient size to normally hold the blocks in position, but small enough to permit them to be removed when lifted up at the ends of the hanger bar. The bar is also provided with a reinforcing web 36 along the bottom thereof to give it added strength. The stem 26 is provided at its upper end with a head portion 37 which is adapted to be inserted between the channel

bars 8 and 9 and supported by the lower flanges thereof.

In order to permit the hanger bars to adjust themselves relative to the channel members, due to change in position of the refractory blocks under expansion and contraction in heating, I provide the underface 38 of the head 37 in the form of a segment of a sphere. Thus if the hanger bar is moved a slight distance out of correct vertical alignment, this shape of the head will permit such movement without in any way changing the amount of weight borne by each channel bar. Also this particular shape of the head permits adjustment not only longitudinally of the channel bars but transversely thereof as well.

From the above description it will be seen that the several units of refractory blocks 12 may be removed when the channel bars are lifted from the furnace by sliding the blocks 11 off the ends of the channel bars and pulling the hanger bars 27 endwise along the channel bars to the end thereof. In this manner a unit of the furnace roof may be lifted off and all of the refractory sections taken off and replaced; or if it is necessary to replace one of the refractory elements 12, the hanger bars may be moved a sufficient distance to separate adjacent units far enough to permit one of the blocks 12 to be lifted from its projection at the end of the hanger bar and taken off in this manner.

This construction makes a furnace roof which is extremely flexible and which is capable of being repaired and replaced without cooling or shutting down the furnace, since a unit may be lifted off by means of a crane and another one set in its place in a very few minutes time without waiting for the furnace to cool off or interrupting its use to any appreciable extent. Also the manner of mounting the refractory elements permits them to adjust themselves readily under the changing conditions in the furnace, and this aids in preventing breakage or spalling or cracking due to the refractory elements being placed under strain by a change in temperature. From the above description it is thought the construction and operation of this device will be clear to those skilled in this art.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States is:—

1. A removable furnace roof construction comprising supporting beams having slots running lengthwise on the under face thereof, inwardly extending flanges on opposite sides of said slots, a plurality of hanger bars having head portions slidably supported in said slots by said flanges, refractory tile members carried by each hanger bar, and means at the opposite ends of each of said beams for supporting them on the vertical walls of the furnace, said beams having flat supporting surfaces on the top thereof over said support-

ing means whereby a plurality of beams may be stacked upon each other with the tile thereon.

2. A removable furnace roof construction comprising supporting beams having slots running lengthwise on the under face thereof, inwardly extending flanges on opposite sides of said slots, a plurality of hanger bars having head portions slidably supported in said slots by said flanges, refractory tile members carried by each hanger bar, and means at the opposite ends of each of said beams for supporting them on the vertical walls of the furnace, said means comprising a plurality of blocks having slots therein receiving said flanges.

3. A removable furnace roof construction comprising supporting beams having slots running lengthwise on the under face thereof, inwardly extending flanges on opposite sides of said slots, a plurality of hanger bars having head portions slidably supported in said slots by said flanges, refractory tile members supported on each hanger bar, and means carried by the opposite ends of each of said beams and depending below the lower faces of said tile members for supporting them on the vertical walls of the furnace, the head portions of said hanger bars having curved faces in engagement with said flanges to permit angular adjustment of the hanger bars relatively to same beams.

4. A removable furnace roof construction comprising supporting beams having slots running lengthwise on the under face thereof, inwardly extending flanges on opposite sides of said slots, a plurality of hanger bars having head portions slidably supported in said slots by said flanges, refractory tile members carried by each hanger bar, and means at the opposite ends of each of said beams for supporting them on the vertical walls of the furnace, the head portions of said hanger bars having the under faces thereof forming a segment of a sphere.

5. A removable furnace roof construction comprising supporting beams having slots running lengthwise on the under face thereof, inwardly extending flanges on opposite sides of said slots, a plurality of hanger bars having head portions slidably supported in said slots by said flanges, refractory tile members carried by each hanger bar, and means at the opposite ends of each of said beams for supporting them on the vertical walls of the furnace, said means comprising a plurality of blocks having T-shaped slots extending transversely across the top face thereof and outwardly extending flanges at the ends of said beams forming with said first named flanges a pair of T-shaped portions extending through said T-shaped slots.

6. A removable furnace roof construction comprising supporting beams having slots running lengthwise on the under face there-

of, inwardly extending flanges on opposite sides of said slots, a plurality of hanger bars having head portions slidably supported in said slots by said flanges, refractory tile members carried by each hanger bar, and means at the opposite ends of each of said beams for supporting them on the vertical walls of the furnace, said means comprising supporting blocks secured to said beams and supporting the lower ends of said tile members slightly spaced from said walls whereby said tile members are free to expand and contract independently of the vertical walls.

7. A removable furnace roof construction comprising supporting beams having slots running lengthwise on the under face thereof, inwardly extending flanges on opposite sides of said slots, a plurality of hanger bars having head portions slidably supported in said slots by said flanges, refractory tile members pivotally and detachably supported on each hanger bar, and means at the opposite ends of each of said beams for supporting them on the vertical walls of the furnace.

8. A removable furnace roof comprising a plurality of units adapted to fit side by side and be supported on the opposite vertical walls of the furnace, said units each comprising a beam, hanger bars having head portions engaging said beams and slidable lengthwise thereof and having horizontal portions extending lengthwise of said beam, a plurality of refractory elements having openings therethrough receiving said horizontal portions and having their side faces in engagement to form a continuous row lengthwise of said beam, and supporting blocks having slots therein slidably receiving the ends of said beam, the lower ends of said blocks extending below the lower ends of said refractory elements and adapted to rest on the said vertical walls to support the unit.

9. A removable furnace roof comprising a plurality of units adapted to fit side by side and be supported on the opposite vertical walls of the furnace, said units each comprising a beam, hanger bars having head portions engaging said beams and slidable lengthwise thereof and having horizontal portions extending lengthwise of said beam, a plurality of refractory elements having openings therethrough receiving said horizontal portions and having their side faces in engagement to form a continuous row lengthwise of said beam, and supporting blocks having slots therein slidably receiving the ends of said beam and adapted to rest upon said vertical walls to support the unit.

10. A removable furnace roof construction comprising supporting beams having slots running lengthwise on the under face thereof, inwardly extending flanges on opposite sides of said slots, a plurality of hanger bars having head portions slidably supported in said slots by said flanges and having tile

carrying portions extending lengthwise of said beams, refractory tile members carried by said hanger bars and means at the opposite ends of each of said beams removably supporting them on the vertical walls of a furnace, each of said beams and the hanger bars and tile secured thereto being removable independently of the other.

11. A removable furnace roof construction comprising independent supporting beams having slots running lengthwise thereof and supporting flanges on opposite sides of said slots, a plurality of hanger bars having head portions slidably supported in said slots by said flanges, depending stem portions and tile carrying portions integral with said head portions, said tile carrying portions extending longitudinally of said beams, and a plurality of refractory tile detachably carried by said tile carrying portions, each of said beams and the hanger bars and tile secured thereto being removable independently of the other.

In witness whereof, I hereunto subscribe my name this 14th day of March, A. D. 1927.

LYLE STOCKTON ABBOTT.

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