Oct. 3, 1950 H. W. WEBER ET AL 2,524,722

SUSPENSION ARCH

Filed Dec. 12, 1946 2 Sheets-Sheet 1

Fig. 1.

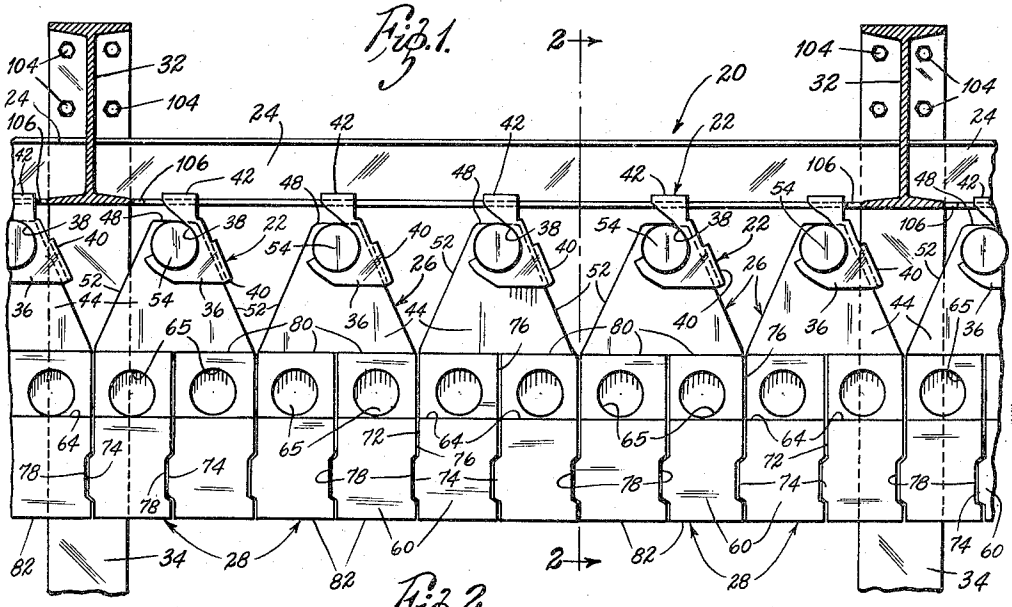


Fig. 2.

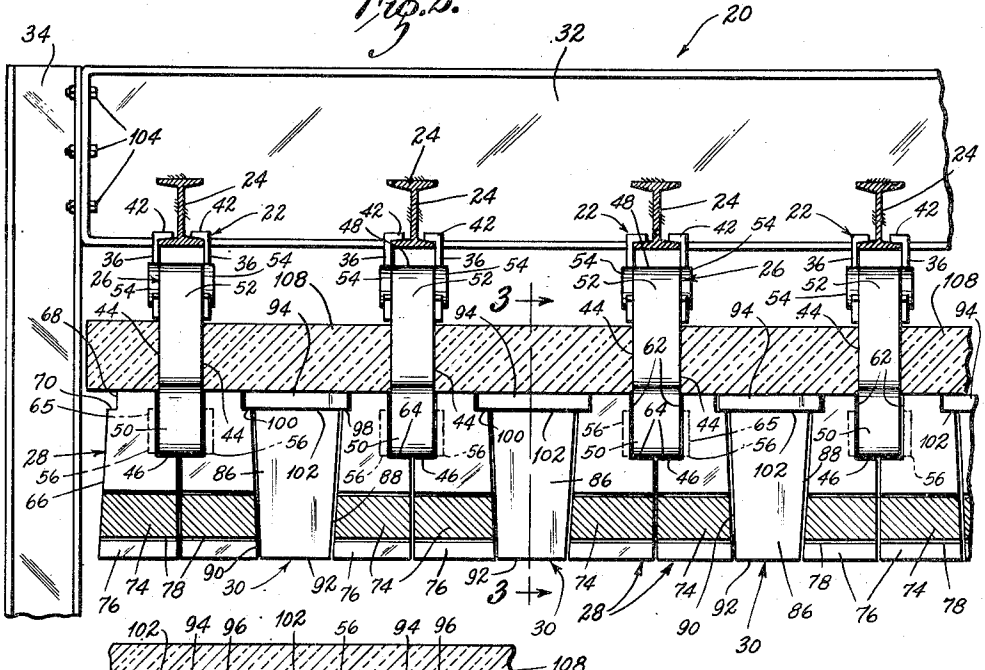
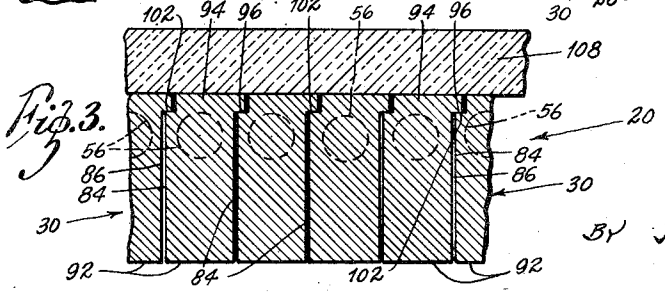


Fig. 3.



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Filed Dec. 12, 1946 2 Sheets-Sheet 2

Fig. 4.

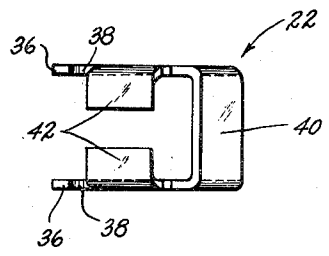


Fig. 5.

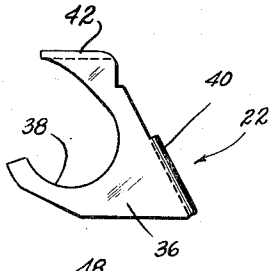


Fig. 6.

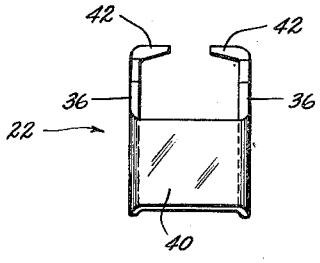


Fig. 7.

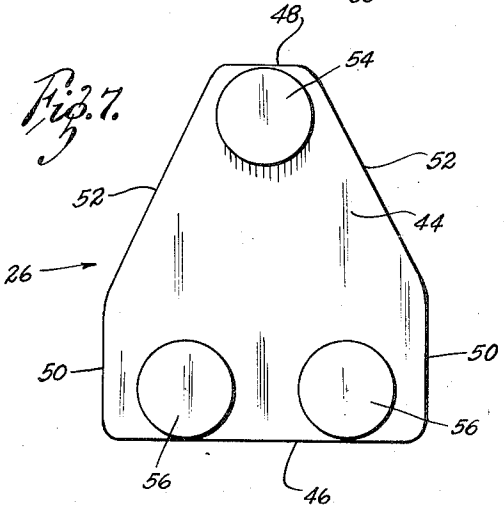


Fig. 8.

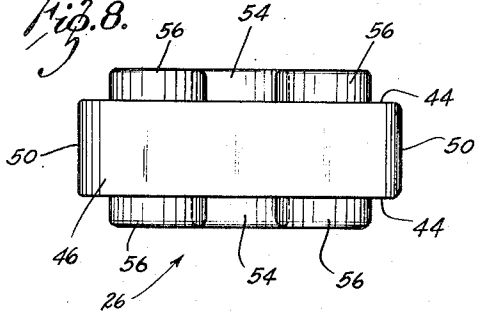


Fig. 9.

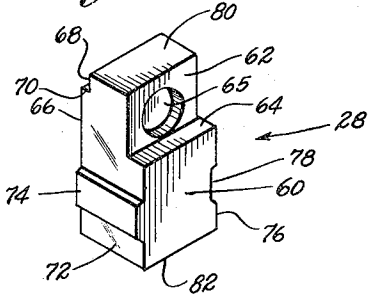
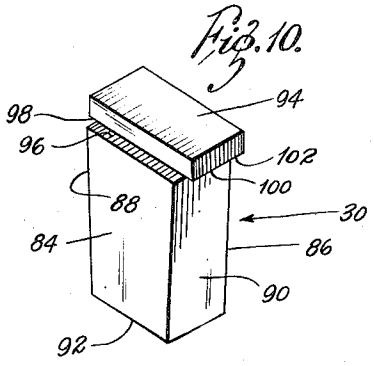


Fig. 10.



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Patented Oct. 3, 1950

2,524,722

UNITED STATES PATENT OFFICE

2,524,722

SUSPENSION ARCH

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Application December 12, 1946, Serial No. 715,728

6 Claims. (Cl. 110—99)

1

The present invention relates generally to roof or arch constructions for furnaces, and more particularly to a tile suspension arch or roof for high temperature furnaces and to novel elements forming parts of the arch or roof.

An object of the present invention is to provide a novel tile suspension arch or roof for a furnace or the like in which high temperatures are developed, such as are encountered in the metallurgical industry, open hearth furnace checker chambers, billet and slab furnaces and the like.

Another object is to provide a novel suspension casting or bracket forming part of the present novel suspension arch or roof which incorporates advantages of suspension, fabrication and application.

Another object is to provide a novel suspension tile which is particularly adapted for use with the present novel suspension casting or bracket.

Another object is to provide a novel tile suspension arch or roof for a furnace which is readily fabricated and which may be repaired with ease and rapidity.

Another object is to provide a novel tile suspension arch or roof for a furnace which incorporates castings of ordinary iron disposed out of the high temperature zones, thereby eliminating expensive heat resisting supporting castings which would otherwise have to be employed and which are prohibitive in cost.

Another object is to provide a novel tile suspension arch or roof for a furnace which is adaptable to any arch or roof shape which may be required to span a particular chamber.

Another object is to provide a novel tile suspension arch which is sturdy in construction and which is formed so that any particular tile can be reached for replacement without the necessity of dismantling the whole arch or roof construction.

Another object is to provide a novel tile suspension device for forming a suspension arch or roof for a furnace which comprises the combined present novel suspension bracket and suspension tile.

Another object is to provide a novel suspension bracket as a unit of a suspension arch or roof for a furnace which is of integral construction and which readily receives and releases a suspension tile supported thereby.

Other objects are to provide a novel tile suspension arch which is relatively inexpensive, which incorporates a minimum number of tile

2

shapes, which may be readily installed with a minimum of instruction, which is fabricated to minimize the load of particular suspension tiles, and which has a long life requiring minimum maintenance.

Other objects and advantages, in addition to the foregoing, are apparent from the following description taken with the accompanying drawings, in which:

Fig. 1 is a fragmentary longitudinal cross-sectional view through a tile suspension arch or roof construction fabricated in accordance with the teachings of the present invention;

Fig. 2 is a fragmentary transverse cross-sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary longitudinal cross-sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a plan view of the present novel suspension bracket or casting;

Fig. 5 is a side elevational view thereof;

Fig. 6 is an end elevational view thereof;

Fig. 7 is a side elevational view of the present novel suspension tile;

Fig. 8 is a bottom plan view thereof;

Fig. 9 is an isometric view of a roof tile; and

Fig. 10 is an isometric view of a filler tile.

Referring to the drawings more particularly by reference numerals, 20 indicates generally a tile suspension arch or roof formed in accordance with the principles of the present invention. Broadly, the suspension arch 20 includes suspension castings or brackets 22 supported on I beams 24, suspension tiles 26 handing from the suspension brackets 22, roof tiles 28 hanging from the suspension tiles 26, and filler tiles 30 supported by and between the roof tiles 28. I beams 32 are disposed at right angles to the I beam 24, being supported by vertical I beam posts 34 in the disclosed embodiment.

Considering in detail the several elements forming the present novel arch construction 20, each novel suspension bracket 22 is preferably formed to the configuration clearly shown in Figs. 4 through 6. The bracket 22 includes opposed side walls 36 of the configuration shown including a cradle 38, the walls 36 being connected by a web 40 which is disposed at a predetermined angle to the horizontal, such as that shown. Each side wall 36 terminates at its upper end in a horizontal flange 42, the two flanges 42 being spaced apart to accommodate the web of an I beam or similar structural member therebetween, the flanges 42 being adapted to rest on the flanges of an I beam or the like, and, when cast, preferably formed with the undersides sloping at the same

angle as that of the I beam flanges. When brackets 22 are stamped, the angle of the flanges 42 to the walls 36 will preferably be obtuse to provide a flat contact of the flanges 42 with the flanges of a supporting I beam. The web 40 is spaced below the flanges 42 in order to permit swinging movement of the bracket 22 on its support to receive or to release a suspension tile 26.

The suspension tile 26 is preferably of the configuration clearly shown in the drawings in Figs. 7 and 8, including opposed parallel side faces 44, a bottom face 46, a top face 48 parallel to the bottom face 46, opposed parallel end face portions 50 and converging end face portions 52. The angle of the end face portions to the horizontal is substantially the same as the angle of the web 40 of the bracket 22. Extending from each of the side faces 44 are integral buttons or bosses 54 and 56, there being a single boss 54 and two bosses 56. The bosses 54 and 56 are shown as of cylindrical form but they may take other shapes if desired, although a circular cross section is preferred. Further, the bosses 54 and 56 may be formed separately from the main body of the tile 26, but an integral construction is preferred.

The roof tile 28 is preferably of the configuration shown in Fig. 9 although other forms may be employed. The tile 28 includes a side face 60 having an upper portion 62 inwardly offset by a shoulder or shelf 64. A circular well 65 is formed in the upper portion 62. An opposed downwardly divergent side face 66 includes an upper portion 68 inwardly offset by a shoulder or shelf 70. Parallel end faces 72 and 76 include a raised portion 74 and a depressed portion 78, respectively. A top face 80 and a bottom face 82 complete the tile 28.

The filler tile 30 is preferably of the configuration clearly shown in Fig. 10, although it may take other forms. The tile 30 includes parallel side faces 84 and 86, end faces 88 and 90, and a bottom face 92. A displaced integral head portion 94 provides a shoulder 96 adjacent the top of the side face 84 and suspension shoulders 98, 100 and 102 adjacent the top edges of the end faces 88, 90 and the side face 86, respectively. The end faces 88 and 90 converge towards the bottom face 92, as is clear from Fig. 2.

In a particular installation employing the present novel tile suspension arch 20, the normal procedure is to provide the framework which, as shown in the drawings, may include vertical I beam posts 34 supporting heavy I beams 32, which may be secured together by suitable bolts or rivets 104. Spaced I beams 24 are supported by I beams 32. The lower flanges of the I beams 24 are cut away at the ends so that the said lower flanges are in substantially the same horizontal plane as the lower flanges of the I beams 32, although this relationship is not essential. The lower flanges of the I beams 24 may be cut back far enough to provide a slot 106 at each side of the web of the said I beams as an access point for engaging brackets on said I beams, as is clear from Fig. 1.

Brackets 22 are slipped onto the lower flanges of the I beams 24 by sliding the flanges 42 thereof through the openings 106. In the drawings, five brackets 22 are shown mounted on a single I beam 24, the number, of course, depending upon the length of the particular I beam. The brackets 22 may be disposed on an I beam 24 prior to the securing of the same to I beams 32, in which case the aforementioned openings 106 may be omitted although they may be provided for removal of the brackets 22. Further, the brackets 22 may be disposed on an I beam 24 by initially providing the flanges 42 thereof in the same plane as the walls 36 and subsequently bending the flanges 42 into position against the supporting lower flange of the I beam 24.

A suspension tile 26 is disposed in the cradle 38 of each bracket 22 by the simple expedient of tilting the bracket into position to receive the single bosses 54. A roof tile 28 is mounted on each of the four lower bosses 56 of each suspension tile 26 through the medium of the wells 65. Filler tiles 30 are disposed between the roof tiles 28 in the manner shown in Fig. 2, the shoulders 98 and 100 of the filler tile 30 resting on the shoulders 70 of the roof tile 28.

Insulation 108, such as slag wool or diatomaceous earth, may be disposed on the roof tiles 28 and the filler tiles 30. Four inches of insulation has been found to be adequate in an average installation. It may be desirable on very high temperature furnaces to employ less insulation, or to omit the insulation altogether to allow the heat to be dissipated, thereby lowering the mean temperature of the tiles and increasing their life.

Three types of refractory material to accommodate different types of furnaces are particularly suitable for the suspension tiles 26, the roof tiles 28 and the filler tiles 30. The tiles may be made of fire clay where no destructive slags are encountered; they may be formed of silica to resist acid slags, such as obtains in the glass industry; and they may be made of basic refractory to resist basic slags, chrome or magnesite being suitable materials, the copper industry being an example requiring basic refractory. It is understood that other refractory materials may be used for the tiles in suspension roofs 20 employed in the above-mentioned industries or elsewhere.

In a preferred suspension roof 20 spanning a furnace in which the roof temperature may be 2800° F., roof tiles 28 and filler tiles 30 of a depth of ten or twelve inches may be employed. The particular dimensions of the several tiles will, of course, depend upon the particular furnace installation and can be readily computed by anyone skilled in the furnace art.

It is clear from the foregoing taken with the drawings that the suspension castings 22, as well as the I beams 24 and 32, are remotely disposed in respect to the high heat within the furnace which the suspension arch 20 spans. Hence, the suspension castings 22 may be made of ordinary iron, since they are not subjected to high heat, and such ordinary iron suspension casting 20 will enjoy a long life. Expensive heat-resisting supporting castings, which often are prohibitive, are not required. The same is true of the I beams 24 and 32.

The suspension arch 20 is of sturdy construction, is easy to install, and is easy to repair since any one or more filler tiles 30 may be readily removed to permit access to any damaged roof tiles 28, or suspension tiles 26. Access is provided to the suspension castings 22 from the exterior of the furnace since the supporting upright I beams 34 and the I beams 24 and 32 are located in a factory room, or the like, free of any outside cover in a standard installation.

It is manifest, of course, that the several elements forming the present novel suspension arch 20 may individually take forms other than those

forms given by way of illustration. However, it is preferable to use tiles of a selected shape or form in a particular installation since this serves to speed up construction. Furthermore, the use of a particular shape for a particular tile on a long range plan is advantageous, since it permits stocking of the tiles, which insures immediate delivery to a damaged furnace for quick repair. The several tiles are preferably all machine made by the dry process, which gives uniformity of shape and insures accurate interfitting of tiles in fabricating a suspension arch 20.

It is manifest that the present suspension arch or roof 20 adapts itself to any roof shape desired in the same manner the suspension arch or roof shown and described in our copending application, Serial No. 694,560, filed September 3, 1946, adapts itself. Direction changing roof tiles, such as the roof tile 30 of our said copending application, may be required, but the same have not been illustrated herein, being unnecessary for a full disclosure of our present invention.

It is clear from the foregoing that the novel bracket 22 and its associated novel suspension tile 26 and the present novel suspension arch, of which the said bracket and suspension tile form parts, fulfill all the objects and advantages sought therefor.

It is to be understood that the foregoing description and the accompanying drawings have been given by way of illustration and example. It is also to be understood that changes in form of the several parts, substitution of equivalent elements, and rearrangement of parts, which will be readily apparent to one skilled in the art, are contemplated as within the scope of the present invention, which is limited only by the claims which follow.

What is claimed is:

1. A ceramic suspension tile for furnace construction comprising a main body having opposed faces, a single boss extending outwardly from each face adjacent the top of the tile, and a plurality of bosses adjacent the lower edge of each face of said tile arranged symmetrically in respect to a vertical center line drawn through the upper boss.

2. A tile suspension arch comprising a support including structural members, brackets supported by said structural members for rocking movement, each bracket including a pair of spaced depending cradle walls, a ceramic suspension tile disposed between each pair of cradle walls and including a boss extending from each side having an arcuate lower portion received by said cradle walls for support of said tile, said brackets being rockable on said supporting structural members to release said cradle walls from supporting engagement with said bosses, bosses extending outwardly from both sides of said suspension tiles spaced below said first mentioned bosses, and roof tiles supported on said lower bosses, said roof tiles having wells in sides thereof into which said bosses extend for support of said roof tiles.

3. A tile suspension arch comprising a supporting structure, brackets supported thereby, each bracket including a pair of depending cradle walls, a ceramic suspension tile supported by each bracket having opposed sides, each of said sides having an annular boss extending outwardly therefrom and disposed on a cradle wall forming together a pivotal support for said tile, each of said sides having spaced annular bosses below said first mentioned bosses, and a roof tile pivotally supported on each of said lower bosses and depending therefrom, each roof tile having a well receiving a boss.

4. A tile suspension arch comprising ceramic suspension tiles each including opposed sides, each of said sides having a single upper boss and at least two spaced lower bosses extending outwardly therefrom, a bracket pivotally receiving the two upper bosses of each suspension tile and supporting said tile, means supporting said brackets, and a roof tile supported on each of said lower bosses.

5. A tile suspension arch comprising ceramic suspension tiles each including opposed sides, each of said sides having a single upper boss and at least two spaced lower bosses extending outwardly therefrom, a bracket pivotally receiving the two upper bosses of each suspension tile and supporting said tile, means supporting said brackets, and a roof tile pivotally supported on each of said lower bosses.

6. A tile suspension arch comprising ceramic suspension tiles each including opposed sides, each of said sides having a single upper boss and at least two spaced lower bosses extending outwardly therefrom, a bracket pivotally receiving the two upper bosses of each suspension tile and supporting said tile, means supporting said brackets, a roof tile pivotally supported on each of said lower bosses, and filler tiles supported by said roof tiles.

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