March 11, 1969 R. C. STEPHENS 3,431,693

HANGER STRUCTURE

Filed Dec. 8, 1966

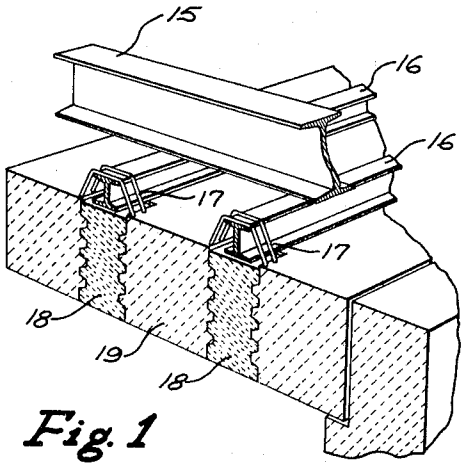


Fig. 1

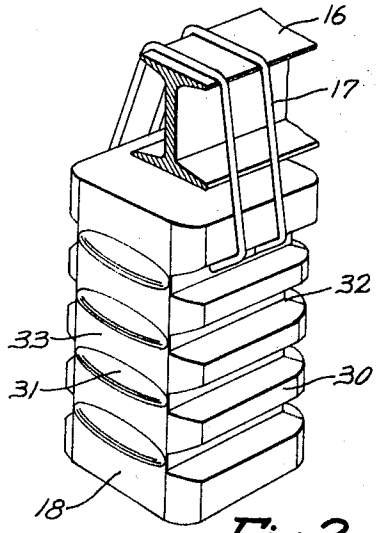


Fig. 2

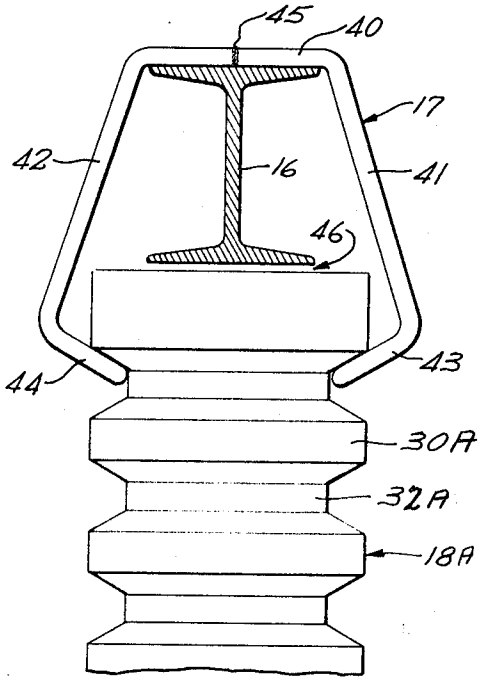


Fig. 3

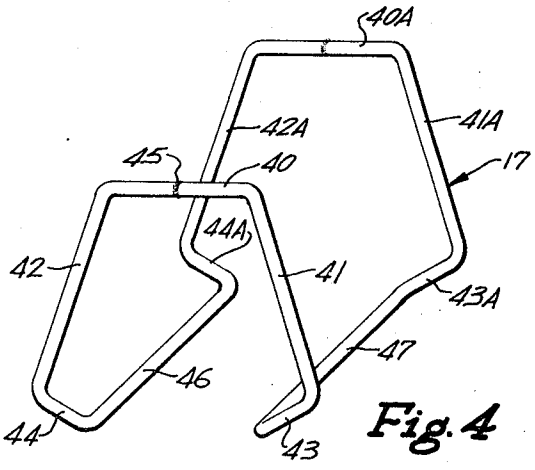


Fig. 4

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HANGER STRUCTURE

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ABSTRACT OF THE DISCLOSURE

The disclosure concerns use of a hanger element made of a single length of wire rod bent to form a support for refractory anchors.

This invention relates to overhead suspended furnace roofs and, more particularly, to roofs of furnaces of the soaking pit type. The invention is likewise applicable to the construction of arches or inclined walls wherein refractory shapes are suspended from some manner of steel reinforcing structure.

It has been common to fabricate such as soaking pit roofs and the like of a plurality of refractory brick, which brick are supported from contiguously overlying support structure. It is not unusual for each brick in the roof to have separate support mechanism associated therewith. It is also common to use spaced, preformed refractory anchors to support monoliths which are rammed, gunned, or cast into place.

In any event, the hanger structure for the brick which are suspended has long been the subject of experimentation and improvisation. Since the hanger structure is usually of metal, it is susceptible to deformation and/or destruction by heat. Some support structures, such as that shown in U.S. Patent No. 3,132,477, when in the form of castings, are not as thermal shock resistant as desired. In some instances, when the support structure is too close to the upper brick face, there is deformation thereof. In addition, when repairing or patching a roof it may be necessary to cut supporting beams in order to place the hanger structure in place. In addition, when a furnace campaign is well advanced, the superstructure (usually consisting of a plurality of heavy steel beams) can be warped. Such a condition further complicates patching with conventional hanger structure. It is not unusual to have undersize and oversize hanger beams, further complicating the problem of finding a universally acceptable hanger structure for a given roof.

Most hanger structure includes means to either wedge-up or wedge-down a brick to tighten the brick in place, depending on whether the refractory will ultimately be in tension or compression.

Thus, it is an object of the present invention to provide a simplified hanger structure which is more readily usable than most of those prior arrangements of which I am aware, and which overcomes all of the disadvantages or problems outlined above. A plurality of substantially identical hanger elements according to my invention can be used in a given roof without regard to slightly oversized or undersized support members or beams or warped parts thereof. In addition, the hanger structure of this invention is readily adaptable to, in combination with the refractory, allow wedging up or down. The structure facilitates repair patching without cutting of a support beam or the like. In addition, it is an object to provide hanger structure which, but its nature, assists in dissipating heat.

Briefly, according to one aspect of the invention, there is provided hanger structure for suspended anchor brick comprising a unitary rod, the ends of which are joined by welding. The rod is shaped to span the top of a support beam and includes downwardly-extending leg portions arranged to cooperate with spaced parallel grooves in the top of an anchor brick or the like. A better understanding of the invention is believed had by a study of the following detailed description, together with reference to the appended exemplary drawings. In these drawings:

FIG. 1 is a fragmentary schematic perspective view of a portion of a monolithic roof structure indicating a manner of usage of hangers according to this invention;

FIG. 2 is an enlarged perspective view of a portion of the arrangement of FIG. 1, better showing the cooperation between an anchor element, hanger structure, and a supporting beam;

FIG. 3 is a side elevation with a portion broken away of an arrangement such as shown in FIG. 2 using a modified anchor form. Comparable reference numerals are used in FIG. 3, but an A is added to indicate it is a modification; and

FIG. 4 is a perspective view of the novel support element of the invention.

Referring now to FIG. 1, in the fabrication of a monolithic refractory roof or wall there is usually a plurality of longitudinal and crossbeams **15** and **16**, which together cooperate to form structure which ultimately supports the weight of the roof. The longitudinal beams **16** in FIG. 1 support, by means of a plurality of novel elements **17** according to this invention, a plurality of anchor elements **18**. The anchor elements **18** are embedded in a monolithic mass of refractory **19**, which the anchors **18** hold in place. The monolith and anchors can be of any compatible, conventional, refractory substance. In a preferred embodiment, the anchors are ceramically bonded brick of the type disclosed and claimed in U.S. Patent No. 3,067,050, Example Q in Table IV. The monolith can be of the same composition but installed as a plastic.

The anchors of FIG. 1 are of a conventional type; and as shown in FIG. 2, may be described as generally of square configuration with opposed parallel faces having protuberances **30** and **31** extending across the respective faces, between which protuberances are substantially equispaced valleys **32** and **33**.

Referring now to FIG. 3, it can be seen that the novel hanger structure **17** in cross-section includes a web portion **40**, downwardly- but outwardly-diverging arms **41** and **42** which terminate through an obtuse angle in inwardly-bent toes **43** and **44**. These toes seat against undersurfaces of the protuberances **30A**, whereby the anchors **18** are supported. The element **17** is formed of a single length of good quality steel rod, which is welded at **45**.

Depending on whether one wishes to wedge-up or wedge-down the brick, wedge pieces can be driven in the space **46** or between the upper part of the I-beam **16** and the bottom of the web **40**.

With the foregoing arrangement, it can be seen that the anchor elements **17** can be easily positioned without cutting or otherwise changing the structure of the support beams; and because it is a rod, the web **40** can be of variable lengths and can be used with undersized and oversized beams without regard to whether or not the beams are warped. Just as easily as the elements **17** are positioned over the beam, anchors such as **18** having spaced parallel grooves adjacent the upper cold end thereof, which grooves extend entirely across the respective faces in which they space **46** or between the upper part of the I-beam **16** and above the fingers **33** and **34**.

FIG. 4 (a preferred construction of approximately scale dimensions) shows the hanger elements **17** to include a pair of each of the webs' outwardly-diverging arms and inwardly-extending respective opposed fingers interconnected by stringer sections **46** and **47**. The web **40** and

its parallel symmetrically disposed mirror image **40A** provide the sole bearing surface for the hanger member and its eventually associated anchor. I have also indicated mirror image parts **41A**, **42A**, **43A**, and **44A**, which together with the webs and the stringers make up the overall structure of the hanger element of the present invention.

Since the foregoing hanger element is made of a good quality steel alloy rod, it is much more shock-resistant than cast support elements. The anchor element which is interconnected with the support element or hanger has the bearing surfaces spaced as far away as possible in the coolest location, since it bears against the top of such as I-beam **16**, which is furthest away from the refractory.

Another desirable aspect is that the weld or welds which hold together and make unitary the hanger structure **17** can be located in the coolest area spaced furthest away from the roof. In addition, the very nature of my hanger element **17**, being as it is constructed of a length of good quality steel alloy (for example, 302 Stainless Steel), is particularly adapted to dissipating any heat which it may pick up from the associated anchor element.

While in the drawings I have shown a single length of wire rod welded at **45**, it should be understood there could be a plurality of short sections welded together or two sections, in which case there would be a weld in the web **40A**, etc.

The FIG. 3 arrangement can be considered approximately to scale. In such an arrangement, the stainless steel rod from which the hanger element **17** is fabricated has about a 5/16 inch diameter. The I-beam **16** is about 3 inches in heighth. The preferred anchor is of the type shown in FIG. 2 in U.S. Patent No. 3,132,447.

Having thus described the invention in detail and with sufficient particularity as to enable those skilled in the art to practice it, what is desired to have protected by Letters Patent is set forth in the following claims.

I claim:

1. For use in combination with a refractory wall or roof including a plurality of anchor elements and exterior steel supporting beams or the like which extend in parallel arrangement across the exterior of said wall or roof, said anchor elements having a hot end and a cold end, said anchor elements having at least a pair of opposed parallel grooves formed adjacent the cold end thereof, a plurality of hanger elements for supporting said anchors, said hangers each being comprised of unitary rod means in the form of a closed structure, said structure shaped to form a pair of mirror-image sections, each mirror-image section comprised of an upper, substantially flat web from the ends of which extend two outwardly-diverging legs which legs terminate in inwardly-directed feet, respective opposed feet of said two mirror-image sections joined by substantially equidistant stringers, said feet being in the respective opposed grooves adjacent the cold end of said anchor elements and bearing against an upper surface of said grooves, said webs being supported on an upper surface of said support beams thereby supporting said anchors said rod joined only on the upper flat webs.

2. The combination of claim **1** in which said rod means is formed of a single length of metal rod, opposed ends of which are joined.

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U.S. Cl. X.R.

52—487, 489; 110—99