

Dec. 28, 1965

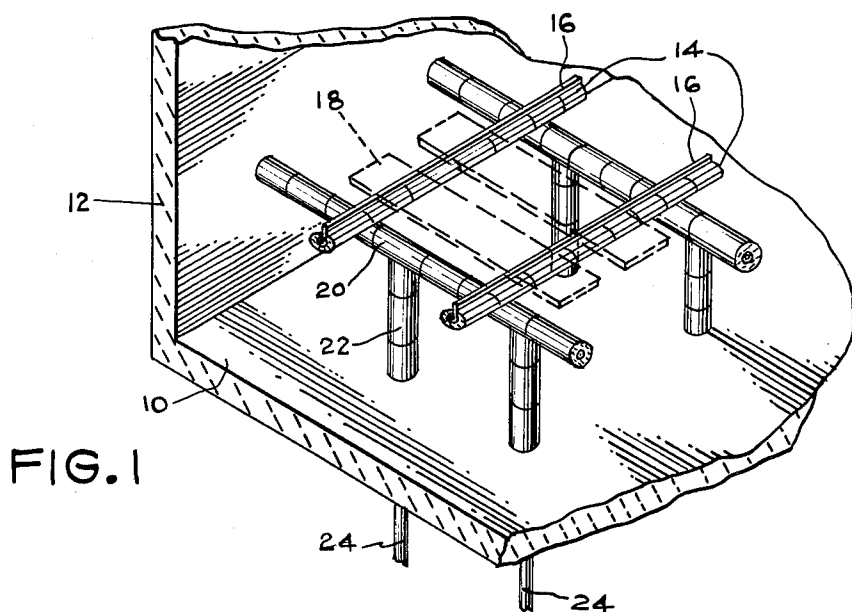
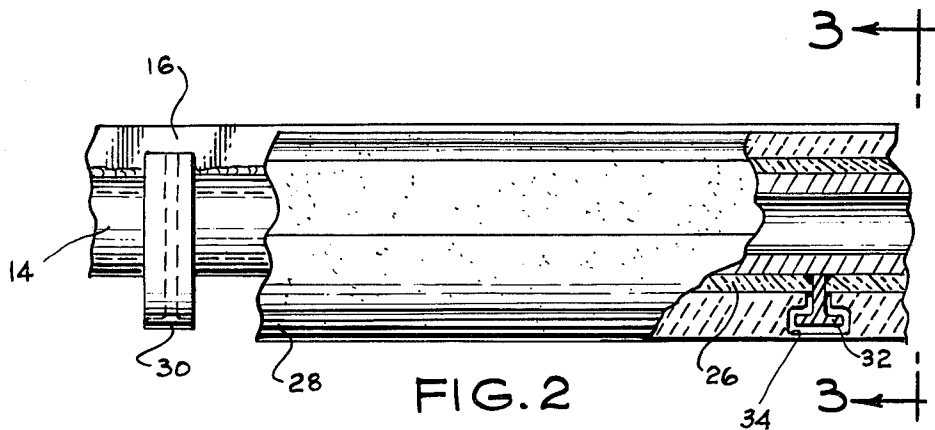
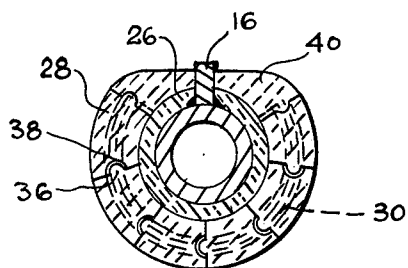
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3,226,101

INSULATED FURNACE MEMBERS

Filed Oct. 21, 1963

2 Sheets-Sheet 1



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INSULATED FURNACE MEMBERS

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2 Sheets-Sheet 2

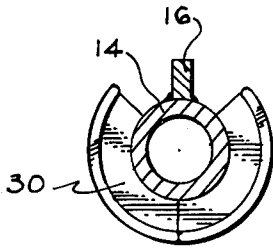


FIG. 4

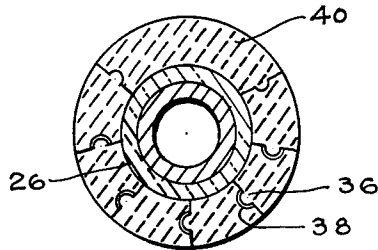


FIG. 5

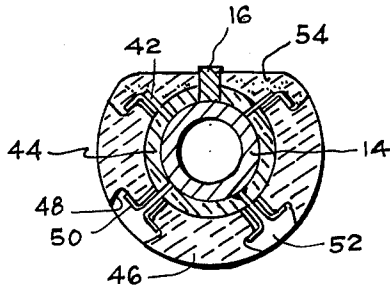


FIG. 6

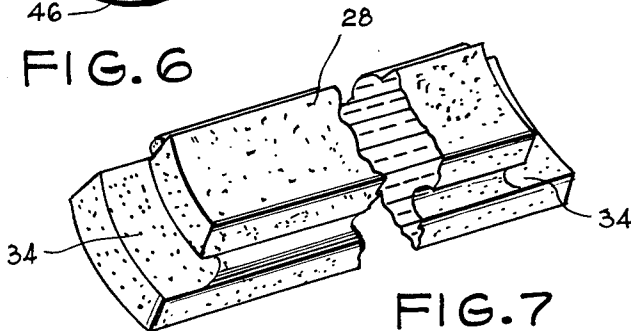


FIG. 7

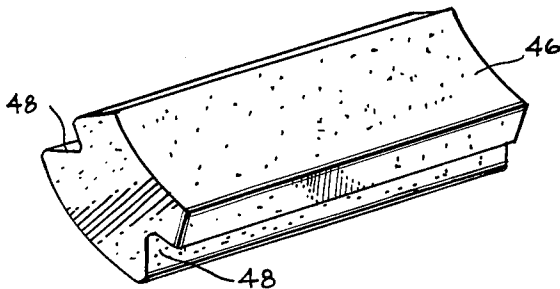


FIG. 8

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3,226,101

INSULATED FURNACE MEMBERS

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5 Claims. (Cl. 263—6)

This invention relates to improvements in furnace constructions. In the particular structure to be described herein, the furnace comprises a construction of the type employed for soaking or otherwise heating metal stock in preparation for work to be done on the stock while in the heated state. It will be understood that the inventive concepts disclosed herein could be employed for other furnace units and for various applications in such units.

In typical heating furnace constructions, vertical support members rise above the furnace floor and horizontal support members extend across these vertical members. Skid rails comprising upstanding means on the horizontal members are conventionally provided, and the work to be heated rests on these skid rails.

The above described constructions are employed for furnaces of the under-fired type. Since the heating means in such furnaces are located at a level below the work, the support members are subjected to temperatures which are usually more severe than the temperatures to which the work is heated. Since the high heat to which the support members are subjected would greatly weaken these members, means must be provided for maintaining the members at a lower temperature to avoid collapse within the furnace. Cooling of the members is accomplished by forming the members with hollow pipe, and by circulating cooling liquid, such as water, through the members in the course of the furnace operation. In addition, insulating means are provided around the members to keep the exterior surface of the members at safe temperatures.

The insulating means conventionally provided for such members are characterized by certain drawbacks. In many cases, the insulating means is formed of plastic refractory material which must be shaped around the support members. This operation has been found to be time consuming and expensive. In addition, great difficulties are encountered when deterioration of the refractory occurs and replacement becomes necessary.

Certain refractory coverings have been designed which comprise blocks adapted to be associated around the furnace support members. Such blocks have been found to be unsatisfactory since assembly and replacement operations are difficult. Furthermore, it has been found that the use of such blocks is ineffective in many cases to maintain the temperature of the support members at a desired low level.

It is an object of this invention to provide improved insulating means for furnace constructions which can be economically manufactured, and which can be employed in a relatively simple fashion.

It is a more particular object of this invention to provide insulating means comprising a unique combination and characterized by a unique design which can be associated with furnace support members in a relatively simple fashion, and which can be replaced without undue difficulty.

It is a further particular object of this invention to provide insulating means for furnace constructions which are capable of maintaining relatively low temperatures in the support members whereby weakening of these members in the course of a furnace operation can be readily eliminated.

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These and other objects of this invention will appear hereinafter and, for purposes of illustration but not of limitation, specific embodiments of the invention are shown in the accompanying drawings in which:

FIGURE 1 is a fragmentary perspective view of a typical furnace construction adapted to be modified in accordance with the techniques of this invention;

FIGURE 2 is a fragmentary elevational view, partly in section, illustrating a support member provided with the insulating means of this invention;

FIGURE 3 is a cross-sectional view taken about the line 3—3 of FIGURE 2;

FIGURE 4 is a cross-sectional view of a horizontal support member which has been modified to provide for the use of the insulating means of this invention;

FIGURE 5 is a cross-sectional view of a support member having the insulating means in place;

FIGURE 6 is a cross-sectional view of an alternative form of the invention;

FIGURE 7 is a perspective view of one form of refractory block used in accordance with this invention; and,

FIGURE 8 is a perspective view of an alternative form of a refractory block.

The construction of this invention generally comprises a combination of materials for use on the supports within the furnace. Specifically, the present invention contemplates the provision of a layer of insulating material directly in contact with the outer surface of the supports to be protected. Blocks of refractory material are then disposed outwardly of the insulating material and this refractory material is exposed to the heat of the furnace.

In accordance with this invention, the insulating layer is provided by wrapping sheets of fibrous material around the furnace supports whereby a plurality of thicknesses of this material is provided. The fibrous material may be in the form of a continuous sheet which is wrapped a plurality of times to form the desired thickness. If desired, sections of such material may be combined to achieve the same results.

Since the furnace supports are ordinarily tubular and have a circular cross-section, the refractory blocks are manufactured to define segments of a circular configuration. Means are provided on the supports for receiving the blocks one at a time whereby the combined segments will substantially completely encircle the insulating material covering the supports. A plastic refractory is packed into any openings defined between adjacent segments of refractory material.

The concepts of this invention are most advantageously applied to the horizontal supports of a furnace, which supports define upstanding rail portions for carrying the work to be heated in the furnace. The improvements of this invention, to be hereinafter more specifically described, provide protection for the supports in a manner such that the major portion of the support area is protected while the rail portions remain exposed for carrying the work. The designs, to be hereinafter described, are such that the rail portions do not interfere with assembly and replacement of the members in the combination forming the support protection.

FIGURE 1 of the accompanying drawings illustrates a furnace construction which comprises a bottom wall 10 and a side wall 12. Horizontal support members 14 define upstanding rails 16 which serve as the supports for the work 18. These horizontal members are in turn supported by additional horizontal members 20 and vertical members 22. All of the members are of a hollow configuration whereby cooling fluid, such as water, can be supplied to the members through pipes 24 and circulated during operation of the furnace. It will be understood

that the particular arrangement of the support members described herein is not a limiting factor of the invention. Furthermore, the concepts of this invention can be applied to any of the support members which would be advantageously modified by this invention. Finally, it will be noted that the invention is particularly concerned with furnaces of the under-fired type; however, the concepts of this invention will be suggested for use in other applications.

FIGURES 2 through 5 illustrate the combination of this invention which serves to protect the support members. This combination includes a layer or layers of fibrous insulating material 26. As previously noted, this material is preferably provided by wrapping one or more sheets of the material around the tubular support to provide the desired thickness.

Refractory blocks 28 are located around the layer of fibrous material. Each of these blocks defines a segment of a circular configuration. The blocks are applied to the support with the use of guide tracks 30 connected to the outer surface of the member 14. These tracks 30 are annular members which include rims 32 adapted to be received by recesses 34 defined at each end of the blocks 28. In assembling the blocks 28, the blocks are adapted to slide along the track, one at a time, to eventually cover substantially the whole outer surface defined by the insulating material 26. The track 30 is not formed completely around the support member 14 so that an upper opening is defined for facilitating placement of the refractory blocks onto the track.

Each of the refractory blocks defines a tongue 36 on one side and a corresponding groove 38 on the other. This configuration of the blocks prevents loss of the block from around the support in the event that the ends thereof should be freed from the track 32. This could happen in the event of a fracture at one of the ends. Accordingly, the design illustrated provides dual means for maintaining the blocks in position.

In the use of the construction illustrated in FIGURES 2 through 5 and 7, sheets of fibrous material are placed over the supports to provide several thicknesses thereof, the refractory blocks are then moved into place by sliding the blocks over the tracks 32. When the last block is in place, a plastic refractory material 40 is packed between the rail 16 and the respective ends of the blocks. Such refractory material can also be utilized for filling spaces between other adjacent blocks.

FIGURES 6 and 8 illustrate a modified form of the invention. In this case, the support 14 includes outwardly extending mounting means 42 which may be located in spaced relationship along the length of the tubular member. A fibrous layer 44 is associated with the tubular member and refractory blocks 46 are adapted to be placed over this layer for direct exposure to the heat of the furnace. These refractory blocks define recessed portions 48 in each of their lateral walls. When the blocks have been put in place between the members 42, pins 50 are then bent over into the recesses 48 to secure the blocks 46 in place. The pins 50 may be initially associated with the mounting means 42 or they may be welded in place after the blocks have been positioned. Plastic refractory material 52 can be used to fill up the openings between adjacent blocks while plastic refractory material 54 is utilized for filling the space between the rail 16 and the respective ends of the blocks 46.

It will be apparent that the constructions described provide relatively simple and reliable combinations for protecting support members in a heating furnace. In both cases, the fibrous material can be readily applied around the support members. Such fibrous material is readily available, and an adhesive or binder material can be employed to temporarily hold the fibrous material in place while the refractory blocks are located in position. As explained above, the positioning of the refractory blocks is straight forward and, in all cases, the means holding the blocks in place are of a reliable character.

Furthermore, the blocks are easily removable for replacement.

In addition to the advantages concerning assembly of the described construction, the instant invention has been found to provide clear improvements in performance. In this connection, the described assemblies are characterized by durability so that replacement is not a frequent occurrence. Furthermore, the materials which are utilized are not unduly expensive and, therefore, the illustrated construction is competitive from an initial cost standpoint.

The most important feature of the instant invention concerns the ability of the combination to provide greatly improved protection for the support members. Thus, the combination of the insulating material and the refractory blocks provides a means for keeping the temperature of the support members at a desired low level. The temperature in many furnaces has been such that the outer surface of the refractory blocks reaches a temperature in the order of 2450° F. In the case of the instant invention, the refractory blocks may reach similar temperatures throughout its thickness; however, the layer of insulating material maintains the temperature at the surface of the support members at a substantially lower level. Where refractory material alone is used for protection, it is much more difficult to maintain the desired low temperature level in the support members.

The combination described also contributes to the life of the refractory material. In instances where refractory material alone has been employed, the inner surface of the refractory material, which is directly in contact with the water cooled support members, is generally at a substantially lower temperature than the outer surface of the refractory material. The extreme temperature gradient sets up stresses in the refractory material which lead to cracking and correspondingly shorter life for such material. Problems of this nature have been substantially eliminated where the combination of this invention is employed.

Various fibrous insulating materials are contemplated for use in accordance with this invention. Ceramic fiber materials of the type known as Kaowool, manufactured by the Babcock-Wilcox Company; and Fibrefrax, manufactured by Carborundum; are examples of suitable insulating materials. Firebrick, high alumina refractory, and the so-called "super" refractory materials are cited as suitable materials for the refractory blocks.

It will be understood that many changes and modifications can be made in the above described systems which provide the characteristics of this invention without departing from the spirit thereof, particularly as defined in the following claims.

That which is claimed is:

1. In a furnace construction for use in the heating of metal stock wherein supports are provided upon which said stock is adapted to rest, said supports comprising tubular members whereby coolant can be passed therethrough and wherein said members include vertical and horizontal members with the horizontal members being provided with upstanding rail portions which define the bed of the furnace for supporting the stock to be heated, the improvement in means for protecting said supports from the heat of the furnace comprising a layer of insulating material disposed immediately over the outer surface of said supports, and a plurality of blocks of refractory material overlying said layer of insulating material whereby the refractory material is directly exposed to the heat of the furnace, said insulating material and said refractory blocks extending around said horizontal support members into close fitting relationship with the opposite sides of said rail portions while the upper surface of said rail portions remain exposed for contact with said stock, and wherein said insulating layer comprises sheets of fibrous material disposed in a plurality of thicknesses over said supports, said blocks each comprising segments of a generally circular configuration, and including annular guide track means, said track means defining laterally ex-

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tending flanges and being rigidly attached to said members at spaced apart intervals thereon, each of said guide tracks extending partially around said members, and recesses defined by said blocks adapted to receive said laterally extending flanges whereby said blocks can be held in place on said members.

2. A construction in accordance with claim 1 wherein a plurality of blocks are arranged in side-by-side relationship between said guide track means and including tongue and groove means defined by the opposed lateral walls of adjacent blocks disposed on said members to assist in holding said blocks on said members.

3. A construction in accordance with claim 1 wherein said recesses are formed in each end of said blocks and wherein said flanges comprise annular flange portions adapted to be received in said recesses to facilitate sliding of each block into place over said tracks.

4. In a furnace construction for use in the heating of metal stock wherein supports are provided upon which said stock is adapted to rest, the improvement in means for protecting said supports from the heat of the furnace comprising a layer of insulating material disposed immediately over the outer surface of said supports, and a plurality of blocks of refractory material overlying said layer of insulating material whereby the refractory material is directly exposed to the heat of the furnace, said insulating layer comprising a length of fibrous material wrapped around said supports to provide a plurality of thicknesses, said refractory blocks defining segments of a generally circular configuration, and including means on said supports for removably receiving said segments whereby they can be arranged around said supports and removed therefrom, said last mentioned means including annular guide track means, said track means defining laterally extending flanges and being rigidly attached to said members at spaced apart intervals thereon, each of said guide tracks extending partially around said members, and recesses defined by said blocks adapted to receive said laterally extending flanges whereby said blocks can be held in place on said members.

5. In a furnace construction for use in the heating of metal stock wherein supports are provided upon which said stock is adapted to rest, said supports comprising tubular members whereby coolant can be passed there-

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through and wherein said members include vertical and horizontal members with the horizontal members being provided with upstanding rail portions which define the bed of the furnace for supporting the stock to be heated, the improvement in means for protecting said supports from the heat of the furnace comprising a layer of insulating material disposed immediately over the outer surface of said supports, and a plurality of blocks of refractory material overlying said layer of insulating material whereby the refractory material is directly exposed to the heat of the furnace, said insulating material and said refractory blocks extending around said horizontal support members into close fitting relationship with the opposite sides of said rail portions while the upper surface of said rail portions remain exposed for contact with said stock, and wherein said insulating layer comprises sheets of fibrous material disposed in a plurality of thicknesses over said supports, said blocks each comprising segments of a generally circular configuration, each of said blocks including recessed side walls defining shoulders located inwardly with respect to the outer surfaces of the blocks, said blocks being aligned on said supports with said side walls being located in side-by-side relationship to thereby locate the shoulders of adjacent blocks in opposed relationship, mounting means for said blocks attached to said supports and extending outwardly through said layer between said side walls, and including pin means associated with said mounting means, said pin means being bent over onto said shoulders to secure said blocks in position.

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