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SUPPORTING MEANS FOR FURNACE CHARGES

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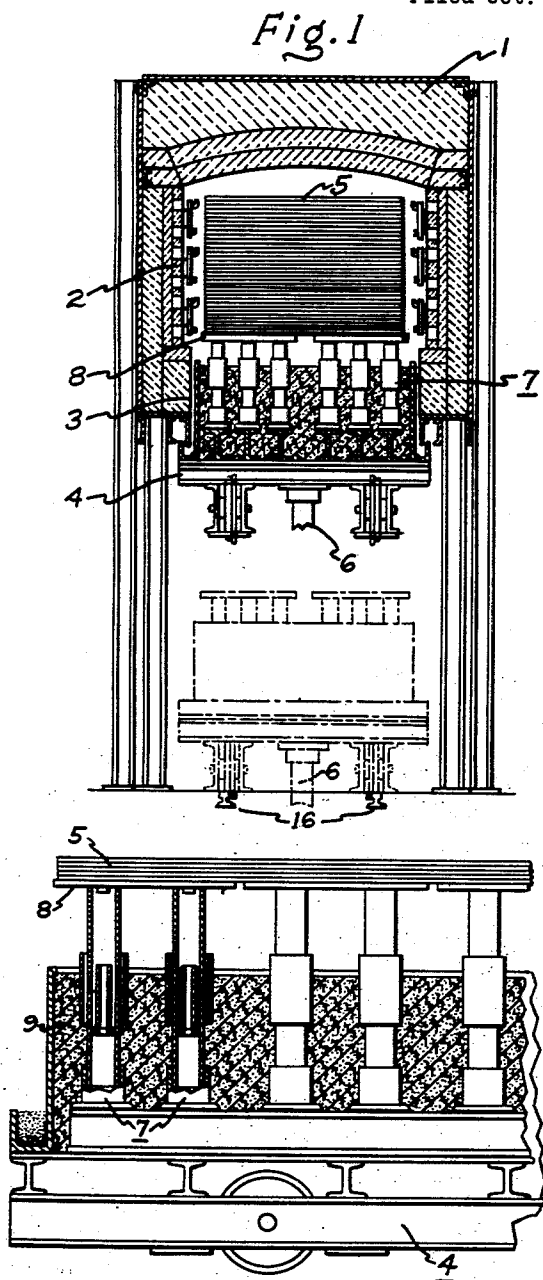


Fig. 2

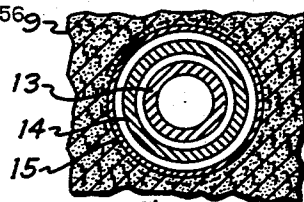


Fig. 4

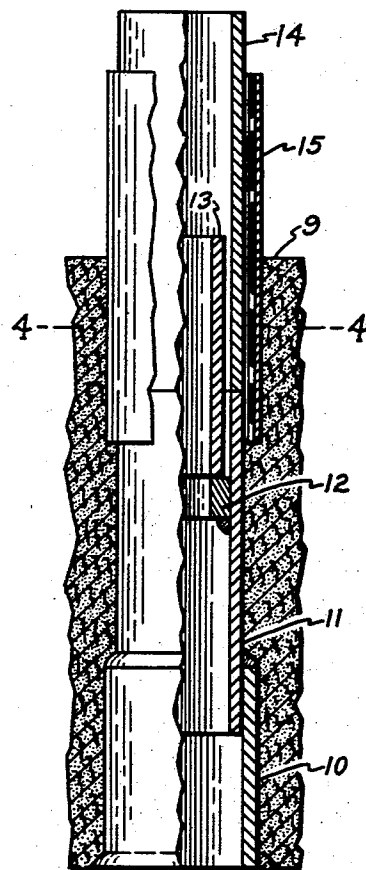


Fig. 3

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SUPPORTING MEANS FOR FURNACE CHARGES

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1 Claim. (Cl. 263—47)

The present invention relates to supporting apparatus, and more particularly to apparatus for supporting material while being heated in an annealing furnace or the like. The invention has particular application to large furnaces of the type having a hearth or floor mounted on a movable support such as a car which is arranged to carry a large quantity of material such as stacks or coils of steel sheets and adapted to be moved or lifted into and withdrawn from the furnace.

Furnace cars of the above type are shown and described in U.S. Patent 1,963,846, Ipsen et al. As there illustrated, the furnace car is provided with spaced support columns secured to the car floor and having hearth plates on their upper ends on which the charge of stacked sheets is supported while being heated.

Support structures of this type are subject to certain drawbacks. Due to the elevated furnace temperatures to which the apparatus is subjected, the hearth plates which bridge the supporting columns expand a substantial amount and cause the upper portion of the support posts to deflect laterally. The weight of the load itself aggravates such deflection when the posts have become bent beyond a certain point. As a result, the posts soon become deformed to an extent where they will no longer uniformly support the loads or will allow dangerous tilting of the stacked sheets. It then becomes necessary to remove the insulating material usually provided on the car between the posts, unbolt the posts at their base or burn them off if welded, re-secure the new posts to the car floor, and replace the insulation material. Such operations, particularly in view of the large number of posts involved, require considerable time, labor and expense and further loss is occasioned in the shutdown of the furnace while the car is being repaired.

It is an object of the present invention to provide an improved furnace charge supporting device of the above type which overcomes the disadvantage of the known supporting apparatus.

It is another object of the invention to provide an improved supporting post structure for support apparatus of the above type which has longer operational life under elevated furnace temperature and considerably facilitates repair or renewal of the supporting posts.

In accordance with the invention, there is provided a supporting device for furnace charges which comprise the combination of a supporting base, and a plurality of composite posts mounted on the supporting base and adapted to carry material to be heated in a furnace, each composite post comprising a lower post portion secured to the supporting base and an upper post portion on which the material to be heated is adapted to be carried, the upper post portion being removably mounted on the lower post portion. Normally, a hearth floor comprising one or more metal plates bridging the tops of the upper post portions is provided for carrying the charge load. Preferably, the upper post portions are of tubular form and are rotatable on the lower post portions so that after the upper post portions have undergone ap-

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preciable lateral deflection or deformation due to the expansion of the heated metal material or hearth plates resting thereon, they may be rotated to compensate for further deflection caused by continued use in the furnace. It is preferred, in accordance with the invention to provide a tubular insert member projecting upwardly from the lower post portion on which the upper post portion is positioned.

The invention will be better understood from the following description taken in conjunction with the accompanying drawing, in which:

Fig. 1 is an elevational view of a furnace provided with a furnace car embodying the present invention;

Fig. 2 is a fragmentary view in elevation of the side of the furnace car;

Fig. 3 is a sectional view in elevation of the post of the present invention showing constructional details; and

Fig. 4 is a cross-section of the post shown in Fig. 3 taken along the line 4—4.

Referring now to the drawing, and particularly to Fig. 1, there is shown an elevator-type annealing furnace 1 having heating units 2 along its walls and an opening 3 at the bottom through which the furnace car 4 may pass when raised vertically to position the load 5 of steel strips or the like within the furnace interior. The charge 5 of metal strips rests upon hearth plates 8 supported on posts 7, and when car 4 is raised into operative position, hearth plates 8 serve as the floor of the furnace. A suitable elevator mechanism 6 may be used for raising and lowering car 4, which in the lowered position is adapted to run on tracks 16. It will be understood, however, that types of furnaces and supporting platforms other than those shown may suitably embody the support post device of the present invention.

Fig. 2 shows in greater detail the arrangement of support posts 7 on car 4, with the posts 7 carrying one or more hearth plates 8 on which rest the stacked sheets of steel 5. As many as 60 support posts 7 may be mounted on the car uniformly spaced from each other and with the weight of load 5 distributed over them as uniformly as possible. Hearth plates 8 may be of such length as to bridge two or more posts on the car, and form a flat supporting surface for suitably distributing the weight of the charge on the posts. Suitable heat-insulating material 9 such as finely divided diatomaceous earth, fire brick, or the like preferably is placed on the car bed to fill the spaces between posts 7 to a substantial level, normally as high as the car walls to protect the lower portions of the posts and the car floor from the intense heat of the furnace and in order to avoid absorption of the furnace heat by these parts.

Due to the extremely elevated temperature (e.g., 1100° C.) to which the charge 5, hearth plates 8, and the upper portions of posts 7 are subjected in the furnace, considerable difficulty has resulted in the past from the lateral deflection or deformation of the support posts of the type heretofore used, principally caused by the thermal expansion of the hearth plates 8. This deformation was aggravated by the heavy load imposed on the posts and the extreme heat which tended to weaken the posts.

The improved structure of support posts 7 in accordance with the invention as shown in detail in Figs. 3 and 4 has overcome the foregoing difficulty to a remarkable degree. As shown in Fig. 3, a preferred construction comprises a tubular base 10 of heavy steel which may be welded to or otherwise firmly secured to the car bed or other supporting platform. Inserted into and welded on base 10 is a post member 11 which extends upwardly from base 10 and together therewith constitutes the lower, fixed portion of the present composite post device. Member 11 is preferably composed of a

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high temperature resistant nickel-chrome alloy steel of known composition. While two members 10 and 11 are shown as jointly constituting the fixed post portion it is obvious that a single tubular member of suitable material could be used instead, if desired.

On the inner surface of member 11 intermediate its ends there is secured by welding or otherwise an annular ledge member 12, on which a tubular insert member 13 rests freely with a substantial portion of its length projecting upwardly beyond the top of member 11.

Upper post member 14, also preferably composed of high-temperature alloy material, is located directly over and in abutting relation with the lower member 11 and impaled over the projecting portion of insert member 13. As shown, lower and upper post members 11 and 14 are of about the same wall thickness and diameter, whereas tubular insert member 13 has an outside diameter somewhat less than the inside diameters of members 11 and 14 so as to provide appreciable clearance between itself and the post members. Normally, the clearance between members 11, 14 and insert member 13 is less than the wall thickness of the post members.

While a preferred arrangement of the post components is illustrated in the drawing, it will be understood that arrangements other than that shown could be used if desired and would come within the scope of the invention. For example, the insert member 13 could be long enough to rest on the car bed, rather than being mounted on the lower member 11 as shown, or it may form an integral part of member 11, rather than being separably mounted thereon. Further, the upper and lower post members could be of different diameters and have flange means or the like at their adjacent ends to provide a suitable supporting surface therebetween.

Though not essential to the present invention, the described post assembly may be supplemented with an outer sleeve 15 which is arranged covering the joint between upper and lower post members in order to prevent the particulated heat insulating material 9 surrounding the post units from gaining access through the joint to the spaces between the post parts and thereby hindering movement therebetween. The insulating material 9 may also be placed within the hollow post units, so long as care is taken to avoid the presence of the insulating material in the space between insert member 13 and the members 11, 14.

The clearance between upper post member 14 and insert member 13 permits lateral movement of member 14 in response to the thermal expansion of the loaded hearth plate 8 resting on top of member 14, and such limited shifting thus compensates for part of the thermal expansion of hearth plate 8 before it causes deflection or deformation of any part of the post structure. Once deformation of the upper post member begins, as observed after the annealing treatment, it is necessary only in accordance with the invention, to rotate upper post member 14 through an angle of 180° about its axis before the next furnace treatment. By such rotation, member 14 is in a position whereby the hearth plate expansion forces tend to return it to its former vertical position. With the post deflection thus cancelled out, the posts need be replaced only because of deterioration by aging and not because of deformation, which normally

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occurs much sooner than deterioration. Furthermore, by virtue of the present invention, when the posts are no longer suitable for the annealing process, only the upper members need be removed and replaced by new ones. The same procedure may be employed with insert member 13 if this needs replacement, since this member likewise is freely removable from the post assembly. In this way, a complete car of 60 posts may be provided with a new set of load supports in a matter of minutes, as contrasted with the weeks formerly required to remove and replace the integral type posts. It will be apparent, therefore, that considerable economy in time, materials and labor are made possible by the present invention.

While the present invention has been described with reference to particular embodiments thereof, it will be understood that numerous modifications may be made by those skilled in the art without actually departing from the scope of the invention. Therefore, the appended claim is intended to cover all such equivalent variations as come within the true spirit and scope of the invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

A supporting device for furnace charges comprising, in combination, a supporting base, a plurality of composite posts mounted on said supporting base and adapted to support material to be heated in a furnace, each said composite post comprising a lower tubular post portion fixedly secured to said supporting base, a cylindrical insert member mounted within said lower tubular post portion and projecting upwardly therefrom, an upper tubular post portion having a thickness about the same as that of said lower post portion separably and rotatably mounted in abutting relation on said lower post portion and impaled on said cylindrical insert member, the clearance between said insert member and said post portions being less than the thickness of said post portions, the top of said upper post portion being above said insert member, particulated heat insulating material on said supporting base occupying the space between said composite posts to a predetermined level above said lower post portion, the separation of said upper and lower post portions being substantially closer to said predetermined level than to the supporting base, an outer tubular member arranged about each composite post covering the abutting joint of said upper and lower post portions, said upper post portion being readily upwardly removable away from said lower post portion and out of said outer tubular member and said heat insulating material and metal plate means resting on and extending across the top of said upper post portions and forming thereon a supporting surface bridging the tops of said composite posts.

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