Jan. 26, 1932. E. D. FLINTERMANN 1,842,981

HEAT TREATING FURNACE AND THE LIKE

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Fig. 1.

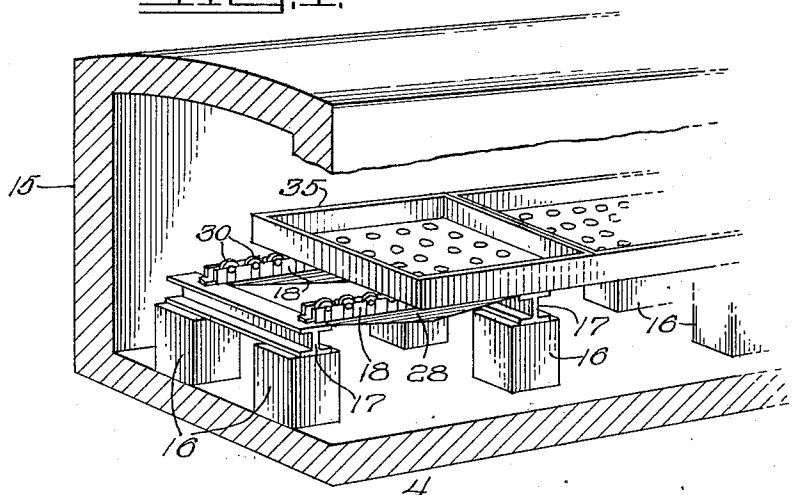
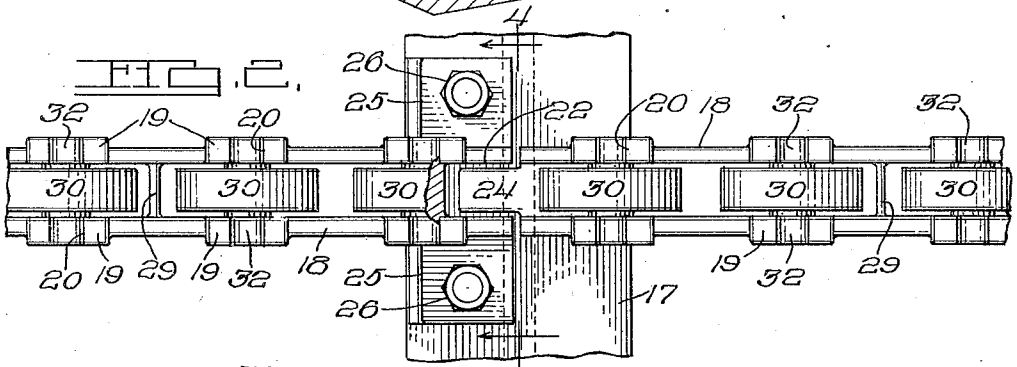


Fig. 2.



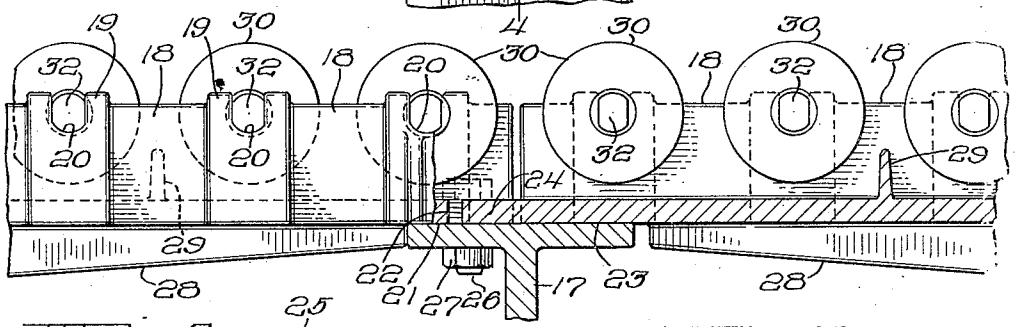


Fig. 4.

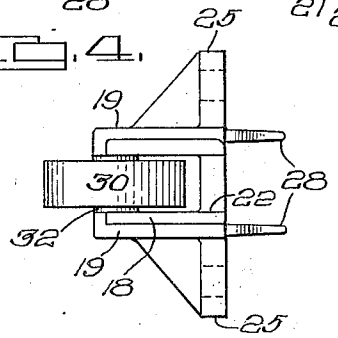


Fig. 3.

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FIG. 5.

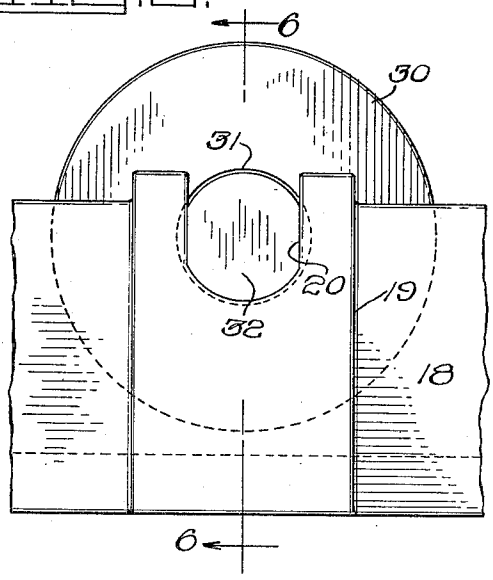


FIG. 6.

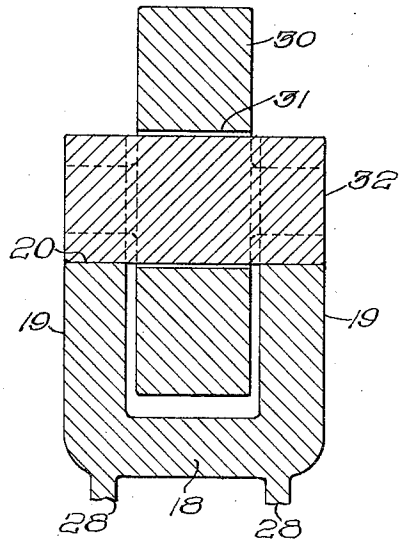


FIG. 7.

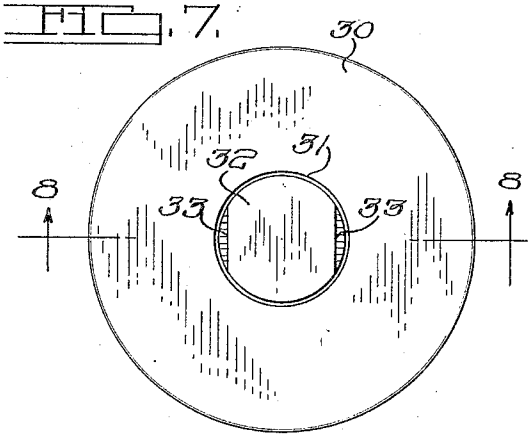


FIG. 8.

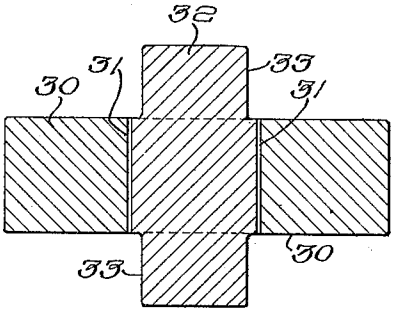
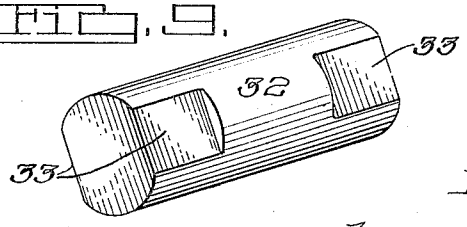


FIG. 9.



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UNITED STATES PATENT OFFICE

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HEAT TREATING FURNACE AND THE LIKE

Application filed June 20, 1929. Serial No. 372,285.

This invention relates to heat treating or like furnaces, and particularly to such furnaces as are provided with means for continuously passing the articles to be treated thereby through its length, the principal object being the provision of an improved mechanism for supporting the articles in their travel through the furnace.

In furnaces of this type, what is known as "rails" are provided extending along the length of the furnace, and which are adapted to slidably support, directly or indirectly, the articles which are to be treated in the furnace, and which may be supported directly on the rails or be positioned in pans or other containers which in themselves are supported and moved on the rails through the furnace. Such rails are usually made in relatively short lengths and suitably joined together to form a continuous rail structure throughout the length of the furnace. Because of the extremely high heats which such rails are subjected to, they must be made of a special type of steel alloy, and because of the wide range of temperatures to which they are liable to be subjected, I have found it preferable to provide means to compensate for the variation in length of the rails due to contraction and expansion.

One of the objects of the present invention is to provide a rail construction which will permit the expansion and contraction of the various rail sections without interfering with the proper function of the rail structure, and in which contraction and expansion will not subject the rails to undue stresses.

It is customary to provide the so-called rails with rollers which project above their upper face and upon which the pans or containers are adapted to rest, so that less effort will be required to move such pans or containers through the furnace. In the constructions heretofore employed, the construction of these rails has been such that the scale which is liable to be formed on the articles being treated in the furnace may come in contact with their bearing faces and seriously interfere with the proper operation thereof. It is another object of the present invention to provide novel means comprising U-section truss members and non-rotary axles, for supporting such rollers on the rails,—whereby the bearing surfaces of said rollers are protected from scale or other foreign matter that may be present in the furnace.

The above being among the objects of the present invention, the same consists in certain features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawings, and then claimed, having the above and other objects in view.

In the accompanying drawings which show a suitable embodiment of the present invention, and in which like numerals refer to like parts throughout the several different views;

Fig. 1 is a more or less diagrammatic fragmentary perspective view of a furnace of the type described.

Fig. 2 is a fragmentary plan view of a pair of cooperating rail sections.

Fig. 3 is a partially broken side view of the structure shown in Fig. 1.

Fig. 4 is an end view of one of the rail sections, taken as on the line 4—4 of Fig. 2.

Fig. 5 is an enlarged fragmentary side view of one of the rail or truss members showing the roller supported thereby.

Fig. 6 is a vertical sectional view taken on the line 6—6 of Fig. 5.

Fig. 7 is a side view of one of the rollers and its cooperating axle member.

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 7.

Fig. 9 is a perspective view of one of the roller axle members.

In furnaces of this type, it is conventional practice to support the rail sections either directly upon the surface of the hearth or to support the rails at their ends only by cross bars which are supported from the lower wall of the furnace by pedestals or the like. This last type of construction is shown in the drawings as a preferable form of construction.

Referring to Fig. 1, I show a furnace whose walls are indicated generally as 15. A plurality of pedestals 16 are provided on the bottom wall of the furnace and extend

upwardly therefrom. Extending transversely of the furnace and supported by each pair of pedestals 16 are spaced supports in the form of cross bars 17 between which the rail sections are supported at their ends. Each rail section, in accordance with the present invention, is formed of or as a truss having a body portion 18 of generally U-shaped section which opens upwardly. At spaced intervals along substantially vertical side flanges 18, opposed boss-like pads 19 are formed and the pads 19 are each provided with a groove or notch 20 opening upwardly therein, it being understood that the grooves 20 in each opposed pair of pads 19 are in transverse alignment with each other. The purpose of these grooves 20 will be presently described.

Each of the rails or truss sections is shown as provided at one end with a flat bottom surface 21 (see Fig. 3) which is adapted to seat upon the upper surface of the corresponding cross bars 17 and this end of each member is provided with a longitudinally extending central recess or groove 22 in a bottom web which unites the flanges 18. The opposite end of each member is provided with a corresponding flat bottom surface 23 which is adapted to rest upon the top face of the corresponding cross member 17, and this end of each member is provided with a tongue 24 which is adapted to be received in the groove or recess 22 of the next adjacent rail section and be guided against lateral movement therein. The mentioned web, including surfaces 21 and tongue 24, is shown as straight; and sufficient clearance is provided between the tongue 24 and the groove or flanges defining recess 22 to permit free longitudinal movement of the tongue in the recess. One end, and preferably the recessed end of each of the truss members may be provided with a pair of laterally extending flanges 25 whose bottom surfaces are flush with the bottom surface 21 and through which bolts 26 may be extended downwardly through the upper flange of the cross member 17, and these both may there be provided with nuts such as 27 and serve to secure this end of each of the rail sections to the cross members and lock this end of the rail sections against longitudinal movement. The opposite or tongued ends of the respective rail or truss sections are not bolted down or otherwise secured to the cross members 17 in any manner whatsoever, their position being controlled by the reception of the tongues 24 in the recesses 22. Ample end clearance between the adjacent transverse surfaces of the adjacent rail section ends is initially provided to permit any amount of expansion of the rail sections that will occur in service without bringing such transverse faces into contacting relationship such as would set up a strain longitudinally of the rails. This is a material advantage over constructions heretofore proposed in that in the heretofore construction each rail section has been rigidly tied longitudinally to the adjacent rail section at each end so that the expansive and contractive forces set up on one rail section have been transmitted to all of the rest of the rail sections, with the obvious attendant disadvantages.

Where these one-piece trusses or rail sections are to be supported at their ends only, as shown in the drawings, I prefer to provide one or more downwardly extending triangular strengthening ribs or longitudinal webs, such as 28, on the lower surface, these being shown as disposed below flanges 18 and as increasing in depth from the ends to the middle. I also prefer to provide a plurality of relatively small transverse ribs such as 29 between the sides of the main body portion, and within the channel thereof, to further strengthen the construction.

In these types of constructions as previously provided, the rollers were generally formed with integral axle portions which were rotatably received within grooves in the main body portion corresponding with the grooves 20 previously referred to. The result of such construction was that the bearing surface of the axle portions of the roller were continuously exposed at the upper side of the grooves 20, and any foreign matter that was present in the furnace was free to find its way into contact with such bearing surfaces. Furthermore, with some types of metal which is treated in such furnaces, a scale of ferric or other oxide often forms on the surface of such material, and when the material is slightly cooled, such scale cracks off from the surface of the material and is often thrown about the interior of the furnace. This scale, together with other foreign matter, soon clogs the bearing surfaces of the roller axles to such an amount as to often-times make the rollers inoperative. The construction herein provided serves to protect such bearing surfaces and prevents such clogging of the same with foreign matter. I do this by making the axle of the rollers separate from the rollers themselves and securing the axle members against rotation in the rail sections, and permitting the rollers to turn on the axles. In this manner the surfaces of the axles which are exposed to scale or other foreign matter are stationary while the roller itself covers and protects the bearing surfaces of the axle members upon which the rollers rotate.

The rollers themselves are preferably formed merely as one-piece discs such as 30 having central apertures 31, and they are, as illustrated in Fig. 6, of slightly less thickness than the width of the channel in the main body portion, between flanges 18. The axle members 32 are preferably of a diameter less than the openings 31 so as to provide ample clearance between the axle members

and the rollers 31. The axle members are preferably of substantially the same length as the outside width of the main body portion, as also indicated in Fig. 6. In the present construction, a portion of each axle member 32 projecting to either side of the rollers 30 is flattened off, as best indicated as at 33 in Fig. 9, on diametrically opposite sides of the actual member. The grooves or upwardly opening vertical slots 20 in which these ends are received, are flattened on their sides and are of such a width as to relatively closely receive the flattened ends of the axle members 32 therein. In this manner, the axle members are adapted to be merely dropped into position, and thereby locked against turning in the sockets, so that the rollers 30 are constrained to rotate upon the axle members. It will thus be apparent that either end of any axle may enter any socket in either of two positions, and that the bearing surfaces between the axle members 32 and the rollers 30 are at all times covered and protected by the roller itself. I find that by this construction all members of this rail organization being preferably united by a mere play-permitting interfitting of threadless smooth surfaced parts thereof, the rollers 30 and axle members 32 have considerably longer life and are more efficient during their life than the conventional constructions, and less effort is required to move the pans, such as 35 in Fig. 1, and which rest on the rollers 30, through the furnace after an appreciable period of use, as compared to the usual constructions.

On the other hand, when repairs or replacements are called for, any rail member or section may be directly and vertically removed from between like sections, without disturbing the latter; and any one-piece axle member may, in turn, be directly and laterally removed from a corresponding one-piece roller, upon a vertical withdrawal of the flattened ends of said axle member from the slots in the flanges of a one-piece rail member.

There is also another advantage in this construction, and that is that not only are the rollers and axle members more economical to produce in the first instance, the former having the character of a centrally apertured and flattened one-piece disc, but that from the service viewpoint if either the roller 30 or the axle 32 becomes worn to a point where replacement is necessary without the other being thus worn, one may be replaced independently of the other, and a great saving effected thereby. Furthermore, in conventional constructions where the rollers have integral axles, the wear takes place between the axle and the rail, so that it is quite common that such wear necessitates the replacement of the rail itself, a necessarily relatively expensive procedure. In the construction provided herein there is no possibility of such wear or necessity of replacement of the rail or truss sections for this reason; and the non-circular end portions are receivable, in either of two positions, in either of two opposite slots. This is an important item in the upkeep of this class of devices.

Although I have described the last-mentioned features of construction as a part of the described type of furnace construction, it will be apparent that it may be modified for use in connection with furnace constructions where the employment of side rails is not necessary or advisable, and its application to other constructions will be obvious to those skilled in the art.

Formal changes may be made in the specific embodiment of the invention described without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

What I claim is:

1. In a furnace structure, in combination, a rail organization comprising a plurality of truss members cooperating in end-to-end relationship and each including a bottom web, which is substantially straight throughout its length, and lateral flanges, said web terminating at one end short of said flanges and including a tongue at its other end and in the same plane therewith, adapted to so enter between the flanges of the adjacent truss member as to limit lateral play between such truss members, spaced means for supporting said truss members, means for securing one end of each of said truss members against movement relative to said supporting means, said tongues and flanges being shaped for slidably guiding the opposite end of each of said truss members in the adjacent section cooperating with said opposite end.

2. In a furnace structure, in combination, a plurality of rail sections adapted to be arranged in end-to-end relationship and each including a bottom web, which is substantially straight throughout its length, and lateral flanges, said web terminating at one end short of said flanges and including a tongue at its other end and in the same plane therewith, adapted to so enter between the flanges of the adjacent truss member as to limit lateral play between such truss members, supporting means at the ends of said sections, means for securing one end of each of said sections against movement relatively thereto, said tongues and flanges serving as a connection between the other end of each of said sections and the fastened end of the cooperating section permitting longitudinal movement of said other end relative to said fastened end while maintaining said other end against lateral movement.

3. In a furnace structure, in combination, a plurality of rail sections adapted to be supported in end-to-end relationship and each including a bottom web, which is substan-

tially straight throughout its length, and lateral flanges, said web terminating at one end short of said flanges and including a tongue at its other end and in the same plane therewith, adapted to so enter between the flanges of the adjacent truss member as to limit lateral play between such truss members, the same end of each of said sections being provided with means for securing the same against movement and said tongues and flanges serving as a longitudinally slidable connection between said secured end and the adjacent end of the adjacent section, said adjacent end being free to move longitudinally.

4. In a furnace structure, in combination, a pair of rail sections, means for securing but one end of each of said sections against longitudinal movement, and a tongue and groove connection, between said sections so formed as to permit each section to expand and to be directly replaced without disturbing any adjacent sections, while nevertheless limiting lateral movement between adjacent ends of said sections.

5. In a furnace structure, in combination, a plurality of rail sections arranged in end-to-end relationship, the same end of each of said sections being secured against movement and the opposite end of each of said sections being free to move longitudinally, and a tongue and groove connection between each of said secured ends and the cooperating free end of the adjacent section so framed as to permit each section to expand and to be directly replaced without disturbing any adjacent sections, while nevertheless limiting lateral movement between adjacent ends of said sections.

6. In a furnace structure, in combination, a plurality of rail sections arranged in end-to-end relationship, a flange at the same end of each of said sections for securing the corresponding ends of said sections against longitudinal movement, and a sliding connection between the flanged end of each of said sections and the adjacent end of the section cooperating with said flanged end so framed as to permit each section to expand and to be directly replaced without disturbing any adjacent sections, while nevertheless limiting lateral movement between adjacent ends of said sections.

7. A rail section for a heat treating furnace comprising a U-sectioned body comprising a straight bottom web provided with a securing flange at but one end thereof, a longitudinally disposed recess in said end, and a longitudinally disposed tongue at the opposite end of said section, said flange, said recess and said tongue being in the plane of said web and so formed as to permit each section to expand and to be directly replaced in a vertical direction, without disturbing any adjacent section, while nevertheless limiting lateral movement between adjacent ends of said sections.

8. As a structure within the interior of a heat treating furnace, a conveyor system comprising a channel rail, the upper edges and the sides of the rail having open, non-circular slots formed therein, axles disposed transversely of the rails and having their opposite ends disposed within the slots, an end of each axle and the corresponding slot being shaped positively to prevent rotation thereof in the slots, and single piece rollers rotatably mounted upon the axle.

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