

Nov. 26, 1935.

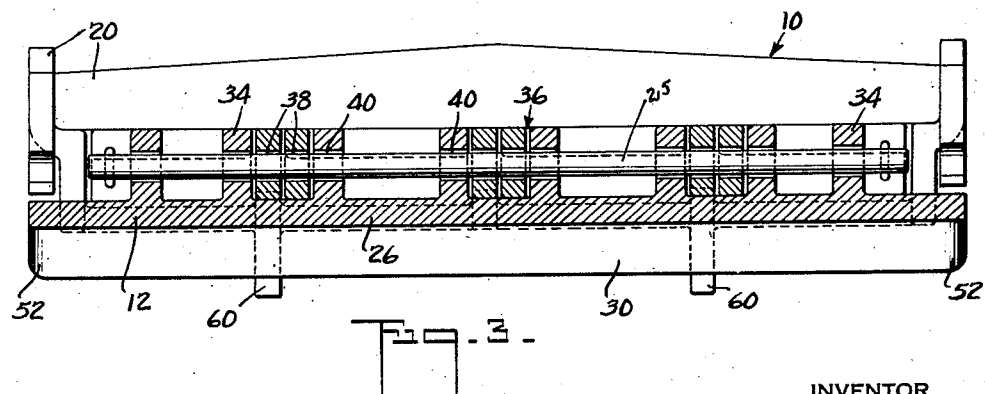
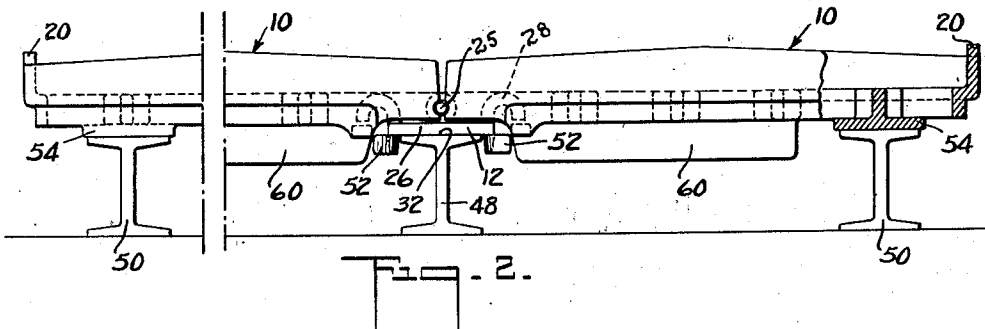
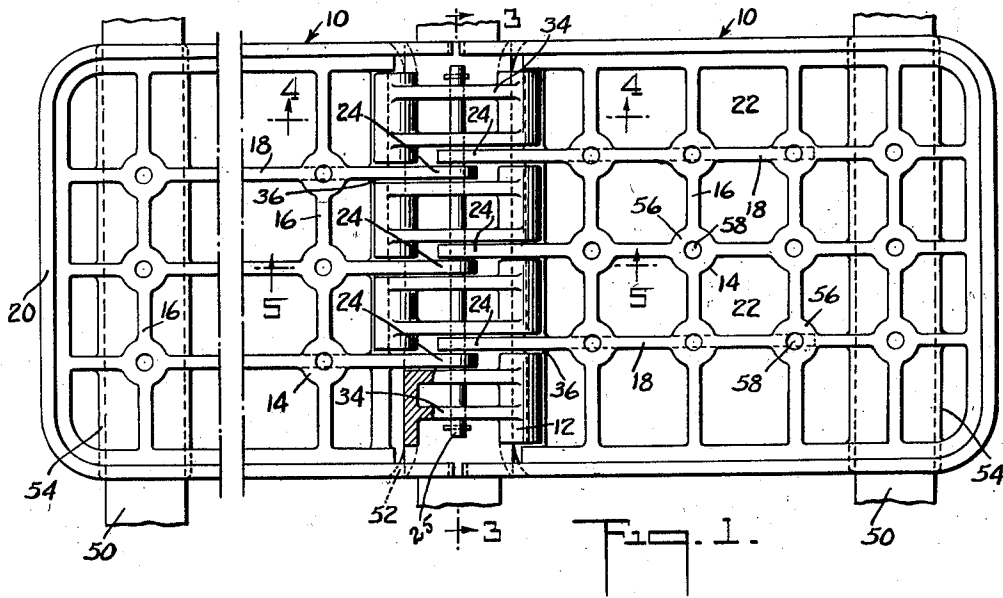
H. H. HARRIS

2,022,283

HEAT TREATING FURNACE TRAY

Filed July 28, 1934

3 Sheets-Sheet 1



INVENTOR
Henry H. Harris
BY
Byke and Schaines
ATTORNEYS

Nov. 26, 1935.

H. H. HARRIS

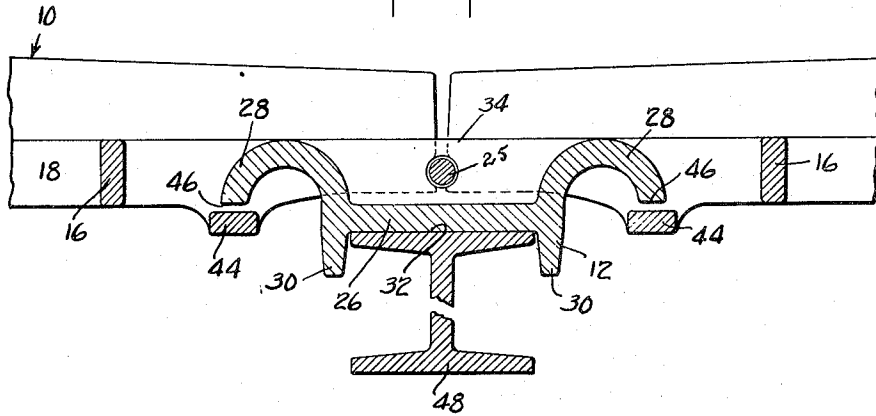
2,022,283

HEAT TREATING FURNACE TRAY

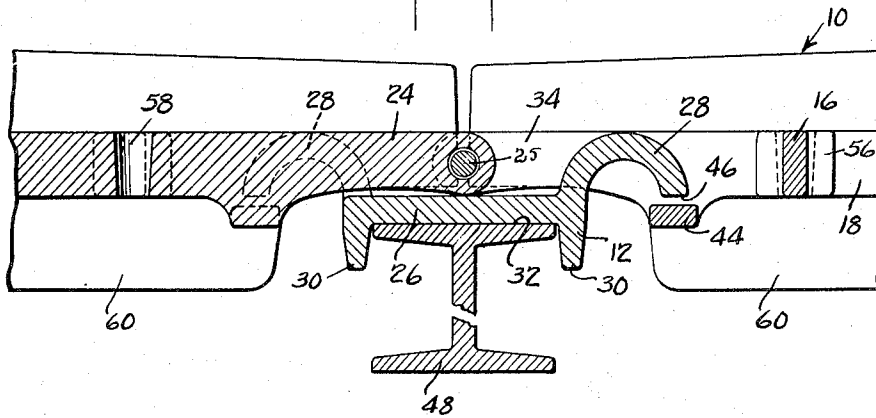
Filed July 28, 1934

3 Sheets-Sheet 2

Fig. 4.



T-9-5-



Nov. 26, 1935.

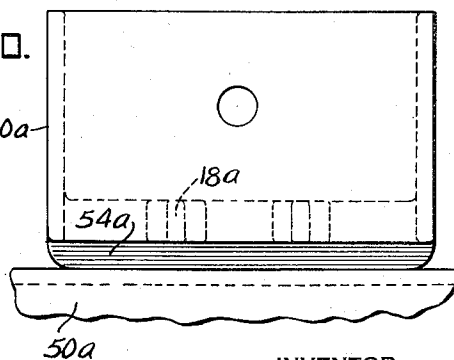
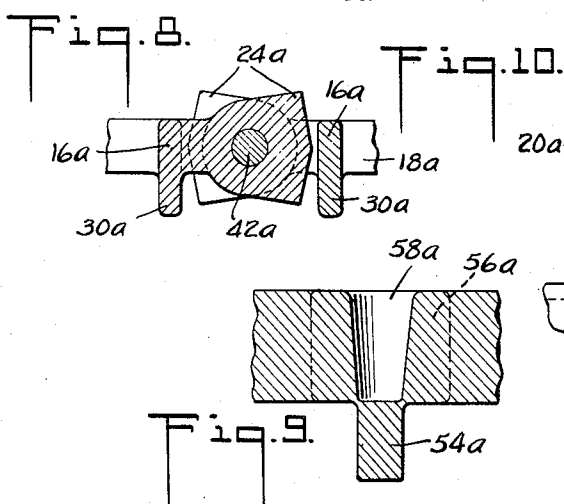
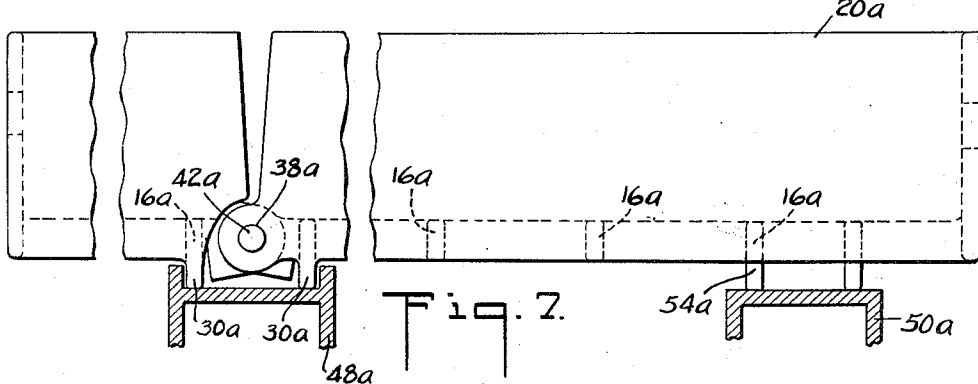
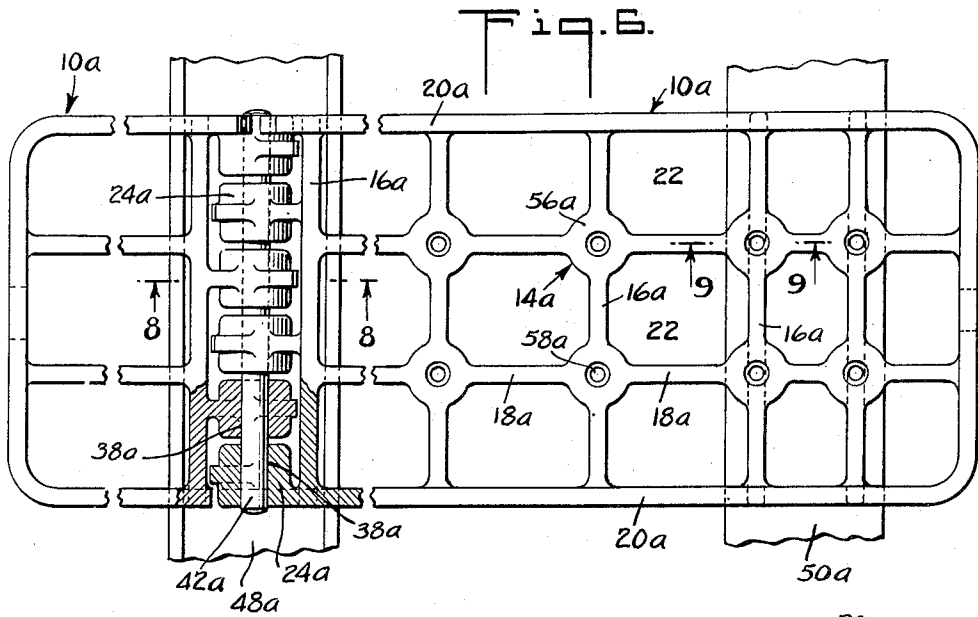
H. H. HARRIS

2,022,283

HEAT TREATING FURNACE TRAY

Filed July 28, 1934

3 Sheets-Sheet 3



INVENTOR
Henry H. Harris
BY
Dyke and Schaines
ATTORNEYS

UNITED STATES PATENT OFFICE

2,022,283

HEAT TREATING FURNACE TRAY

Henry H. Harris, Boston, Mass.

Application July 28, 1934, Serial No. 737,332

16 Claims. (Cl. 263—47)

My invention relates to heat treating furnaces such as carburizing and annealing furnaces, etc., and particularly trays or supports therein upon which articles being heat treated are disposed during passage through the furnace.

To obtain optimum results in the heat treatment of metals, ceramics, etc., it is necessary that every part or side of the article being treated be subjected to the furnace heat. Consequently, the practice is to make the supports—or trays, as same will hereinafter be called—of skeleton or open-work formation, and to support them and space them from the furnace floor by rails on which the trays are traveled, thus providing a free and uninterrupted flow of heated air around and about the articles disposed upon the tray.

Heretofore furnace work-carrying trays have been of rigid, one-piece construction, of length somewhat less than the width of the furnace through which they are to be passed, running on a plurality of rails, usually three in number, which extend the length of the furnace, and upon which the trays are mounted and guided during passage therethrough. The guide rails are constantly subjected to the heat conditions prevalent within the furnace and after some time will bulge, buckle and warp out of line. Because of this the rigid trays have needed to be heavy and strong and of girder-like construction. For example, if the middlemost of three rails bulges upwardly from the furnace floor, a light, weak tray will be warped and bowed downwardly at the ends, due to the lack of support for the tray and the weight of the tray and the articles carried on it and the effect of the extreme heat in the furnace. If one or both of the outside rails bulges upwardly, a weak tray, due to similar causes, will sag in the middle. In any event, when any of the rails change their relative position, the shape of the tray is affected, necessitating repairs and frequent replacements.

Even if the rails should not buckle or warp, the tray itself, due to the heat within the furnace and the weight of the articles placed thereupon, will warp out of shape, buckle, or sag. For these and other reasons the form of tray used heretofore cannot be used very long before it has to be discarded.

I have discovered that the effects of the heat within the furnace on the guide rails or rollers can be counteracted and overcome by the use of multiple section trays, and my invention provides for trays made of two or more sections hinged or pivotally secured together, the hinging

being preferably located so as to come over, or substantially over the middle rail in the case of a furnace with a three-rail track.

The main object of my invention is to provide a tray for use in and passage through heat treating furnaces whose efficiency will not be impaired or destroyed by the ordinary heat conditions which prevail within the furnaces.

A further object of my invention is to provide a multiple-section tray for use in heat treating furnaces.

A further object of my invention is to provide a device of the character described having connection between the various components which will allow free relative movement thereof to compensate for and overcome distortion of the components themselves and/or of the guide support rails.

Still another object is to provide multiple-point support for each section of a tray composed of more than one section.

Other objects of the invention, and the advantages to be obtained therefrom, will in part be apparent from the following description of certain embodiments thereof, and in part be pointed out hereinbelow.

In the annexed drawings forming a part of this application:

Fig. 1 is a plan view of one form of device constructed according to and embodying my said invention, comprising a three-section tray: two side sections and a middle shoe section, a portion of the shoe section being broken away;

Fig. 2 is a side elevation thereof, partly in section;

Fig. 3 is an enlarged section on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged section on the line 4—4 of Fig. 1;

Fig. 5 is an enlarged section on the line 5—5 of Fig. 1;

Fig. 6 is a plan view of another form of device constructed according to and embodying my said invention, comprising two side sections, with portions thereof broken away;

Fig. 7 is a side elevation of the modified form shown in Fig. 6;

Fig. 8 is an enlarged section on the line 8—8 of Fig. 6;

Fig. 9 is an enlarged section on the line 9—9 of Fig. 6; and

Fig. 10 is an end elevational view of the form shown in Fig. 6.

Referring to Figs. 1-5 inclusive, reference numerals 10, 10 indicate the side sections, and 12

indicates the central shoe section. Each of the side sections 10 comprises a cast alloy grating member 14, preferably of chrome-nickel heat and corrosion resisting alloy, comprising bar portions 16 and 18 which intersect at right angles, bars 16 extending across the width and bars 18 extending the length of the grate. Openings 22 are thus provided by the criss-cross arrangement of bars 16 and 18, allowing for the free passage of air therethrough. This member 14 is cast in one piece and is provided, about three sides thereof, with an integrally cast wall 20 projecting upwardly and at right angles to the plane of the grate.

Extensions 24 are provided on the fourth (unwalled) side of grate 14, preferably by elongation of bars 18, and when a pair of side sections 10, 10 are placed opposite one another, with the opposed extensions 24, 24 of the respective sections in side-by-side relationship, in the position of Fig. 1, they are hinged together, as by means of pintle rod 25 passing through registering holes 38 in the extensions 24.

Shoe 12 is also cast of an alloy metal similar to that of which the sides are formed, and comprises a body 26 substantially as long as sides 10, 10 are wide, and integrally cast curved flanges 28 which flare upwardly and outwardly from the top edge thereof and are semicircular in cross section. A pair of integrally cast depending flanges 30 are provided on the underside of body 26, defining a channel 32.

The backs of flanges 28 are joined and reinforced by a number of integrally cast transverse ribs 34, on the upper surface of the shoe 12. Portions of flanges 28 are omitted or cut away, providing openings 36 into and through which extensions 24 of side-sections 10 are received. The pintle rod or pin 25, which is passed through holes 38 provided in each of extensions 24 near the end thereof also extends through holes 40 in the ribs 34. In this way the side sections 10, 10 are hingedly connected to each other and each of them is also hingedly connected to the center shoe section 12.

The tray is supported and guided through the furnace by a number of rails, preferably of I-beam formation, (three being shown here) secured to the furnace floor and extending longitudinally therethrough, one of which, 48, is disposed centrally of the furnace, and the others, 50, 50 on each side thereof and in parallel relation thereto. The channel 32 of shoe section 12 straddles the top platform of track 48 and to aid in the reception and fitting of track 48 within the channel 32 the flanges 30 are flared outwardly at their ends, as at 52. The tray is thus guided through the furnace along the path of the center rail 48. Skids 54 are secured to the underside of side sections 10, 10 and are adapted to slide on tracks 50, 50. By having two of the flanges 30 on shoe section 12, to engage both sides of this center rail, the tray being traveled along is kept in position on all the tracks, and no such flanges or guides are needed on skids 54 which are free to travel on track 50 without provision of local lateral guiding means, which if present could cause binding, as in case of misaligned tracks or the like.

When the pair of side sections 10 are connected to shoe 12 in the above described manner each of these tray components is relatively movable to some slight degree in an arcuate path about pin 25. The amount of movement, however, is small, and means are provided to limit the

amount of relative movement. Rising movement of side sections 10 relative to shoe section 12 is limited by cross-bars 44, which, formed as integral parts of sides 10, extend across the gratings 14 from side wall to side wall at a level slightly lower than that of the cross-bars 16, 18, and serve as abutments or stops in cooperation with the under edges 46 of flanges 28.

Joining portions 56 are formed at each intersection of bars 16 and 18, which portions serve, along with bars 16 and 18, as platforms upon which articles to be heat treated or boxes containing such articles are received. Holes 58, through these thickenings 56, allow the passage of heat therethrough. These joining portions 15 may be reduced in area as compared with the form shown, since the articles placed on the grids will find adequate support on the cross-bars 16, 18.

The advantages of this construction over the 20 conventional rigid one-piece tray are many. For example, with reference to Fig. 2, if the central track 48 bulges upwardly, lifting the ends of the side sections at shoe 12, the other ends of the side sections 10 will still be supported by the track beams 50, 50. Each section of the tray will still be supported at two points, and the tray as a whole would not sag or buckle. In the event that one of the outside beam bulges, only one-half of the tray will be affected, since the bulge would be taken up by the hinging connection between this side section and the shoe section, and in this case also the tray will still have multiple point support, and no opportunity for sagging or warping of the tray due to lack of support is present.

Force to move the tray through the furnace is usually applied or concentrated centrally of the tray, and for this reason I locate the tray travel guiding means, channel 32, in the center of my device, on the underside of shoe 12. While skids 54 may be provided on their undersides with channels in like manner as on shoe section 12, only one guiding means is preferred, however, in order to avoid the locking and binding of the tray to the beams which could occur with warping of the rails if more than one guideway were employed.

One of the tray sections, either of the side sections or the shoe section, may ultimately become so warped as to render the entire tray inoperative, and in this case only the particular portion affected need be replaced in order to reestablish the entire tray in perfect operative order. Each tray side section is cast identically with the other and they are freely interchangeable, and on proper occasion, the components of two defective trays might even be utilized to make a third perfect tray.

In the modification of Figures 6 to 10 inclusive the intermediate shoe section 12 is dispensed with. Side sections 10a are composed of grates 14a, comprising bars 16a intersecting with and criss-crossing bars 18a, and these grates are provided with walls 20a about each of the two sides and the outer end thereof. Bars 16a at the meeting end of the side sections 10a are provided with coincidental holes 38a through which a pin 42a is passed to pivotally secure the sections together to form the complete tray unit.

This modification of the tray of my invention is similarly adapted to be supported and guided through a furnace. An H-rail track 48a on the furnace floor is preferably provided with this form of tray. Skid flanges 30a are provided at

the inner ends of the tray sections, preferably formed as downward extensions of the inner-end cross bars 16a, to support and guide the tray. These skid flanges are received and guided within the channel formed by the platform and walls of the H-beams track 48a. A pair of skid rails 54a are provided at the outer end of each side section, adapted to cooperate with tracks 50a to serve as additional supporting means for the tray, although, if desired, the arrangement comprising skids 54 running on an I-beam track, shown in Fig. 2, may be provided with this modification also.

The walls on the longer sides of the sections 10a, 10a extend over a short distance beyond the grate 14a at the side of and in the direction of extensions 24a, and when the said sections are hinged together serve as abutments to limit the relative upward pivotal movement of the sections.

This modification possesses in general the advantages of the form of Figs. 1 to 5, and in addition the further advantages of fewer parts and greater ease of assembly and replacement.

When the trays are pushed out of the furnace they are travelled over rollers to the place where the trays are unloaded. The path of the rollers is usually transverse to the line of travel in the furnace. To meet this condition I provide skid rails 60 extending lengthwise of the tray, on its underside, disposed to extend below the surface of the furnace rails and ride between same when in the furnace.

Trays of my invention will not buckle or warp out of shape as quickly as the conventional trays; they will ride along deformed rails with little or no difficulty; they will last longer under heavy duty; they can be made much lighter in weight than heretofore since the heavy construction is not needed with this type of tray, and therefore will be much more economical to make and to repair and replace.

Having now described my invention what I claim and desire to secure by Letters Patent is:

1. In combination, a tray for use in heat treating furnaces comprising a pair of side sections, means to hingedly secure each thereof to the other, and means on the furnace floor to support said tray at a plurality of points.

2. In combination, a tray for use in heat treating furnaces comprising a pair of side sections, means to hingedly secure each thereof to the other, and means on the furnace floor to support each of said sections at a plurality of points.

3. In combination, a tray for use in heat treating furnaces comprising a pair of side sections, means to hingedly secure each thereof to the other, and means on the furnace floor to support each of said sections at a plurality of points, certain of said last named means providing partial support to both of said side sections.

4. The combination of claim 1 in which the last-named means comprises a plurality of rails adapted to make sliding contact with the underside of the tray.

5. The combination of claim 1 in which the last-named means comprises a plurality of rails, and means on the underside of the tray to make sliding contact with said rails.

6. In combination, a tray for use in heat treating furnaces which comprises a pair of side sections, means to hingedly secure same to one another, and means to support same at a plurality of points in spaced relation to the furnace floor

surface, certain of said last named means serving also to guide said tray through said furnace.

7. A tray for use in heat treating furnaces comprising a pair of side sections, means to movably secure each thereof to the other, and means to limit the relative movement of said sections.

8. A tray for use in heat treating furnaces comprising a pair of side sections disposed in edge-adjacent relationship, extensions from the adjacent edges of each of said sides interlapping in staggered relationship, means at said extensions to secure said sides in pivotal relationship, and means to limit the relative pivotal movement of said sections.

9. A tray for use in heat treating furnaces comprising a pair of side sections, a shoe section centrally disposed therebetween and beneath, means to secure said shoe and side sections to each other in pivotal relation, and means to limit the amount of pivotal movement between said shoe and said side sections.

10. A device as in claim 9 in which certain of said last-named means are positioned on said shoe and certain others thereof on said side sections.

11. A tray for use in heat treating furnaces comprising a pair of side sections, a shoe section centrally disposed therebetween and beneath, means to join said shoe and side sections to each other in pivotal relation, and means on the underside of said shoe to guide said tray in its travel through said furnace.

12. In combination, a tray for use in heat treating furnaces comprising a plurality of hingedly connected sections, means on the furnace floor to support said tray in spaced relation to said floor, and means on the underside of the tray to cooperate with the support means to guide said tray through said furnace.

13. In combination, a tray for use in heat treating furnaces comprising a plurality of hingedly connected sections, means on the furnace floor to support said tray in spaced relation to said floor, and means on the underside of the tray to cooperate with the supporting means against sidewise displacement to guide said tray through said furnace along the path of said support means.

14. In combination, a tray for use in heat treating furnaces comprising a plurality of hingedly connected sections, means on the furnace floor extending the length of and through the furnace to support said tray in spaced relation to said floor, a track within said support means, and means on the underside of said tray to cooperate with said track to guide said tray along said support means through the furnace.

15. A tray for use in heat treating furnaces comprising a pair of side sections, a shoe section centrally disposed therebetween and beneath, and means to join said shoe and side sections to each other in pivotal relation.

16. A tray for use in heat treating furnaces comprising a pair of side sections disposed in edge-adjacent relationship, extensions from the adjacent edges of each of said sides interlapping in staggered relationship, means to secure said sides in pivotal relationship, and downward extension means on the bottom of the tray to cooperate with a track to guide said tray longitudinally and prevent sidewise movement and horizontal turning thereof.

HENRY H. HARRIS.