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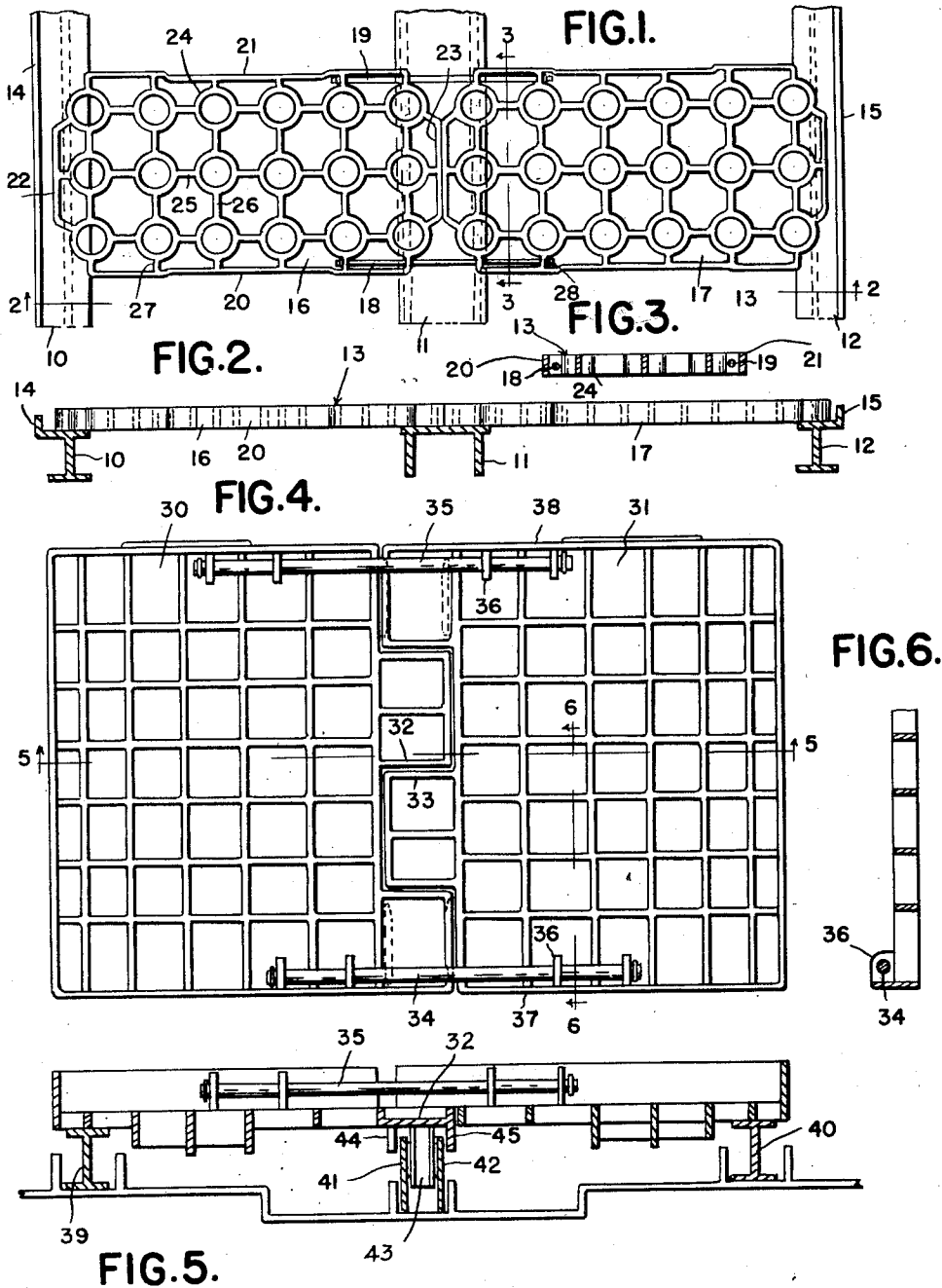
A. RUCKSTAHL

2,338,784

WORK SUPPORTING TRAY FOR HEAT TREATING FURNACES

Filed Oct. 24, 1941

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

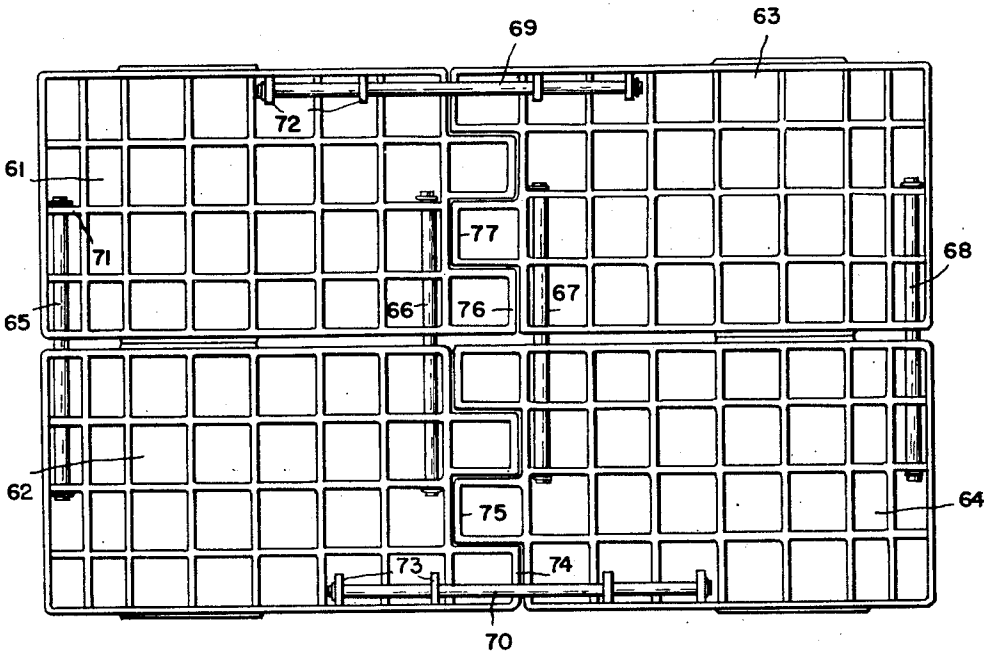
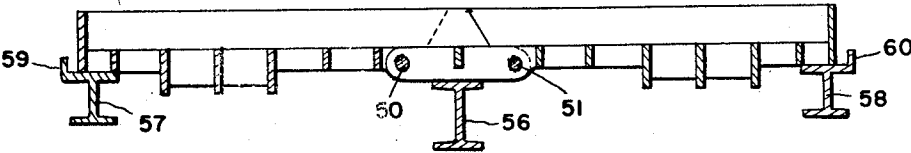
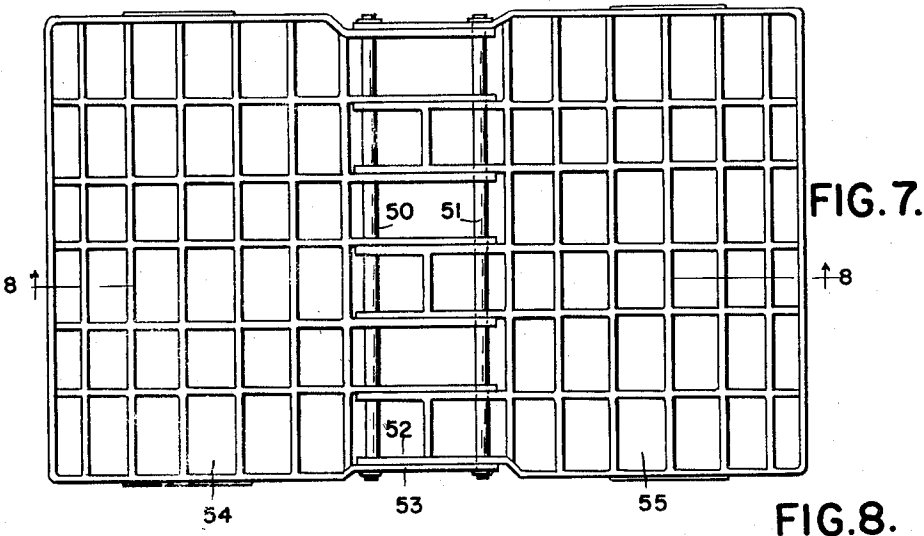


FIG.9.

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WORK SUPPORTING TRAY FOR HEAT
TREATING FURNACES

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4 Claims. (Cl. 263—47)

This invention relates generally to work supporting trays and refers more particularly to those designed for use in heat treating furnaces.

Usually parts to be heat treated are carried on rigid trays that are normally in the form of cast metal grids or plates of suitable size and shape. Such trays are pushed through the furnace on one or more supporting rails or may be carried on chains, driven rolls, or any other suitable means.

When heated to normal operating temperatures, the trays mentioned lose over 90% of their strength, hence it is necessary to use larger size trays which must be made of stronger sections or must be supported on more than two rails. In the latter case, it is not practical to maintain an alignment so that a tray will always rest on all rails while being pushed or conveyed through the furnace. Therefore, at first the tray rests upon two rails, then due to load and heat will sag or bend until it rests on the other rails. This bending or flexing causes breakage and decreases the life of the trays, which are usually made of an alloy containing a high percentage of nickel and chromium and are costly.

Another tray structure used in the past was made of two or more sections hinged or pivotally secured together; however, they were difficult to handle outside the furnace and were expensive to manufacture. For example, when it was desired to lift them to dip and quench the work thereon or to transport or move them about outside the furnace, the hinge or pivotal joints between the sections permitted said sections to move relative to each other and thereby tipped, tilted or spilled the work thereon. Moreover, some means had to be provided to stop or limit the pivotal or hinge action between the sections, and while the play allowed by such stops was adequate for the sections when upon the rails in the furnace, it was too much for said sections when lifted outside the furnace. More material was needed to form the stops and this added to the cost of manufacturing such trays.

In the present instance, I have provided a tray structure having two or more separate sections that are normally substantially rigid with each other in edge-to-edge relation so that outside the furnace they may be lifted or moved about like a one-piece structure, but are capable of moving relative to each other when subjected to the heat within a furnace for proper supporting engagement with the track rails therefor. Such structure includes normally straight rods that serve at one time as rigid connectors between the sec-

tions and are capable at another time of flexing to permit the relative movement aforesaid. Actually the tray structure is shallower, less material is employed in the construction thereof, the differential in stresses is less, the cost of manufacture is less, and the structure can be handled and moved about easier and with greater safety than heretofore.

In the accompanying drawings:

10 Figure 1 is a top plan view of a tray structure embodying my invention and showing portions of the supporting track rails therefor;

Figure 2 is a sectional view taken substantially on the line 2—2 of Figure 1;

15 Figure 3 is a sectional view taken substantially on the line 3—3 of Figure 1;

Figure 4 is a top plan view of a slightly modified form of tray structure;

20 Figure 5 is a sectional view taken substantially on the line 5—5 of Figure 4;

Figure 6 is a sectional view taken substantially on the line 6—6 of Figure 4;

Figure 7 is a top plan view of another modified form of tray structure;

25 Figure 8 is a sectional view taken substantially on the line 8—8 of Figure 7;

Figure 9 is a top plan view of another modified form of tray structure.

Referring now to the drawings, 10, 11 and 12, 30 respectively, are the track rails, and 13 is a work supporting tray embodying my invention.

As shown, the center rail 11 is inverted channel-shaped while the outer rails 10 and 12 are in the form of I-beams and have upstanding flanges 14 and 15, respectively, at their outer edges for guiding the tray 13. Such rails may be mounted upon any suitable means (not shown) such as the floor of a heat treating furnace.

The tray 13 preferably has two sections 16 and 17 that are identical in construction and are connected together in edge-to-edge relation by substantially parallel normally straight rods 18 and 19, respectively. Each section is a nickel chrome alloy casting in the form of an elongated grating having substantially parallel sides 20 and 21, substantially parallel ends 22 and 23, circular portions 24 disposed in transversely and longitudinally extending rows and interconnected by webs 25 and 26, respectively, and transversely extending webs 27 projecting from the sides 20 and 21 of the sections to the adjacent circular portions 24. The rods 18 and 19 are of sufficient length to extend through the two innermost transverse webs 27 of the sections 16 and 17 and have heads or retaining element 28 at opposite

ends thereof. Preferably such heads are upon the outer sides of the adjacent webs 27 and may be secured thereto if desired. The rods 18 and 19 may be any suitable size or cross section and may be made of any suitable material, but are preferably cylindrical and are formed of nickel chrome alloy so that normally, i. e., when outside the furnace, they constitute rigid connectors between the sections and will hold such sections substantially rigid with each other, but are capable of flexing when subjected to the heat within the furnace to permit the sections of the tray to move relative to each other for proper supporting engagement with the track rails 10, 11 and 12.

In use, the work (not shown) to be heat treated is placed upon the tray 13 and the latter is moved along the rails 10, 11 and 12 located within the furnace. Thus, heat within the furnace is free to circulate in the space between the rails beneath the tray and through the grating structure of the tray to the work thereon. As a result of the intense heat within the furnace and the load or weight of the work on the tray sections, the rods 18 and 19 will flex sufficiently to permit said sections to move relative to each other should it be necessary for them to do so for the tray sections to have proper supporting engagement with the rails 10, 11 and 12. However, before the tray is inserted into the furnace or after it has been removed therefrom, the rods 18 and 19 are free of the heat mentioned and therefore are sufficiently stiff and rigid to hold the sections 16 and 17 of the tray substantially rigid with each other and thereby prevent objectionable relative movement when, for example, it is desired to lift or move the tray about for any purpose.

In Figures 4 to 6, inclusive, I have illustrated a slight modification wherein the sections 30 and 31 of the tray have alternating projections 32 and 33, respectively, arranged in transverse alignment at approximately the center of the tray and are connected by rods 34 and 35 that are similar in construction to the rods 18 and 19 and extend through lugs 36 projecting inward from opposite sides 37 and 38, respectively, of the sections. In this instance, the tray is substantially square-shape in plan and the sections 30 and 31 thereof are gratings having substantially square-shaped openings. The outer supporting rails 39 and 40 for the tray are I-beams upon which the sections 30 and 31 are adapted to slide, while parallel center rails 41 and 42 carry therebetween rollers 43 that engage the underside of the transversely aligned alternate projections 32 and 33, respectively, of the tray sections. Any suitable means such as the flanges 44 and 45 depending from the underside of the alternate projections 32 and 33 and disposed upon the outer sides of the rails 41 and 42 may be employed as guides for the tray.

In Figures 7 and 8, I have illustrated another modification wherein parallel rods 50 and 51 similar in construction to the rods 18 and 19 extend transversely of the tray and engage transversely aligned holes in oppositely extending alternately disposed arms 52 and 53 of the tray sections 54 and 55. In this construction the arms 52 and 53 are supported on an I-beam rail 56, while the ends of the sections 54 and 55 are supported on I-beam rails 57 and 58 having upstanding guide flanges 59 and 60, respectively.

In Figure 9, I have illustrated another modification wherein the tray has four sections 61, 62, 63 and 64, respectively, connected together by six rods 65, 66, 67, 68, 69 and 70, respectively, that

are similar in construction to the rods 18 and 19. As shown, the rods 65, 66, 67 and 68 extend transversely of the sections 61, 62, 63 and 64 and engage aligned holes in longitudinally extending webs 71 thereof, the rod 69 extends longitudinally of the sections 61 and 63 at one side of the tray and engages aligned holes in lugs 72 projecting inward from the outer sides of said sections, while the rod 70 extends longitudinally of the sections 62 and 64 at the opposite side of the tray and engages aligned holes in lugs 73 projecting inward from the outer sides of the sections 62 and 64. At the center of the tray are transversely aligned alternate projections 74, 75, 76 and 77, respectively, of the tray sections which are similar to the alternate projections 32 and 33 in Figure 4 and may be supported in a like manner.

In each of the forms shown, the underlying principle is the same, namely, the provision of sections that are normally substantially rigid with each other in edge-to-edge relation so that outside the furnace they may be lifted or moved about like a one-piece structure, but are capable when subjected to heat within a furnace of moving relative to each other for proper supporting engagement with the track rails or their equivalents. In each instance, the rods normally serve as rigid connectors between the sections but are capable of flexing to permit the relative movement mentioned. Likewise, in each instance, the rods serve as stiffeners or reinforcing members for the respective sections. Thus, the desired results are accomplished with the minimum number of parts.

What I claim as my invention is:

1. A work supporting tray of the class described comprising two separate rigid sections arranged substantially end to end in substantially a common horizontal plane, said sections being provided adjacent opposite side edges thereof near the line of juncture between said sections with longitudinally spaced transversely extending rigid portions, and rigid rods extending across the line of juncture between said sections and extending longitudinally of said sections adjacent opposite side edges thereof, said rods extending through and held against displacement from the transversely extending rigid portions of said sections and constituting the sole connecting means between said sections, said rods normally resisting relative hinge action between said sections but subject to bending stress transverse of the axes thereof at the line of juncture between the two sections to permit relative hinge action between said sections.

2. A work supporting tray of the class described comprising two separate rigid sections arranged substantially end to end in substantially a common horizontal plane, said sections being provided near the line of juncture between said sections with longitudinally spaced transversely extending rigid portions, and elongated rigid members extending across the line of juncture between said sections and extending longitudinally of said sections, said elongated rigid members extending through and held against displacement from the transversely extending rigid portions of said sections and constituting the sole connecting means between said sections, said elongated rigid members normally resisting relative hinge action between said sections but subject to bending stress transverse of the axes thereof at the line of juncture between the two sections to permit relative hinge action between said sections.

3. A work supporting tray of the class described comprising two separate rigid sections arranged substantially end to end in substantially a common horizontal plane, said sections being provided with spaced transversely extending rigid portions, and elongated rigid members extending between and longitudinally of said sections, said elongated rigid members extending through and held against displacement from the transversely extending rigid portions of said sections and constituting the sole connecting means between said sections, said elongated rigid members normally resisting relative hinge action between said sections but subject to bending stress transverse of the axes thereof at the line of juncture between the two sections to permit relative hinge action between said sections.

4. A work supporting tray of the class described comprising two separate rigid sections

5 arranged substantially edge to edge in substantially a common horizontal plane, said sections having longitudinally spaced transversely extending rigid portions arranged in laterally spaced substantially parallel rows, and rigid rods extending across the line of juncture between said sections and extending longitudinally of said rows of transversely extending rigid portions, said rods extending through and held against displacement from the transversely extending rigid portions of said sections and constituting the sole connecting means between said sections, said rods normally resisting relative hinge action between said sections but subject to bending stress transverse of the axes thereof at the line of juncture between the two sections to permit relative hinge action between said sections.

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