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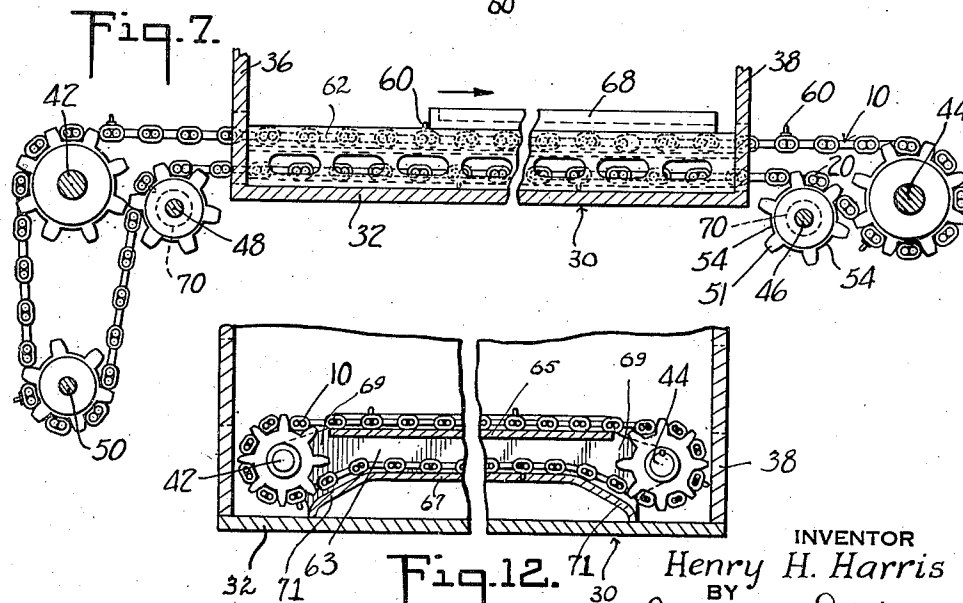
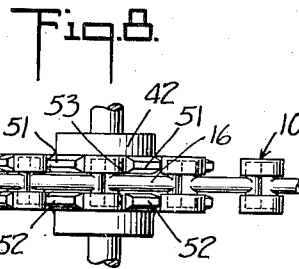
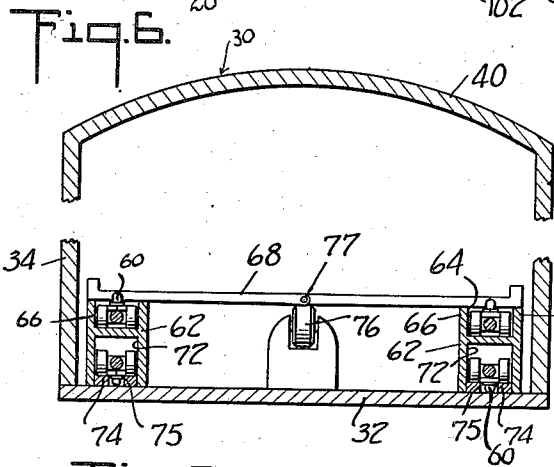
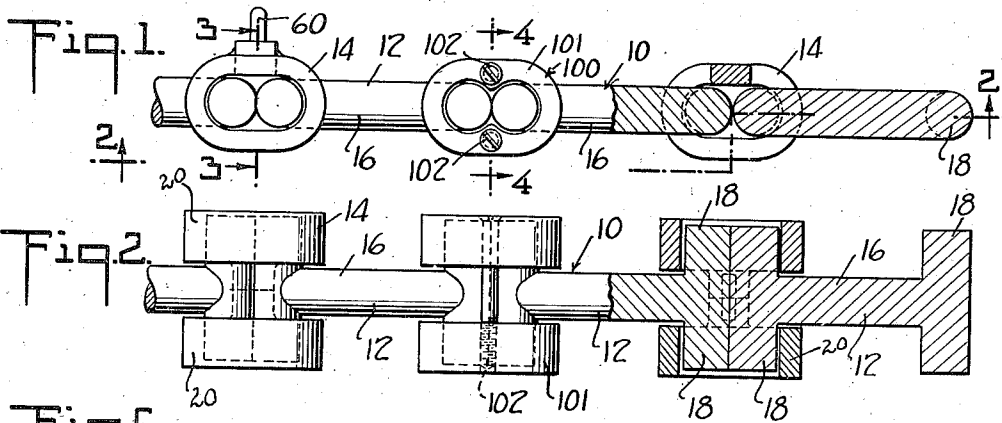
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2,189,983

CHAIN CONVEYER FOR HEAT-TREATING FURNACES

Filed Oct. 14, 1937

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

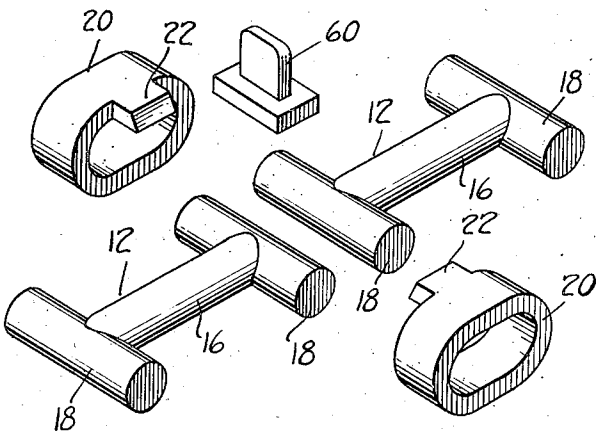
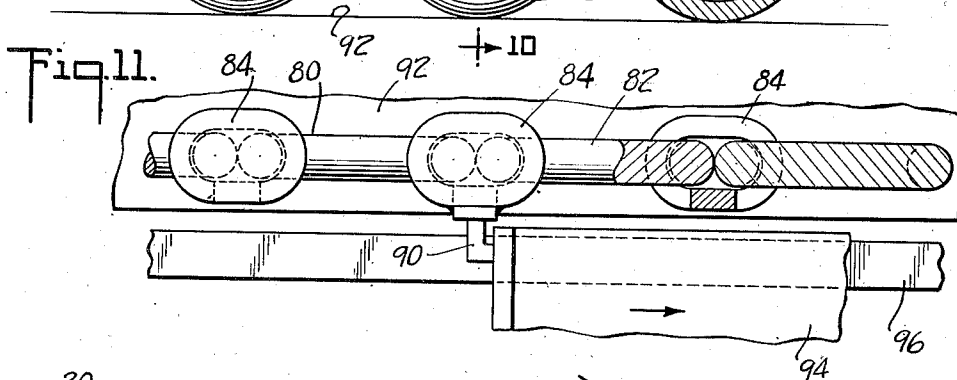
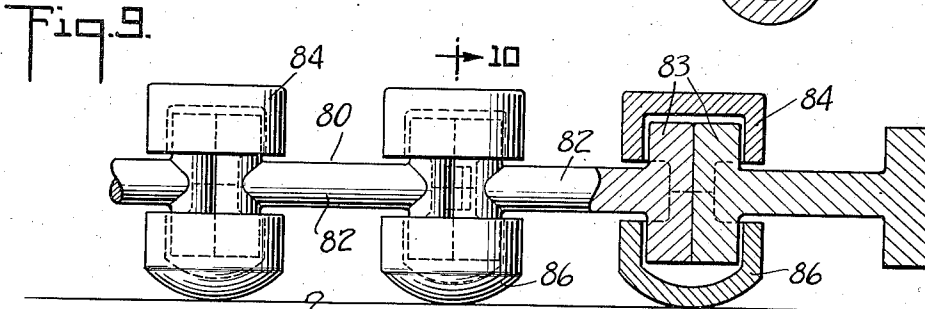
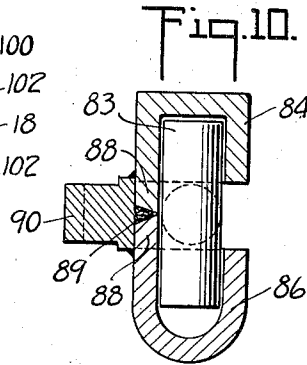
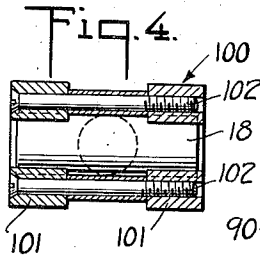
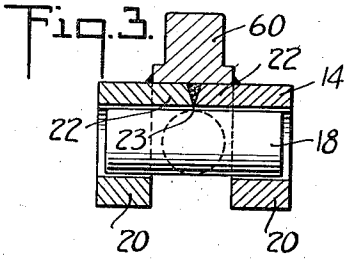


Fig. 5.

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CHAIN CONVEYER FOR HEAT-TREATING FURNACES

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2 Claims. (Cl. 263—8)

My invention relates generally to heat treating furnaces, and specifically to the provision of an apparatus for conveying articles to be heat treated through such furnaces.

Ordinarily, articles to be heat treated are travelled through furnaces either, if of sufficiently large size, by being placed directly on skid rails or tracks or roller rails and being pushed through the furnace, or else, in those instances where the articles are of rather small size and are loaded onto supports, or "trays" as they are commonly called, and pushed through the furnace in tandem either on skid rails or tracks or roller rails. My invention, although applicable for use with larger articles, will be described with relation to its use with trays of the hinged type such as described and claimed in my Patent No. 2,022,283, for the conveying of smaller articles through heat treating furnaces.

For travel through the furnace, the trays are usually pushed in tandem, that is, pressure applied to the rearmost of the trays is communicated from one to the other in front thereof down the line until the tray at the far end of the line is pushed out of the furnace. This method has several distinct disadvantages. For one thing, it places severe and ultimately destructive compressive stresses on the trays themselves since they bear directly against one another in communicating the travelling pressure from one to the other thereof. For another thing, the process is slow and uneconomical. In order to operate properly, the line of trays must be continuous, and to pass even a single tray load through the furnace, it is necessary that an entire line of trays be assembled and loaded in order to effectively travel the one tray through. In such instances there is an enormous waste of power.

The main object of my invention is the provision of a method and apparatus for moving work supports such as trays or the like through furnaces quickly and economically.

Broadly, my invention consists in utilizing a pair of endless, continuous drag conveyer chains mounted for travel within the furnace and along the longitudinal walls thereof, and providing these endless, continuous chains with means to drag along therewith trays on which are disposed articles to be heat treated.

Other, and further objects of my invention will in part be obvious and in part pointed out specifically hereinbelow in connection with the following description thereof:

In the drawings annexed hereto and made a part hereof,

Figure 1 is a side elevational view, partly in section, of one form of chain constructed according to and embodying my invention;

Fig. 2 is a bottom plan view, also partly in section, of the chain illustrated in Fig. 1, along the broken line 2—2 of Fig. 1;

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

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

Fig. 5 is an exploded view of the component parts of the form of chain illustrated in Figs. 1 to 4;

Fig. 6 is a cross sectional view through a conventional form of heat treating furnace with one form of my invention applied thereto;

Fig. 7 is a longitudinal sectional view through the furnace shown in Fig. 6, illustrating one form of the endless, continuous chain drive connection in elevation;

Fig. 8 is a plan view of a sprocket wheel showing a portion of the chain passing thereover;

Fig. 9 is a view similar to Fig. 2 of a modified form of chain constructed according to and embodying my invention;

Fig. 10 is a section on the line 10—10 of Fig. 9;

Fig. 11 is a view similar to Fig. 1 illustrating the form of chain shown in Fig. 9 in operation; and

Fig. 12 is a view generally similar to Fig. 7, but illustrating in elevation a modification of my invention in which the endless, continuous chain drive of my invention is wholly contained within the furnace.

Referring specifically to Figs. 1 to 5, reference numeral 10 indicates one form of chain constructed according to and embodying my invention, which is formed of a plurality of what I prefer to designate as I-members 12, connected and pivotally secured together by a plurality of what I prefer to designate as O-members 14. Each I-member 12 comprises a one-piece metal casting of heat and corrosion resisting alloy, preferably of nickel, chromium and iron. Each member 12 is provided with a straight body portion 16 and a pair of cross heads 18, 18 at the opposite ends thereof and at right angles thereto, so that member 12 as a unit generally resembles a capital letter I. Cross-heads 18, 18 are circular in cross-section and of substantially uniform thickness, and body portion 16 is preferably of like formation. I-members 12 are pivotally secured together, as shown, by O-members 14, each of which comprises a pair of opposed elliptical rings 20, 20, having generally the form of a capital letter O. These rings 20, 20 are also

one-piece metal castings of heat and corrosion resisting alloy, preferably of nickel, chromium and iron. Each ring 20 has a short integral extension 22 on one side thereof. A continuous chain is permanently connected up by arranging consecutive I-members 12 in end-to-end relation with their cross-heads 18, 18 substantially abutting, disposing a pair of O-members 20 to encircle opposite ends of the cross-heads 18 of adjacent I-members 12 with the extensions 22, 22 thereof projecting inwardly from each side as indicated in Fig. 5, and welding together the meeting ends of extensions 22, 22, as indicated at 23, Fig. 3.

Rings 20, 20 are duplicates of each other, though turned into reverse positions in the assembling of the parts comprising the chain. The rings 20 are formed sufficiently wide and long enough to receive cross-heads 18, 18 loosely there-within and to enable the I-members 12 to swing and pivot freely with respect to one another. This free pivoting movement is essential for proper operation of the chain as a whole, and while limited on one side because of the welded connection 23 between extensions 22, 22, the pivotal movement between I-members 12 on the other side is practically unlimited.

Since the last pair 100 of O-members 20, 20 to connect the ends of a sprocket chain are ordinarily secured together by the user having no welding facilities and also to facilitate length adjustment, at least one pair of O-members or rings 101, 101 are connected up by means of upper and lower screws 102, as indicated in Figs. 1, 2 and 4. Chain 10 can readily be opened, if necessary for repairs or other purposes by removing the screws 102 referred to above.

Referring to Figures 6, 7 and 8, reference numeral 30 indicates one form of furnace wherein my invention may be employed, which furnace comprises floor 32, side walls 34, 34, front and back walls 36 and 38, having openings through which the chain is passed, and roof 40. Chain 10 is carried by a number of sprocket wheels, disposed about driving wheel 42 and driven wheel 44. While in the form shown idler wheels 46 and 48 are provided, and also take-up wheel 50, to tighten the chain and take-up any slack therein which may develop through use, both the idler wheels and the take-up wheel may be dispensed with if desired by providing compensating adjustments between the drive wheel and the driven wheel, and in such case the return may be outside, instead of inside the furnace as shown. As shown in Fig. 7, all of these wheels are disposed outside of furnace 30, with chain 10 passing within the furnace confines during both travel and return. If desired, the sprocket wheels may be disposed within the furnace also.

Drive sprocket wheel 42, driven wheel 44, take-up wheel 50, and idler wheels 46 and 48, are all generally similar in construction, if not in size, having laterally spaced sprocket teeth 51, 52 to define a peripheral groove 53 therebetween. The sets of twin teeth 51, 52 on the wheels are so spaced apart that when chain 10 passes there-around, body portions 16 of I-members 12, will be received within the peripheral grooves 53, and O-members 14 will be received within the intersprocket spaces 54.

A plurality of lugs or dogs are provided on chain 10, spaced apart at predetermined distances, to engage trays to be travelled through the furnace and move same along through the furnace. As shown in Figs. 1, 3 and 7, these

lugs or dogs comprise short bars 60 welded to O-members 14 on the back thereof and directly over the welded-together extensions 22, 22.

In the furnace as shown in Figs. 6 and 7, I provide a pair of H-beams 62, 62 disposed on furnace floor 32, extending longitudinally of the furnace and along the side walls thereof. During operative travel through furnace 30, in the direction of the arrow in Fig. 7, chain 10 passes through and along the upper channel 64 of beam 62, the side walls 66, 66 of which are short enough to permit lugs or dogs 60 to project upwardly therebeyond and engage the sides or ends of trays, as 68, to move same along therewith through the furnace. Leaving the furnace, tray 68 is deposited on a take-off platform (not shown) and chain 10 passed over driven wheel 44. Lugs 60 are still directed outwardly, but when passing over idler rollers 46, 48 the lugs are directed inwardly and provision is made, in the form of a deep peripheral channel 70 within wheels 46 and 48, to receive lugs 60. During return travel, chain 10 passes through furnace 30 in a reverse direction, within lower channel 72 of beam 62, and a slotted split rail 74 is provided to rest on furnace floor 32 and support the returning chain 10, its slot 75 receiving the lugs or dogs 60.

As shown in Fig. 6, the H-beams 62 serve as tracks for the tray 68, said tray 68 being supported near its outer edges on the top of beam walls 66, 66. A roller rail 76 may be centrally disposed within the furnace between the side rails or beams 62 extending longitudinally thereof, to make a rolling contact with the underside of tray 68 at the middle thereof to facilitate movement of the tray through the furnace, and the tray may be hinged, as indicated at 77.

In Figs. 9 to 11, I have illustrated a modified form of chain 80. In this form, also made up of one-piece metal castings of heat and corrosion resisting alloy, preferably of nickel, chromium and iron, I-members 82 are generally similar to I-members 12, and are provided with cross-heads 83 similar to cross-heads 18 but instead of being connected by connectors made up of a pair of identical, but oppositely disposed O-members, as 20, members 82 are connected by caps 84 and 86, both of which have elliptical recesses therewithin to receive the ends of a pair of adjacent cross-heads 83, 83. Caps 84 are flattened on top, but caps 86 are rounded on their undersides. In this modification, caps 84 and 86 are similarly provided with extensions 88, which are welded together as at 89 to complete the link unit. Also, lugs or dogs 90 are provided on chain 80, similarly welded over extensions 88 and projecting outwardly therefrom.

In the main form of my invention, chain 10 is travelled through the furnace and over sprocket wheels in a vertical plane. Using the modified form of chain 80, I am enabled to travel the chain through the furnace in a horizontal plane. In instances where it is either impossible or impractical to use space underneath the furnace floor level, this horizontal travel may be necessary. In Fig. 9, chain 80 is shown travelling through a furnace with the rounded undersides of caps 86 sliding along on tracks or guideways 92 formed on the side walls of the furnace, with dogs 90 extending outwardly a distance sufficient to engage and move along therewith the trays 94 resting on suitable supports such as skid rails 96. The rounded cap 86 supports the chain and reduces the friction on the chain supporting track 92. In either modification, it will be seen that the

chain link construction is very simple, each link (I—O member) comprising but two parts when completed. The elliptical ring or cap construction provides a large bearing surface upon the twin-toothed sprockets, and the relative pivotal movement of I-members allows a space-saving short radius turning, so that the sprocket wheels can be small indeed with relation to link size. The same basic arrangement can be used for travel of the chain in a vertical as well as in a horizontal plane making it possible, in either form, to arrange for return of the chain within or without the furnace. With the arrangement of I-bars and O-members making up the chain as described, it will be observed that, instead of the usual single pivoting connection common in ordinary chains, a double pivoting connection is obtained. The turning effect so produced within each O-member or pivoting member, as when the chain passes around a sprocket wheel, is divided up so that it takes place partly between the forward cross-heads and the O-member, and partly between the rear cross bar and the same O-member or ring. Thus, not only is the wear more fully distributed, but also the radius of turning can be greatly decreased, and the entire arrangement of chain and sprocket wheels made much more compact than would otherwise be possible.

One form in which these sprocket wheels are located within the furnace is illustrated in Fig. 12. In this modified form of the invention, I provide a pair of H-beams 63, disposed on furnace floor 32, extending longitudinally of the furnace 30 and along the side walls thereof, similarly to beams 62 in Figs. 6 and 7. During operative travel through furnace 30, chain 10 passes around wheel 42 and through the furnace in one direction along the upper trackway 65, around wheel 44, and back through furnace 30 on the lower trackway 67. The side walls of H-beam 63 are widened, as at 69, to provide journals for the drive and driven sprocket wheels 42, 44, in close proximity to the trackways, and the lower trackway 67 is provided with an inclined apron 71, upon which chain 10 rides upon entering and leaving the lower trackway. Such arrangement makes it possible to keep the entire chain drive connection within the furnace. The source of power to actuate the shafts on which the sprockets are mounted may, if desired, come from outside the furnace, and the chain 10 may be kept under tension by a take-up arrangement of sprocket wheels 42, 44 (not shown). By keeping the sprocket wheels inside the furnace and in close proximity to the trackways over which the chain travels, heat transfer and loss occasioned by the chain passing outside the furnace is avoided, and the cost of operation reduced.

The rounded O-members 20 of chain 10 travel smoothly over the H-beam rails 62. The chain has no projections on the sides thereof, other than lugs 60 to get caught during travel through the furnace. Using the H-beam chain guiding arrangement does away with the necessity for any special brick work or chambering underneath the furnace and thus greatly reduces the cost of furnace construction and operation. Additionally, the chain is always readily accessible for repairs, because the entire H-beam assembly can be removed from the furnace without destroying or disturbing any of the furnace walls, etc.

For convenience of illustration, I have provided H-beams 62, 63, since these forms of beam give the desirable two-story trackway for chain travel and return. My invention is not to be limited to such specific illustration, since numerous two-story or overlying trackways may be provided other than by means of an H-beam. My invention is to be limited in scope only by the claims appended hereto, in which, for convenience, I refer to trays and other material to be heat treated as "articles".

I claim:

1. In combination, a tray and means to convey same through a heat treating furnace, which conveying means comprise a pair of aligned and spaced apart trackway members disposed on opposite sides of and extending the length of the furnace, a central supporting member also within the furnace and extending the length thereof substantially midway between the trackways, the tray comprising a plurality of sections hinged together each of which sections is supported by one trackway and the central support, and movable means associated with the trackways for engaging the tray and moving same through the furnace.

2. In combination, a tray and means to convey same through a heat treating furnace, which conveying means comprise a pair of aligned and spaced apart trackway members disposed on opposite sides of and extending the length of the furnace, a supporting member also within the furnace and extending the length thereof substantially midway between the trackways, the tray comprising a plurality of sections hinged together each of which sections is supported by one trackway and the central support, and movable means associated with the trackways for engaging the tray and moving same through the furnace, the movable means comprising an endless chain having projections thereon for engaging the tray.

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