

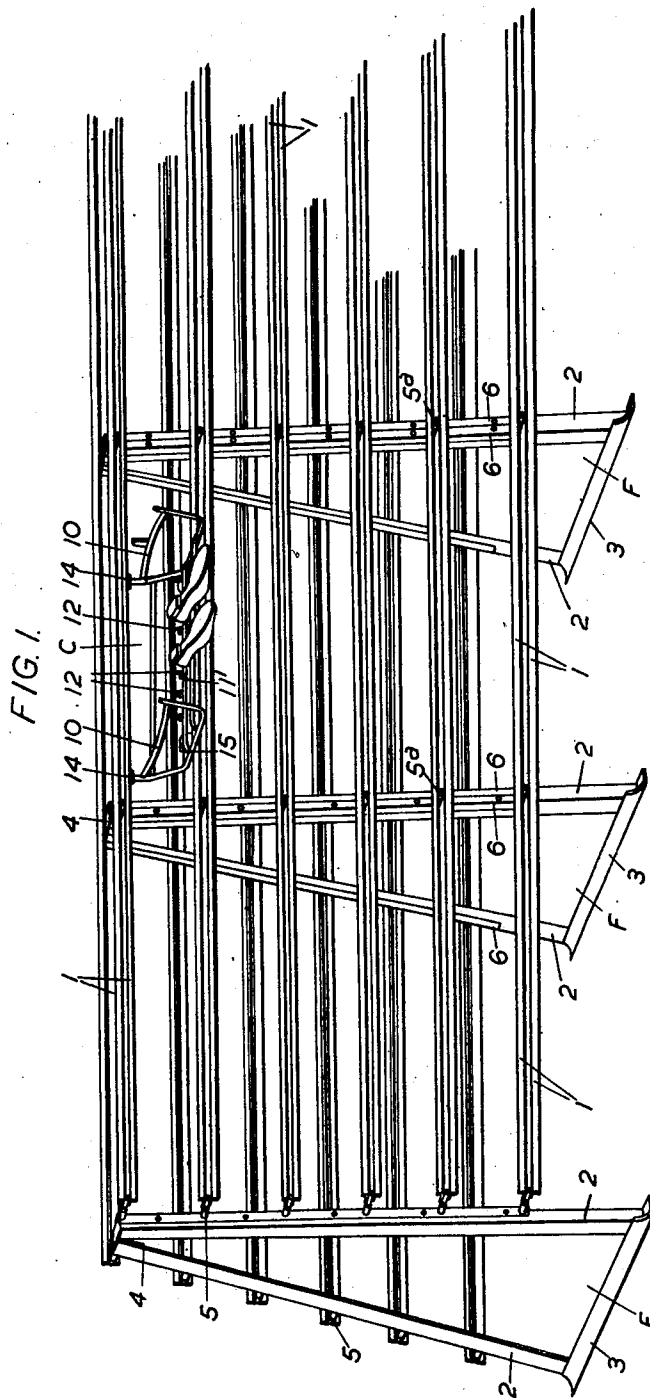
April 7, 1953

A. FREEMAN
MONORAILWAY SYSTEM

2,633,810

Filed May 24, 1949

5 Sheets-Sheet 1



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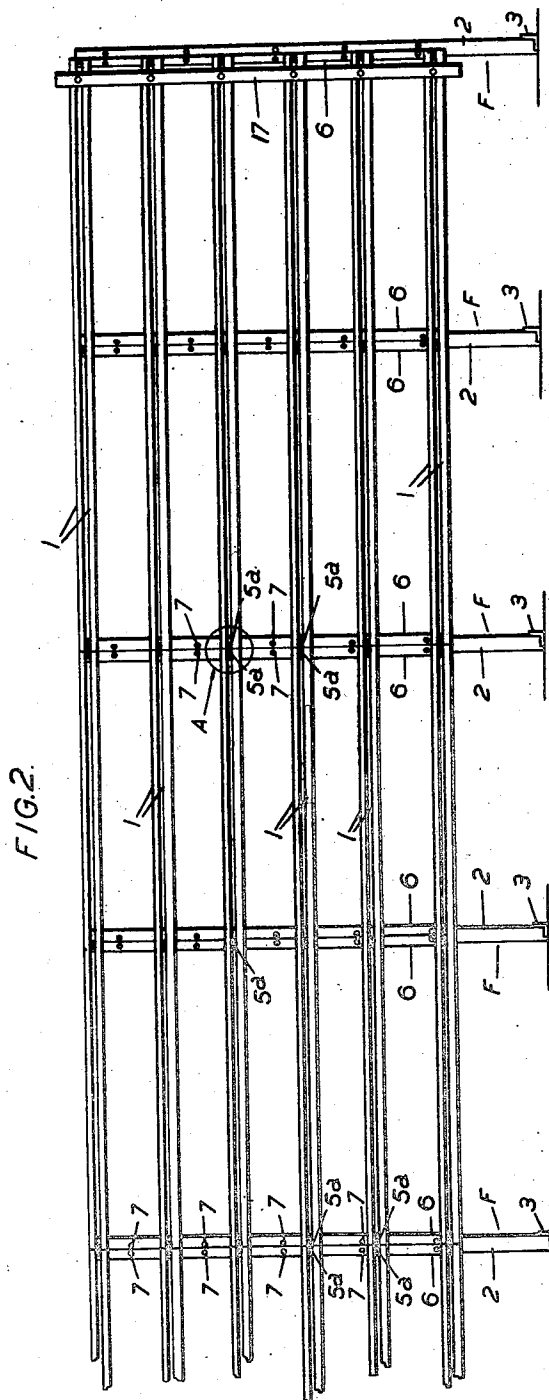
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A. FREEMAN
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5 Sheets-Sheet 2



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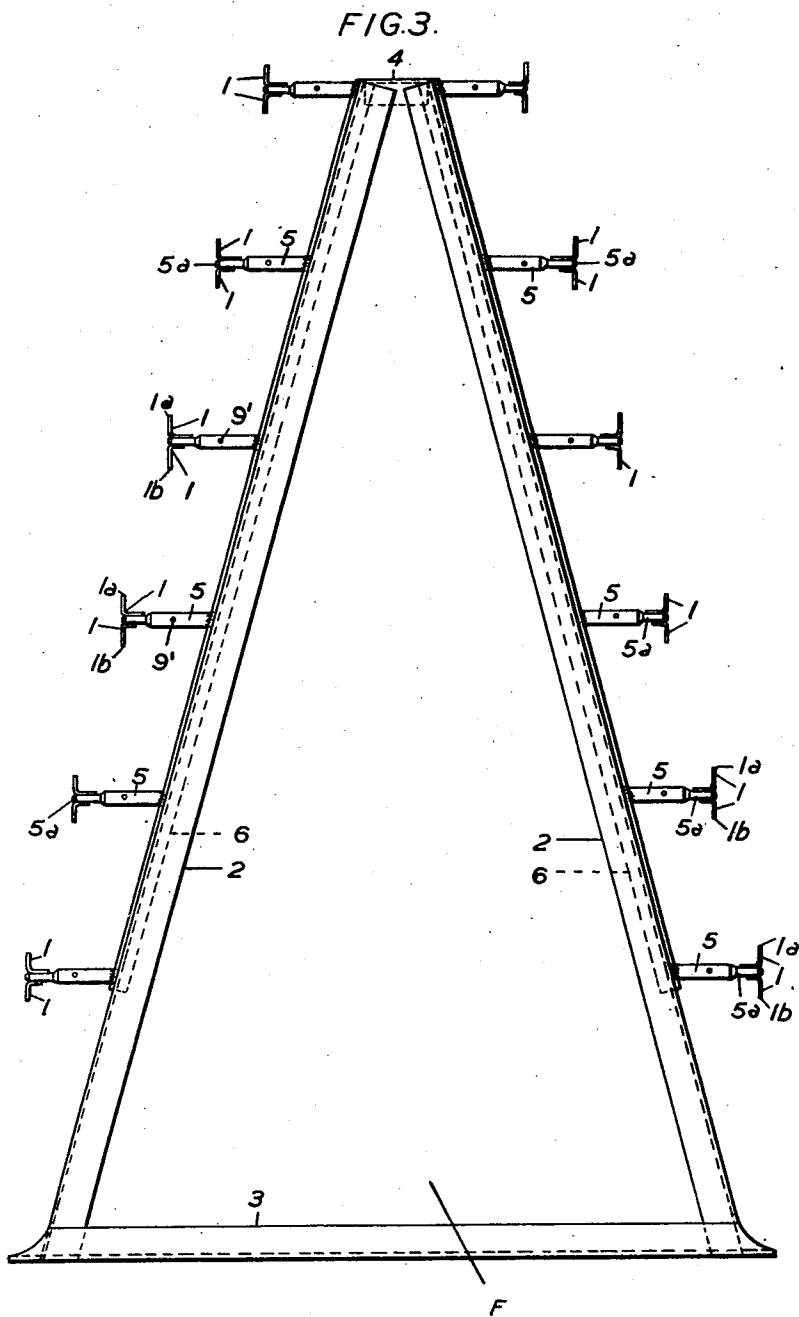
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5 Sheets-Sheet 3



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FIG. 4.

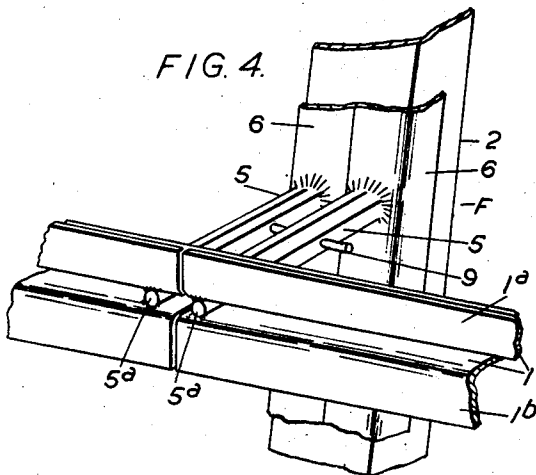


FIG. 6.

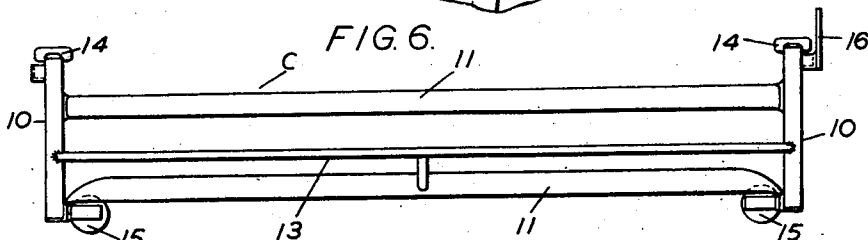


FIG. 7.

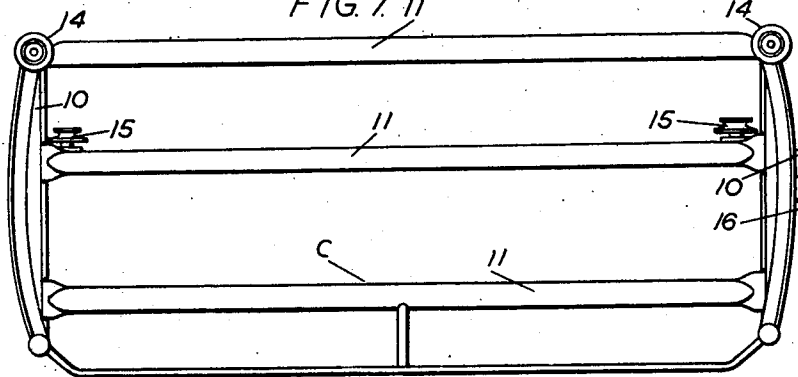
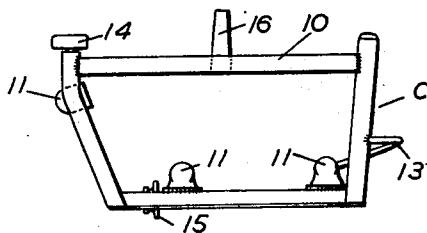


FIG. 8.



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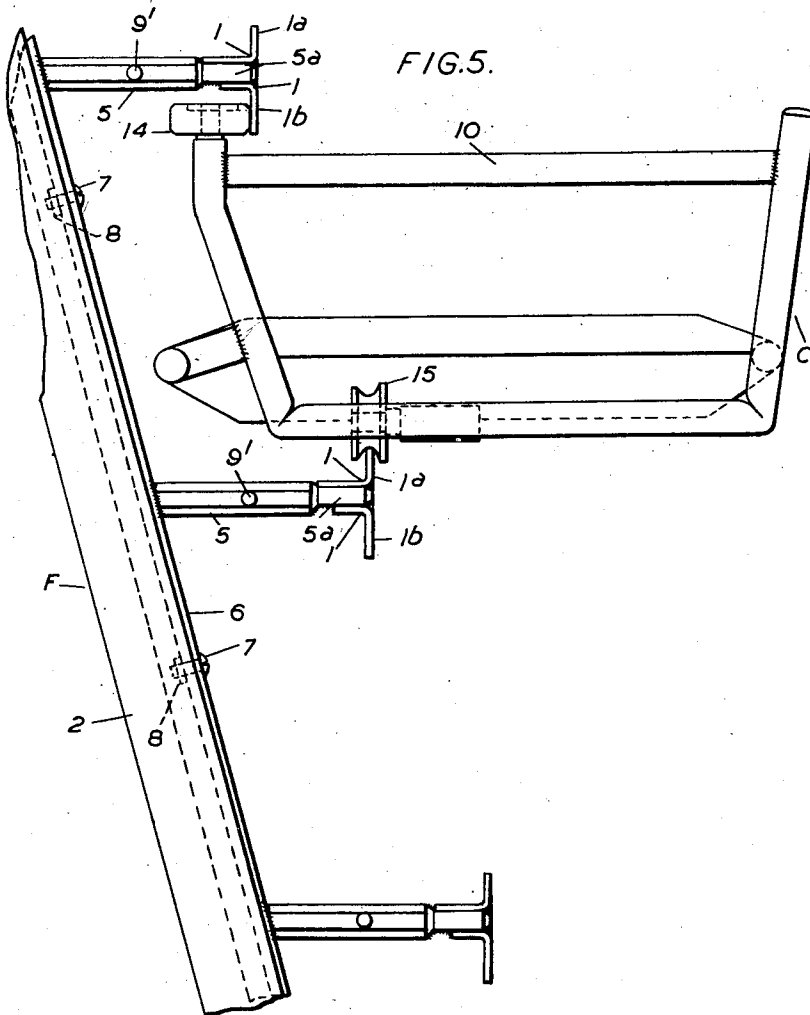
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A. FREEMAN
MONORAILWAY SYSTEM

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

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MONORAILWAY SYSTEM

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7 Claims. (Cl. 104—121)

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This invention appertains to conveyors of the kind comprising parallel rails or the equivalent constituting tracks, and carriages which are adapted for engagement with and to travel along the said tracks, for example for the conveyance of articles or goods from station to station during manufacturing processes and the likes.

In this connection the invention is intended for application principally without, however, limitation in this respect, to conveyors and conveyor systems of this kind suitable for installation in boot and shoe factories for the purpose of systemizing and expediting the progress of manufacturing operations on and along production lines. Thus, in a conveyor system for this particular purpose each of the carriages is usually in the form of a comparatively short wheeled tray or rack, like a small trolley, adapted for holding or supporting one or more series of lasted uppers, complete with lasts, or articles of footwear in various stages of manufacture, or even individual boot or shoe components, and so on. For instance, for the support of lasts, a wheeled rack may be furnished with one or more series of upstanding pegs, whereas other racks or trays may either be provided with work-holding or supporting loops or with receptacles for work in the form of, say, juxtaposed channels or compartments, all as well known to those acquainted with the boot and shoe industry. Accordingly, the invention is not confined to the provision of carriages of any particular form. In use the carriages are propelled, either by hand or automatically, along the tracks from station to station so that the work conveyed can be dealt with progressively by different operators along the production line.

Now heretofore, the pairs of spaced parallel rails or equivalent (hereinafter for convenience referred to simply as "rails") forming the tracks have usually been disposed in horizontal planes, the wheeled carriages naturally being correspondingly arranged. When, therefore, as is usually the case, a complete conveyor system includes a plurality of superimposed tracks each supporting a number of carriages, the work carried by the said carriages is difficult of access since the entire front of the conveyor is barred at intervals heightwise by the frontal rails. In short, whenever an operator desires to remove work from or place it in or on a carriage, he or she finds this an awkward and difficult task by reason of the obstruction resulting from the existence of at least one adjacent front rail.

The principal object of the present invention, therefore, is the provision of an improved con-

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veyor of the kind referred to of simple and robust construction designed to obviate the aforementioned disadvantage.

According to this invention, the tracks of the improved conveyor are so located at or near the backs of carriages as to provide an open fronted structure permitting freedom of access to the said carriages.

As will be appreciated the idea, broadly considered, is to remove what have heretofore been the front rails of the tracks and dispose them to the rear of the fronts of the carriages, thereby providing a clear unobstructed space in which operators can freely work when loading or unloading the carriages.

Preferably, the two parallel rails of each track are arranged one above the other so that the track is in a vertical, or nearly vertical, instead of a horizontal, plane. Accordingly in the preferred construction the vertical or nearly vertical face of the rail-supporting structure has attached thereto super-imposed pairs of vertically separated rails suchwise as in the result to provide what may be regarded as an open-fronted conveyor.

In order that the invention may be more clearly understood and readily carried into practical effect, a specific constructional example thereof will now be described with reference to the accompanying drawings, wherein,

Figure 1 is a general perspective view of a portion of an open-fronted conveyor track system, with a carriage in the form of a tray engaged with the rails of a track,

Figures 2 and 3 are front and end elevations respectively of the track system,

Figure 4 is an enlarged detail perspective view of the portion of Figure 2 ringed round at A showing a typical joint between two sections of the track,

Figure 5 is a detail end view showing more clearly the manner in which a carriage is engaged with the rails of a track, and

Figures 6, 7 and 8 are front and end elevational and plan views respectively of a typical carriage.

Like parts are designated by similar reference characters throughout the drawings.

Referring first to Figures 1-4 it will be seen that the open-fronted conveyor track system consists of a rail-supporting structure comprising spaced upright triangular frames F, and super-imposed pairs of vertically separated horizontal rails I. Each frame F is fabricated of lengths of angle iron and, as shown more clearly in Figures 1 and 3, consists of two "uprights" 2 which

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are relatively inclined towards each other, a horizontal base member 3 serving to connect the comparatively widely separated lower ends of the uprights 2, and a short member 4 connecting together the upper ends of the said uprights at the apex of the frame. Each upright 2, although strictly vertically disposed, as viewed from the front of the conveyor track system (see Figure 2), is rearwardly inclined to the extent of 15° or thereabouts to the vertical. The horizontal rails 1 are sectional, being made up of aligned, initially separate lengths of angle iron. Each initially separate rail 1 may conveniently be 6' 0" long, its cross-sectional dimensions being, say, 1" x 3/4" x 1/8". The horizontal rails 1 are welded to reduced outer end portions 5a of horizontal support spigots 5 which latter at their inner ends are welded, as depicted in Figure 4, to vertically disposed carrier members 6 attached, by means of bolts 7 and nuts 8 (Figure 5) to the uprights 2. The members 6, in the illustrated example, consist of lengths of angle iron of the same section as the rails 1. The support spigots 5 are made from hexagonal steel bar, although they may alternatively be fashioned from steel rod of circular section. The system so far described therefore comprises two sets of superimposed tracks arranged closely back to back. This is advantageous in that it economises in factory floor space. Generally speaking, the bottom rail of each pair of parallel rails constituting a track is mounted above and closely adjacent to the top rail of the pair of rails below. Each bottom rail, moreover, has a vertical upwardly directed flange 1a, whilst the adjacent top rail immediately below has a vertical depending flange 1b, the lengths of angle iron being appropriately arranged as shown in Figures 3, 4 and 5 to achieve this result. As will be seen from a consideration of Figure 2, each rail 1 is welded not only at each of its extreme ends but also at a point midway between these ends to one of the horizontal support spigots 5. The two companion spigots serving to support the adjacently disposed ends of any two aligned rails 1 are connected by a joint pin 9 which, as depicted in Figure 4, is inserted through holes 9¹ formed transversely in these spigots. In this way, there is provided a rigid track joint designed to maintain the alignment of the rails 1. The location of one such joint is indicated at A in Figure 2.

As will be appreciated, in the illustrated example the entire rail-supporting structure is self-supporting. Alternatively, the structure may be fabricated of tubular steel and, instead of being self-supporting, may be made for erection in conjunction with struts or other supports.

The carriages C for use on this conveyor track system are of the general form illustrated in Figures 1, 5, 6, 7 and 8. That is to say, each such carriage is in the form of a tray fabricated of tubular steel and angle iron and comprises two spaced end-frames 10 connected by one or more longitudinal members such as 11. The said end frames are standard for all types of carriages, the remainder of the carriage components being, however, designed to suit specified requirements. For example, the end frames 10 of a carriage may, as shown in Figure 1, be connected by a bar 11¹ furnished with pegs 12 adapted for the support of articles of footwear in various stages of manufacture. The carriage illustrated in Figures 6, 7 and 8, on the other hand, includes three spaced parallel cross bars 11—two bottom bars located in a horizontal plane and a third, i. e.

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rear, bar disposed somewhat above the other two. Such a carriage is, for instance, suitable for supporting shoes with their soles uppermost, and may, if desired, and as shown, be fitted at the front with a hand rail 13. Then other carriages may have flat supporting surfaces, and yet other trough type divisions. But, in any event, the back of each carriage C is provided at the top with two longitudinally spaced plain rollers 14 mounted for rotation about vertical axes and adapted to bear upon the back of and to travel along the depending vertical flange 1b of the top rail of a track; the carriage is also furnished at the bottom (a little in advance of the rollers 14) with similarly spaced circumferentially grooved wheels 15 mounted to rotate about horizontal axes and arranged to engage and run along the upper edge of the upwardly directed flange 1a of the bottom rail of the said track—all as clearly shown in Figure 5. To place a carriage C on a track, all that is necessary is first to tilt the carriage, with its front up, so that the rollers 14 can be inserted between the rails of the track, then to place the wheels 15 upon the bottom rail and finally to allow the carriage to swing downwards until the rollers 14 come into contact with the top rail. Conversely, to effect disengagement of a carriage from a track, it is tilted to move the rollers 14 backwards out of contact with the top rail, and then lifted bodily off the bottom rail and drawn forwardly.

If desired, each of the carriages C may be provided at one end with an upstanding or otherwise appropriately disposed part adapted, when required to do so, to be brought into contact with and to push upon a carriage in the next track above or below. In this way, by pushing or pulling a carriage along one of a series of superimposed vertical tracks, another carriage or other carriages at a different level or levels can be simultaneously drawn along with it. For example, and as shown in Figures 6, 7 and 8 the top of the right-hand frame 10 of each carriage C may be provided with an upstanding lug 16 adapted for contact with the bottom of the corresponding end frame of the carriage on the track above.

A further advantage of the improved construction is that even greater access to work on a lower carriage can be readily obtained by moving aside the carriage on the next track above.

A conveyor of the improved construction may be arranged in a straight run, or it may be curved, or partially straight and partially curved, according to requirements. Where a conveyor system including sharply curved sections is adopted, then the appropriate wheels or rollers of the carriages may be mounted to swivel, thereby enabling the carriages to take the curves without coming adrift.

As hereinbefore mentioned to economise in factory floor space, conveyors, or conveyor sections, of the improved construction are arranged closely back to back as in the illustrated example. In one such layout, an endless system comprises two comparatively long straight sections arranged back to back, the ends of these sections being joined by looped sections of sufficient dimensions to enable carriages to travel continuously forwards, i. e. along the tracks of one longitudinal section, then around a looped section at one end of the endless conveyor, then along the tracks of the other longitudinal section, and finally around the looped section at the opposite end.

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Usually a conveyor, however arranged, will be used in conjunction with a return track for returning empty carriages to the starting point or station of the track system. Such return track may have associated therewith means for automatically propelling carriages in the return direction.

For use in connection with the production of machine-sewn footwear, involving stages in the manufacture between which the articles require to dry, a conveyor of progressively looped or tortuous form may be used, portions of the tracks of such a conveyor being so curved and disposed in relation to the production line as to convey the work, between machines or groups of machines, temporarily away from the line, the carriages returning into the line at desired intervals to enable the work to be dealt with in progressive stages. As will be understood, the fact that the work is carried out of the line between one machine or group of machines and the next affords time for the work to dry. But as continuous streams of carriages are travelling along the tracks, production is not held up. For example, between a seat lasting station and a last slipping station there may be provided a line of independent motorised machines, in which instance spaced portions of the tracks of the conveyor may extend direct from machine to machine whilst the intervening portions extend in the form of comparatively long loops to the rear of the production line. In conjunction with such a conveyor there would be provided a straight return track so disposed as to return the carriages back to the starting point by a direct route. Such a system would not be necessary for stuck work which does not require drying between stages.

In another arrangement, the tracks of a long conveyor may be divided, at a last slipping station, into two independent series of tracks. Stops of any suitable character, such as bars arranged transversely across the tracks, may be provided to effect this division. A typical stop bar is indicated at 17 at the right-hand end of Figure 2. On the portions of the tracks in advance of the said last slipping station would be provided carriages in the form of peg racks designed to carry lasts complete with lasted uppers, whilst on the remaining portions of the tracks would be provided carriages fitted with work-supporting loops. In association with each series of tracks there would be provided a single return track.

What I claim then is:

1. A conveyor for carrying articles and goods from station to station, comprising a supporting structure presenting an upright face, superimposed pairs of vertically separated parallel rails in the form of aligned lengths of angle iron attached to the said face to provide a plurality of tracks, the two aligned series of angle irons constituting each track being so arranged as to present upwardly directed and depending vertical flanges respectively with the flanges of the uppermost rail of each track being located in a plane closer to the supporting structure than the plane of the flanges of the lowermost rail of the track, and carriages each of which comprises a tray structure furnished at one side of the centre of gravity thereof with longitudinally spaced circumferentially grooved wheels mounted for rotation about horizontal axes and adapted to engage the upper edge of the upwardly directed vertical flange of the appropriate rail of a track, and also furnished at the same side of the centre of gravity

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thereof with similarly spaced plain rollers mounted for rotation about vertical axes and adapted to bear upon a face of the depending vertical flange of the other rail of the said track.

2. A conveyor for carrying articles and goods from station to station, comprising a supporting structure including spaced uprights, members which are attached to the faces of the said uprights, forwardly directed horizontal spigots secured to said members, superimposed pairs of vertically separated parallel rails in the form of aligned lengths of angle iron secured to the said spigots to provide a plurality of tracks, the two aligned series of angle irons constituting each track being so arranged as to present upwardly directed and depending vertical flanges respectively with the flanges of the uppermost rail of each track being located in a plane closer to the supporting structure than the plane of the flanges of the lowermost rail of the track, and carriages each of which comprises a tray structure furnished at one side of the centre of gravity thereof with longitudinally spaced circumferentially grooved wheels mounted for rotation about horizontal axes and adapted to engage the upper edge of the upwardly directed vertical flange of the appropriate rail of a track, and also furnished at the same side of the centre of gravity thereof with similarly spaced plain rollers mounted for rotation about vertical axes and adapted to bear upon a face of the depending vertical flange of the other rail of the said track.

3. A conveyor for carrying articles and goods from station to station, comprising a supporting structure, at least one track carried by said structure and including a supporting rail and a guide rail located above and in a plane closer to the supporting structure than the plane of said supporting rail, and at least one carriage for transfer along said track, such carriage including a body for receiving articles and goods to be transported, wheel means on said body for running on said supporting rail, upstanding means on said body, and further wheel means carried by said upstanding means and adapted to engage said guide rail, all said wheel means being located on one and the same side of the centre of gravity of said body when the latter is unloaded and in running position.

4. A conveyor for carrying articles and goods from station to station, comprising a supporting structure, superimposed pairs of vertically-separated parallel rails attached to said structure to provide a plurality of tracks, each track comprising a supporting rail and a guide rail located above and in a plane closer to the supporting structure than the plane of said supporting rail, and at least one carriage for transfer along said track, such carriage including a body for receiving articles and goods to be transported, wheel means on said body for running on said supporting rail, upstanding means on said body, and further wheel means carried by said upstanding means and adapted to engage said guide rail, all said wheel means being located on one and the same side of the centre of gravity of said body when the latter is unloaded and in running position.

5. A conveyor for carrying articles and goods from station to station, comprising a supporting structure presenting two frameworks arranged back to back and inclined towards each other, superimposed pairs of vertically separated parallel rails attached to each of said frameworks to provide a group of tracks thereon, each track including a supporting rail and a guide rail lo-

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cated above and in a plane closer to the supporting structure than the plane of said supporting rail, and at least one carriage for transfer along said track, such carriage including a body for receiving articles and goods to be transported, wheel means on said body for running on said supporting rail, upstanding means on said body, and further wheel means carried by said upstanding means and adapted to engage said guide rail, all said wheel means being located on one and the same side of the centre of gravity of said body when the latter is unloaded and in running position.

6. A conveyor for carrying articles and goods from station to station, comprising a supporting structure, superimposed pairs of vertically-separated parallel rails attached to said structure and mounted with each track offset outwards relatively to that next above it, each track including a supporting rail and a guide rail located above and in a plane closer to the supporting structure than the plane of said supporting rail, and carriages for transfer along the tracks, each carriage including a horizontal tray and wheel means for respective engagement with the supporting and guide rails of a track, said wheel means being disposed on the tray to locate the

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same projecting outwards relatively to the guide rail concerned.

7. A carriage for a monorail conveyor system, comprising a tray structure, wheel means on the underside of said tray structure for rotation about a horizontal axis, upstanding means on the tray structure, and further wheel means carried by said member or members for rotation about a vertical axis, all said wheel means being located on one and the same side of a fore and aft, medial line through said tray structure with said further wheel means being located a greater distance from the medial line than said wheel means.

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