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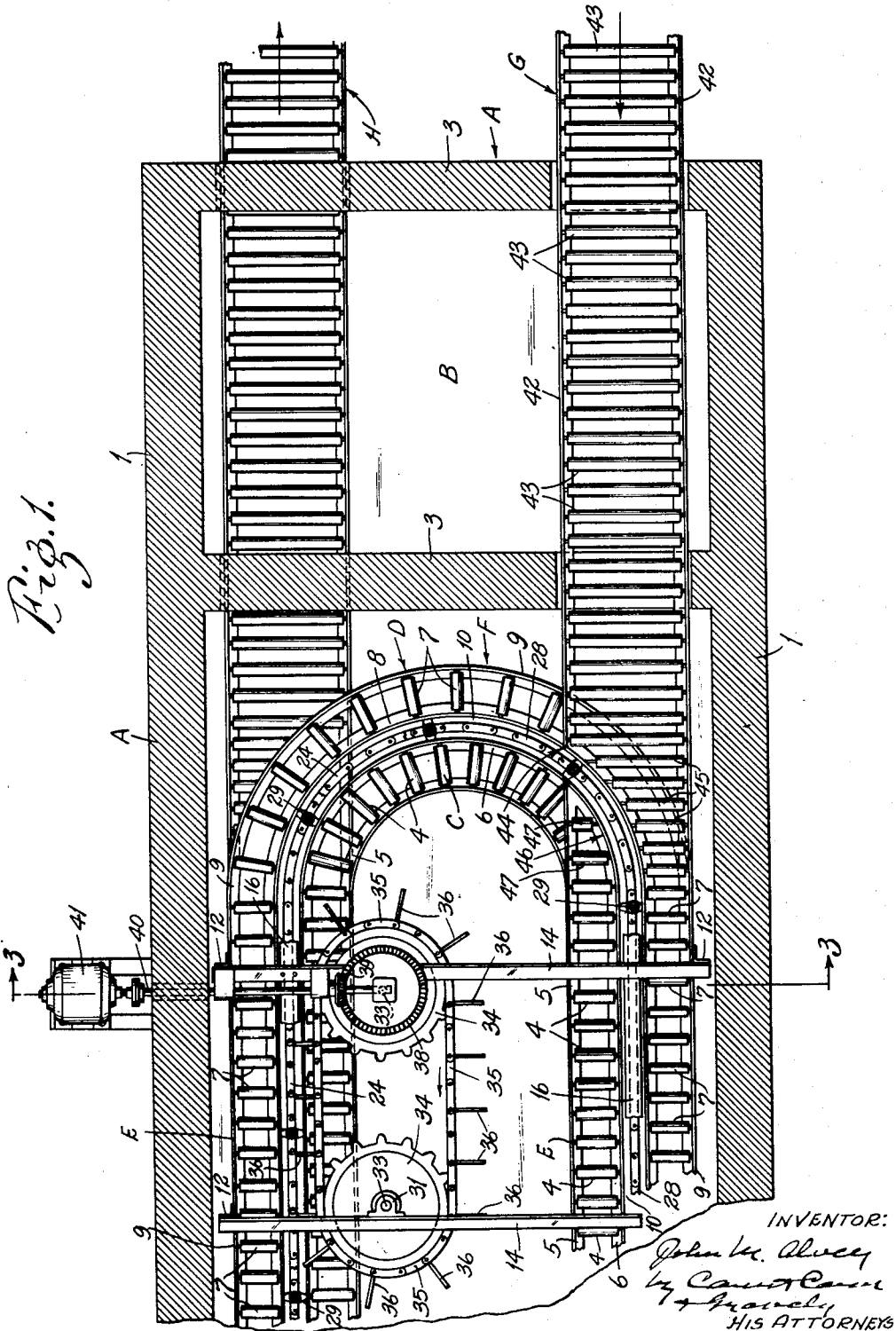
J. M. ALVEY

1,948,090

CONVEYER

Filed March 12, 1932

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Fig. 3.

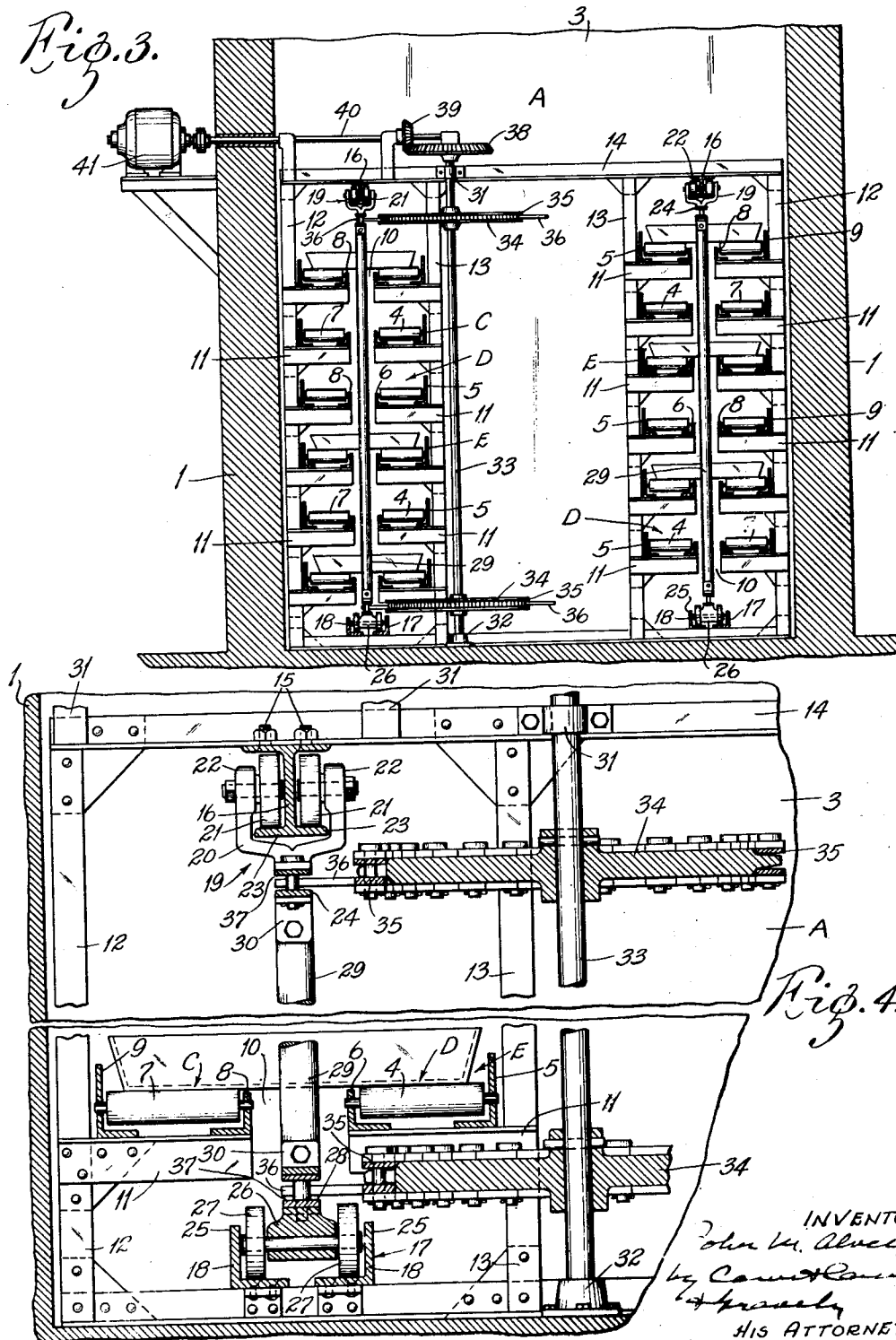


Fig. 4.

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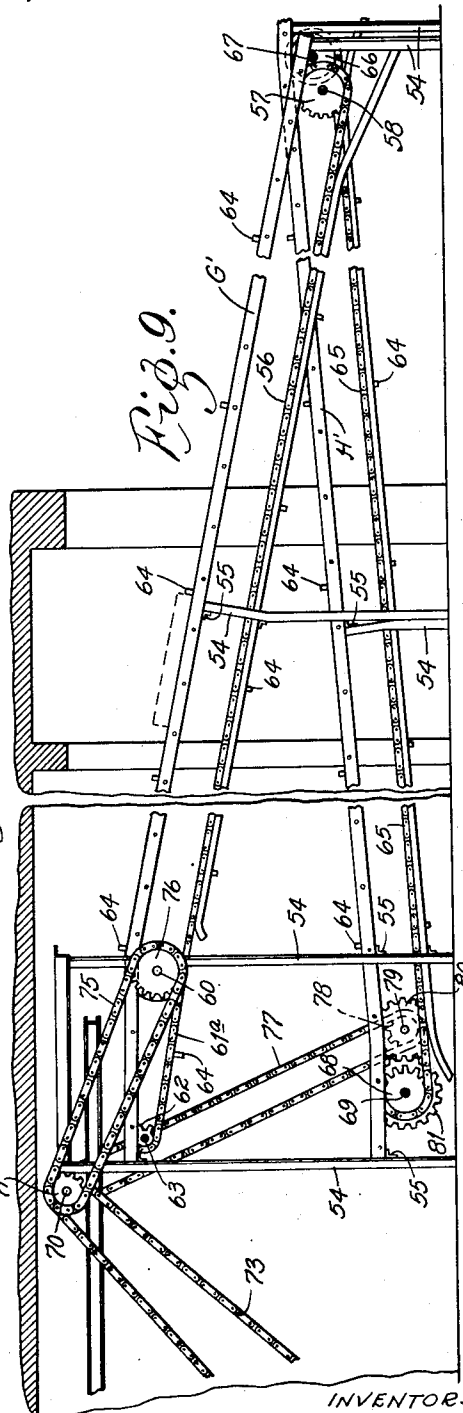
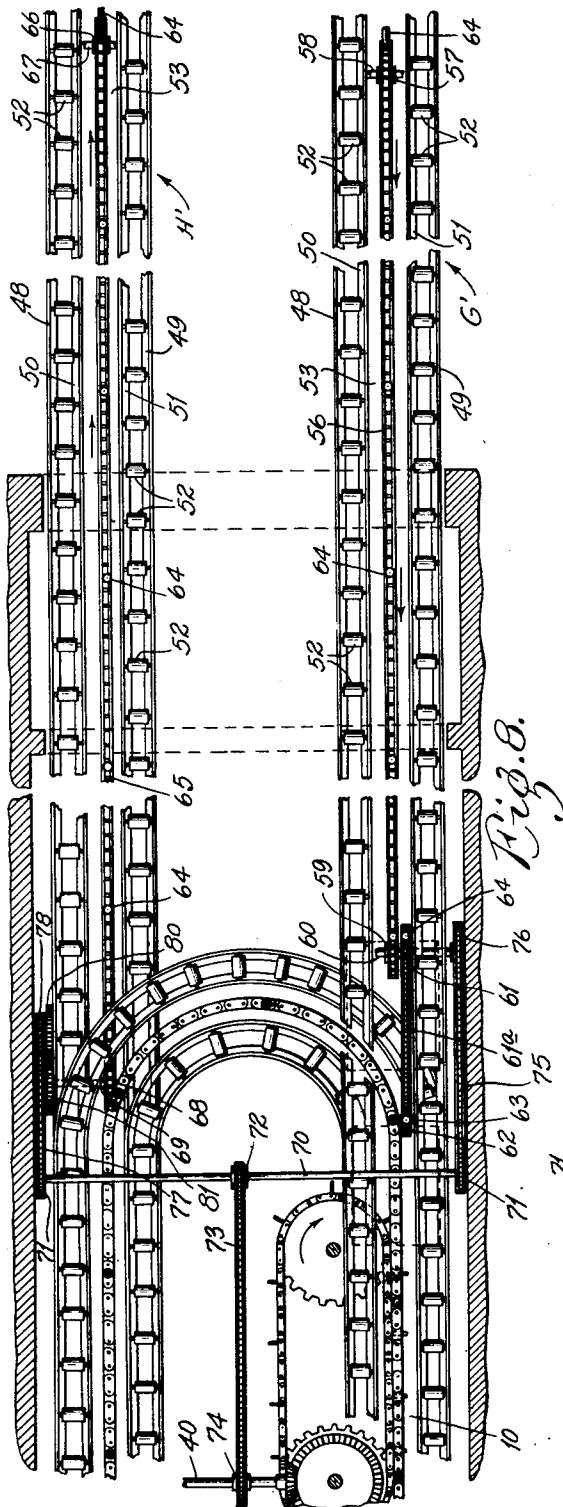
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4 Sheets-Sheet 4



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1,948,090

CONVEYER

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11 Claims. (Cl. 198—136)

This invention relates to conveyers, particularly to a tortuous conveyer for conveying articles through an enclosure which is limited in size such as an ice cream hardening room. In the ice cream industry, containers of cream are frozen by merely placing them in a hardening room having an extremely low temperature and after the cream is frozen, the containers are removed from the room; and one of the principal objects of the present invention is to provide a conveyer which will take a comparatively long path through a hardening room or the like whereby articles can be continuously sent through the room, whereby a large number of articles will be in the room at the same time and whereby each article will remain within the room for a considerable length of time. Another object of the invention is to arrange the conveyer in such manner that simple propelling means may be employed for controlling the movement of articles riding on the conveyer.

The invention consists principally in arranging a conveyer within an enclosure in a spiral-like manner and having the circuitous stretches thereof positioned one above the other and of such shape as to conform substantially to the walls of the enclosure. The invention further consists in providing a slot longitudinally of the conveyer whereby pusher bars extending through the slot and mounted between continuous parallel sprocket chains which are guided in the circuitous path of the various conveyer stretches will engage and propel articles on the conveyer. The invention also consists in the conveyer and in the parts and combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings which form part of this specification and wherein like symbols refer to like parts wherever they occur,

Fig. 1 is a plan view of the greater portion of a tortuous conveyer embodying my invention and mounted within a hardening room;

Fig. 2 is a plan view of the remaining portion of the tortuous conveyer being substantially a continuation of Fig. 1;

Fig. 3 is a vertical sectional view taken along the line 3—3 in Fig. 1;

Fig. 4 is a view on an enlarged scale of the top and bottom portions of the left hand side of Fig. 3;

Fig. 5 is a diagrammatic side elevation of the conveyer showing its path through the hardening room;

Fig. 6 is a diagrammatic plan view of Fig. 5;

Fig. 7 is a diagrammatic plan view of a modified form of tortuous conveyer embodying my invention;

Fig. 8 is a plan view similar to Fig. 1, showing the conveyer equipped with a modified form of feeding and discharging means; and

Fig. 9 is a side view of the greater portion of the construction shown in Fig. 8.

In the construction illustrated, I have shown my invention used in connection with an ice cream hardening plant comprising a long, narrow, rectangular-shaped hardening room A having side walls 1, a rear end wall 2, and a pair of spaced walls 3 at the front end of the room forming an insulating vestibule B. Winding around the inside of the room A in a spiral-like manner is a tortuous conveyer C having a continuous slope and forming a series of circuitous conveyer stretches D arranged one directly above the other; and each circuitous stretch D of the conveyer comprises comparatively long straight side portions E extending parallel to the side walls 3 of the hardening room A and curved end portions F located adjacent to the end walls of the hardening room. The tortuous conveyer C comprises an inner series of rollers 4 supported by side rails 5 and 6 and an outer series of rollers 7 supported by side rails 8 and 9; and the adjacent middle side rails 6 and 8 of each series of rollers are spaced apart so as to define a continuous medial slot 10 extending longitudinally of the conveyer C. The adjacent middle side rails 6 and 8 are disposed below the carrying surface of the rollers so as not to interfere with the passage of articles traveling upon the two series of rollers whereas the outer side rails 5 and 9 extend above the carrying surface of the rollers and constitute side guides for articles traveling on the two series of rollers.

The side rails 8 and 9 supporting the outer series of rollers are mounted on and secured to horizontal brackets 11 which are secured to upright members 12 located adjacent to the walls of the hardening room A, whereas the side rails 5 and 6 supporting the inner series of rollers are mounted on and secured to upright members 13 which extend from the floor of the hardening room A around the center thereof; and the upright members 12 and 13 are secured at their tops to transverse members 14 extending across the hardening room above the top flight of the tortuous conveyer.

Mounted on the under side of the transverse members 14 and secured thereto by means of bolts 15 is a circuitous I-beam track 16 disposed in vertical alinement with the medial slot of the

tortuous conveyer; and another circuitous track 17 comprising two adjacent parallel angle members 18 that are secured to the floor of the refrigerating room extends parallel to the upper I-beam track 16. Supported on the I-beam track is a series of trolleys 19 comprising U-shaped stirrup members 20 having rollers 21 journaled on their branches 22 which run on the lower flange 23 of the I-beam track 16; and the trolleys 19 support a continuous sprocket chain 24. Mounted at regular intervals between the upright flanges 25 of the lower track is a series of hub-like members 26 having rollers 27 on their ends which are guided by the upright side flanges 25 of the adjacent parallel angle members 18 forming the lower circuitous track 17; and mounted on the tops of the hub members 26 is a continuous sprocket chain 28 extending parallel to the upper continuous sprocket chain 24 supported by the I-beam track. Mounted between the upper and lower continuous sprocket chains 24 and 28 at regular intervals is a series of vertically disposed pusher bars 29. These pusher bars are bolted to small angle brackets 30 which are bolted to the chains and they extend through the medial slot 10 of the tortuous conveyer and are adapted to travel in the uninterrupted space defined by the medial slot for engaging and propelling articles along the tortuous conveyer.

Mounted in vertical bearings 31 provided on the side of the transverse members 14 near the front of the hardening room and in step bearings 32 on the hardening room floor are two spaced vertical shafts 33. Each of these shafts 33 carries horizontal sprocket wheels 34 near the top and bottom thereof; and these sprocket wheels 34 are disposed in the same horizontal plane as that of the respective pusher bar chains. Trained around the sprocket wheels 34 are two continuous parallel sprocket wheel chains 35, and these chains 35 are provided with outwardly extending pins 36 which have driving engagement with the pusher bar chains as by extending into openings 37 provided therefor in the sides of the pusher bar chains. Fixed on the top of the vertical shaft 33 nearest the front of the hardening room is a bevel gear 38 meshing with another bevel gear 39 which is fixed on the end of a horizontal shaft 40 extending through the side wall of the hardening room and driven by suitable motor 41; and, when the motor is driven this causes the driving sprocket wheel chains to drive the pusher bar chains around their guided paths.

In the construction illustrated in Fig. 1, articles are introduced through the vestibule B onto the tortuous conveyer by a straight inclined gravity roller conveyer G joining with the upper end thereof near the front corner of the hardening room. The conveyer G comprises side rails 42 supporting rollers 43 of substantially the combined width of the two series of rollers constituting the carrying surface of the tortuous conveyer. As the feeding conveyer joins with the tortuous one, its outer side rail is curved inwardly of the feeding conveyer as at 44 and merges into the middle side rail 8 supporting the outer series of rollers; and rollers 45 of successively smaller lengths are supported between this curved side rail and the outer side rail of the feeding conveyer which forms a continuation of the outer side rail 9 supporting the outer series of rollers of the tortuous conveyer. The middle side rail 6 of the inner series of rollers of the tortuous conveyer curves as at 46 so as to extend parallel to the curved side rail at the end of the feeding conveyer

until it reaches the inner side rail 5 of the inner series of rollers; and rollers 47 of successively smaller lengths are supported along this portion of the conveyer. This arrangement of side rails and rollers at the junction of the feeding conveyer and the tortuous one insures proper movement of articles from the feeding conveyer onto the upper end of the tortuous conveyer and avoids blocking of the medial slot of the tortuous conveyer so as to permit entrance of the pusher bars into the medial slot at the upper end of the tortuous conveyer. Articles are discharged from the lower end of the tortuous conveyer onto another straight inclined gravity conveyer H which is of similar construction to that of the feeding conveyer G and which carries articles out of the hardening room through the vestibule B.

In the construction illustrated in Figs. 8 and 9, power driven feeding and discharging conveyers G' and H' are used instead of the inclined gravity conveyers H and G, respectively, of the construction shown in Fig. 1. These power driven conveyers are used where it is necessary, or desirable, to feed and discharge articles at approximately the same level outside the hardening room. The conveyers G' and H' comprise outer side rails 48 and 49, and inner side rails 50 and 51, supporting a double series of rollers 52 forming a roller carrying surface with a medial slot 53, similar to that of the tortuous conveyer. These side rails are mounted and supported in any suitable manner, such as by being secured to upright members 54, extending from the floor of the hardening room and the floor of the structure or building outside the hardening room, and suitable transverse bracing members 55 are fixed to the underside of the rails. The feeding conveyer G' is inclined upwardly from its initial feeding point outside the hardening room to a point near the upper end of the tortuous conveyer within the room, and it is then disposed horizontally until it joins with and merges into the end of the tortuous conveyer. The discharge conveyer H' forms a continuation of the straight portion of the lower end of the tortuous conveyer for a short distance, and it is then inclined upwardly to the discharge end thereof outside the hardening room.

Traveling within the medial slot of the feeding conveyer G' is the upper reach of a continuous sprocket wheel chain 56 that is mounted around a sprocket wheel 57 fixed on a horizontal shaft 58 at the end of the conveyer G' outside the hardening room and another sprocket wheel 59 fixed on a horizontal shaft 60 that is mounted in a bearing provided on the upright member 54 near the front end of the hardening room. Also fixed on this shaft 60 is a second sprocket wheel 61 having another continuous sprocket wheel chain 61a mounted therearound which is mounted around another sprocket wheel 62 fixed on a horizontal shaft 63 that is located adjacent to the upper end of the medial slot 10 of the tortuous conveyer. The two sprocket wheel chains 56 and 61 are provided with outwardly extending stub pusher pins 64 which are spaced apart the same distance as that of the pusher bars of the tortuous conveyer, and these stub pusher pins 64 are adapted to engage the end portions of articles for propelling them along the conveyer. Traveling within the medial slot 53 of the discharge conveyer H' is the upper reach of another chain 65 that is also provided with stub pusher pins 64 and this continuous chain 65 is mounted on a sprocket wheel 66 fixed on a horizontal shaft 67 supported at the end of the conveyer and another sprocket

wheel 68 fixed on a shaft 69 supported adjacent to the lower end of the medial slot of the tortuous conveyer, and this chain, with its stub pusher pins, is adapted to propel articles along the dis-

charge conveyer H'.
 Suitably supported above the tortuous conveyer near its front end is a horizontally disposed shaft 70 that is provided with a sprocket wheel 71 at each end and a third sprocket wheel 72 intermediate the end sprocket wheels. Mounted around the intermediate sprocket wheel 72 is a continuous sprocket wheel chain 73 that is mounted around a sprocket wheel 74 fixed on the horizontally disposed shaft 40 that is operatively connected to the motor 41 for driving the pusher bars around the tortuous conveyer. The one end sprocket 71 has a continuous sprocket chain 75 mounted therearound which is mounted around another sprocket wheel 76 fixed on the end of the shaft 60. The sprocket wheel 71 on the opposite end of the shaft 70, has another continuous sprocket wheel chain 77 mounted therearound which is mounted around a sprocket wheel 78 fixed on a suitable stub shaft 79 extending parallel to and located near the shaft 69 at the discharge end of the tortuous conveyer; and this shaft 79 has a gear 80 fixed thereon meshing with another gear 81 fixed on the shaft 69.

Obviously, the hereinabove described driving means for the propelling chains of the feeding and discharging conveyers and those for the pusher bar chains of the tortuous conveyer are operable conjointly; and it is to be understood that the sizes of the various driving sprocket wheels and gears are so chosen that the stub pusher pins for propelling articles on the conveyers G' and H' will travel at the same rate of speed as that of the pusher bars for propelling articles along the tortuous conveyer within the hardening room.

In the operation of my conveyer system which is equipped with the gravity type of feeding and discharging conveyers, articles are placed one at a time on the feeding conveyer G outside of the vestibule and by their own weight travel through the vestibule onto the upper end of the tortuous conveyer in the hardening room. At this point the articles are engaged by the vertically disposed pusher bars 29 which propel them around and down the various circuitous stretches of the tortuous conveyer until they reach the lower end thereof; and obviously, a single pusher bar is capable of simultaneously engaging and propelling articles on each of the different conveyer stretches. At the lower end of the conveyer, the articles are discharged onto the lower straightway conveyer H and here again, on account of their own weight, they travel out of the hardening room through the vestibule.

In the operation of my conveyer system which is equipped with power driven feeding and discharging means, the articles are placed on the feeding conveyer G' one at a time so that each article is engaged by a single pusher stub pin which propels them up the inclined feeding conveyer and onto the upper end of the tortuous conveyer. At this point, each article is successively engaged by the pusher bars of the tortuous conveyer and propelled therearound to the lower end thereof, since the pusher bars are arranged to travel at the same speed as the pusher stub pins and spaced the same distance apart, a smooth transfer of articles from the feeding conveyer onto the upper end of the tortuous conveyer is insured; and there is also no chance of the articles

jamming or bumping into each other at any point along the entire conveyer system. When each article reaches the lower end of the tortuous conveyer, it is then transferred onto the discharging conveyer and propelled therealong by the pusher stub pins.

While I have shown and described my invention as being used for carrying articles through a rectangular-shaped room; it is obvious that my invention readily lends itself to carrying articles, packages, or trays, into almost any kind of tortuous path, even, for instance, such an irregular winding path as is shown diagrammatically in Fig. 7. In this case, the various stretches of the tortuous conveyer take a winding path conforming substantially to the walls of an H-shaped inclosure; and obviously, by guiding the pusher bar chains in a path in vertical alinement with the various flights of the H-shaped conveyer, the pusher bars could be made to propel articles along this kind of conveyer in accordance with my invention. Furthermore, instead of using a roller carrying surface, it may be feasible to substitute therefor a sheet metal slide or the like; and as many other changes may be desirable and as the operation of my tortuous conveyer may be reversed so as to transfer articles from a lower level to a higher one without departing from the spirit of my invention, I do not wish to limit the invention to the precise construction shown and described.

What I claim is:

1. In combination, a plurality of spaced tortuous rollerways, a movable member in position to simultaneously engage articles on different rollerways, and a circuitous track for supporting said movable member along said rollerways.
2. In combination, a plurality of spaced continuous rollerways positioned one above the other, said rollerways having longitudinal medial slots disposed in vertical alinement with each other, a track extending in vertical alinement with said slots, a chain movably mounted on said track, and a pusher bar extending from said chain through said slots for simultaneously engaging articles on the different rollerways to control the movement of said articles thereon.
3. In combination, a tortuous conveyer having a spirally arranged rollerway provided with a longitudinal medial slot, an endless circuitous track extending in vertical alinement with said slot, an endless flexible member movably mounted on said track, and pusher bars extending from said flexible member through said slot for engaging and controlling the movement of articles on the spiral rollerway of said tortuous conveyer.
4. In combination, a tortuous conveyer having a spirally arranged rollerway, said rollerway having a continuous medial slot, a circuitous endless track located above said tortuous conveyer and disposed in vertical alinement with the medial slot, an endless chain movably suspended from said track, a second circuitous endless track located below said conveyer and disposed parallel to the upper track, a second endless chain movably mounted on said lower track and pusher bars mounted between and secured to said chains, said pusher bars extending through the medial slot, and means for driving said pusher bar chains whereby the pusher bars will engage and control the movement of articles on the spiral rollerway of tortuous conveyer.
5. In combination, a conveyer, an endless track extending in alinement therewith, an endless chain movably mounted on said track, pusher

- members extending from said chain in position to engage articles on said conveyer, and an endless chain located adjacent to one of the stretches of the first mentioned chain, said second mentioned chain having members extending therefrom which have driving engagement with the adjacent stretch of said first mentioned chain for moving the same along said track to cause said pusher members to engage articles on said conveyer for controlling the movement of the articles thereon.
6. In combination, a tortuous conveyer having a longitudinal slot, a movable member, a track for guiding said movable member in alinement with said slot, a plurality of spaced pusher bars extending from said movable member and extending through said slot for controlling the movement of an article on said tortuous conveyer, a second conveyer communicating with said tortuous conveyer, a second movable member for traveling in alinement with said second conveyer, a plurality of spaced pusher members extending from said second movable member for controlling the movement of an article on said second conveyer, said pusher bars and said pusher members being spaced the same distance apart, and means operatively connected to the two movable members to cause them to move at the same rate of speed.
7. In combination, a plurality of conveyer stretches, a track extending in alinement therewith, a member supported on a pair of rollers running on said track, and a pusher bar fixed to said member between said pair of rollers for simultaneously engaging articles on different conveyer stretches.
8. In combination, a plurality of spaced tortuous conveyer stretches, a track extending in alinement therewith, trolleys movably suspended from said track, a flexible member supported by said trolleys, and a member depending from said flexible member directly below said trolley in position to simultaneously engage articles on different conveyer stretches.
9. In combination, a plurality of spaced tortuous conveyer stretches, a track extending in alinement therewith and comprising spaced rails, a member provided with rollers for running on the respective rails of said track, a sprocket chain fixed to said member, and a pusher bar extending from said sprocket chain intermediate said rails for simultaneously engaging articles on different conveyer stretches.
10. In combination, a plurality of spaced tortuous conveyer stretches, a track comprising spaced rails extending in alinement therewith, hub members provided with rollers for running on said rails, a sprocket chain supported on said hub members, and pusher bars extending from said sprocket chain at its points of connection with said hub members for simultaneously engaging articles on different conveyer stretches.
11. In combination, a plurality of spaced rollerways having longitudinal slots, an I-beam track located above said rollerways and disposed in alinement with said slots, trolleys running on said track, a sprocket chain fixed to said trolleys, a track located below said rollerways and disposed in alinement with said slots, said track comprising spaced angle bar rails, members having rollers for running on the rails of said lower track, a sprocket chain fixed to said members, and pusher bars extending through said slots and fixed to said sprocket chains at points of connection with said trolleys on the upper track and the roller supported members on the lower track.

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