

March 20, 1945.

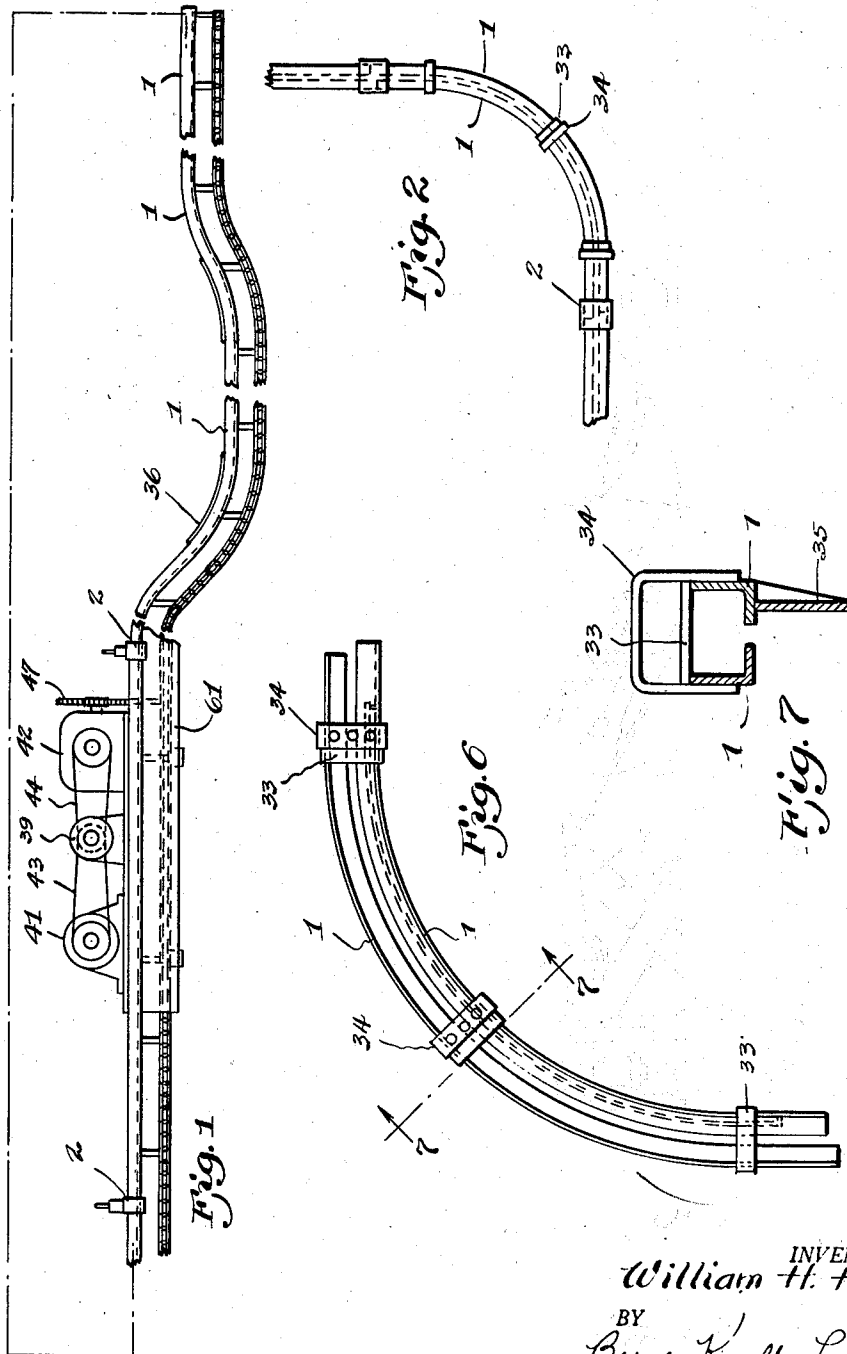
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2,371,624

CONVEYER

Filed July 15, 1942

7 Sheets-Sheet 1



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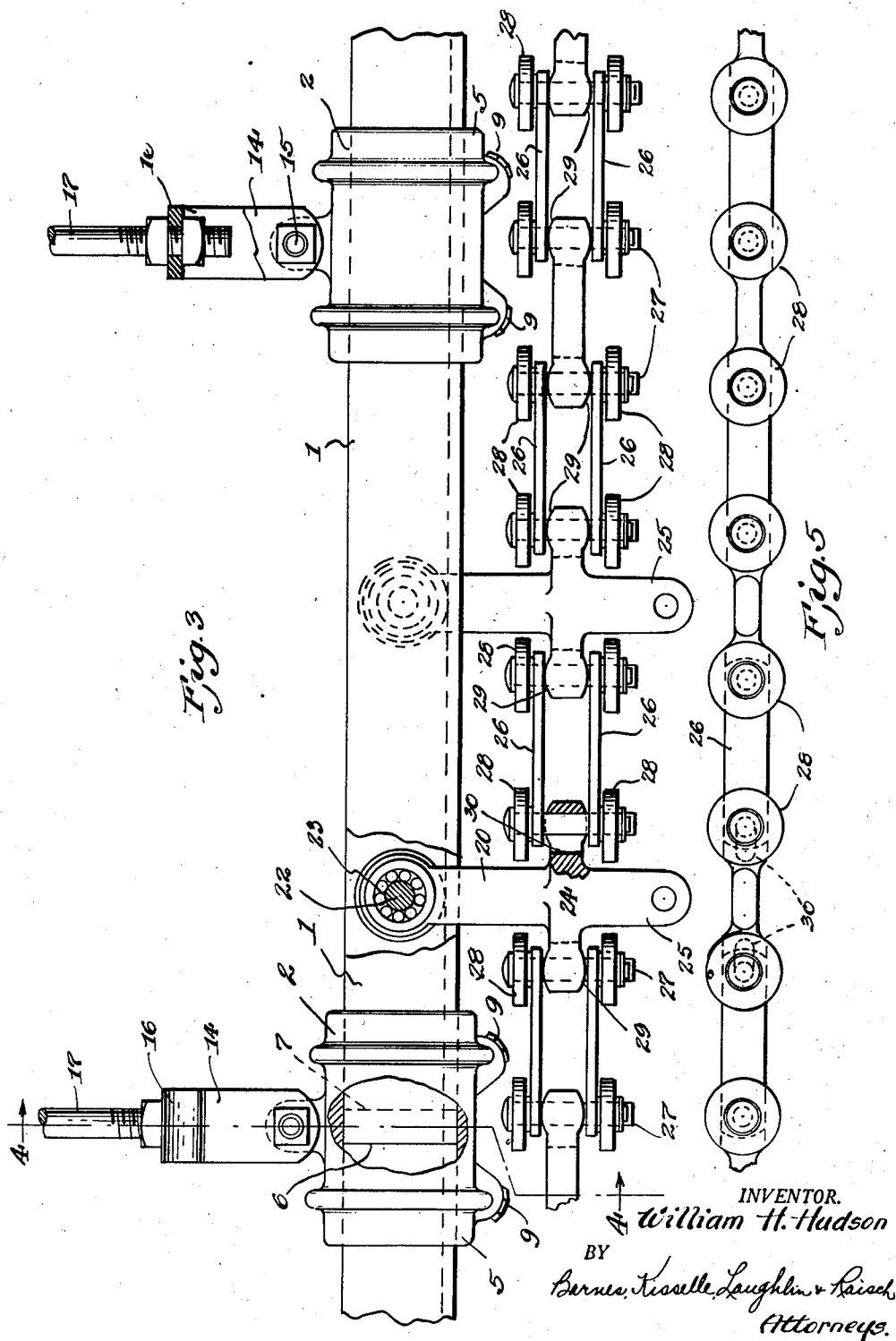
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7 Sheets-Sheet 2



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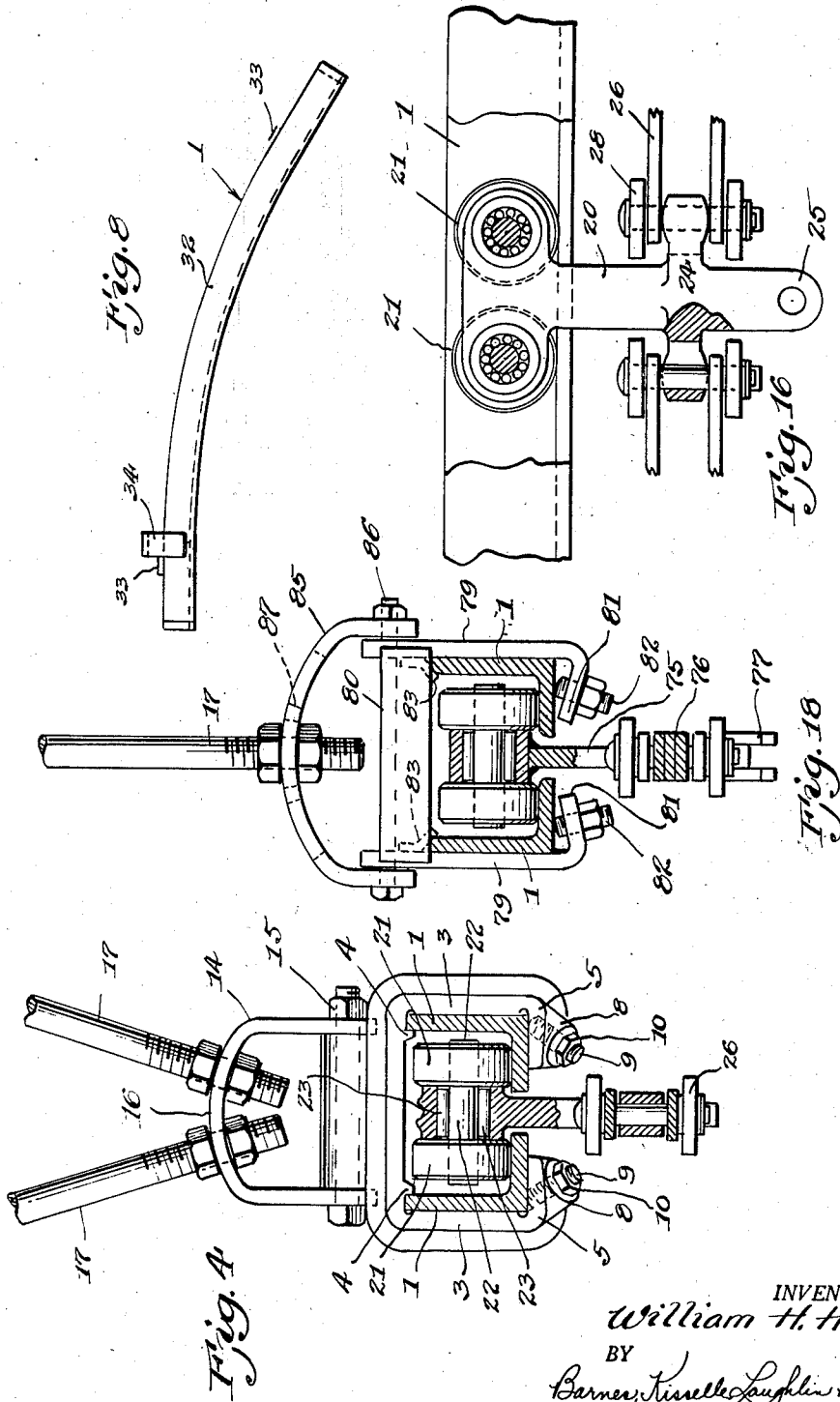
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CONVEYER

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7 Sheets-Sheet 3



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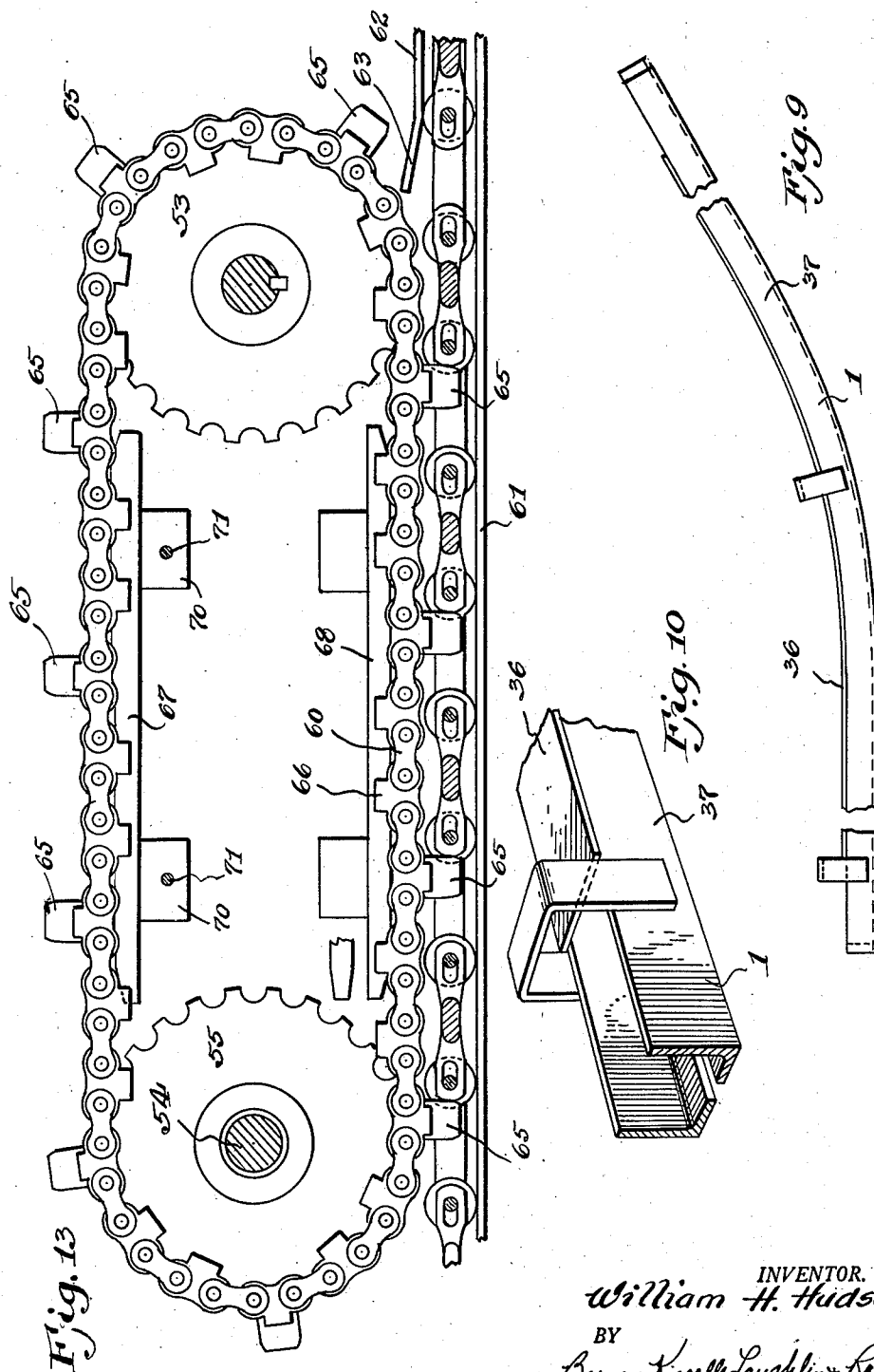
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7 Sheets-Sheet 4



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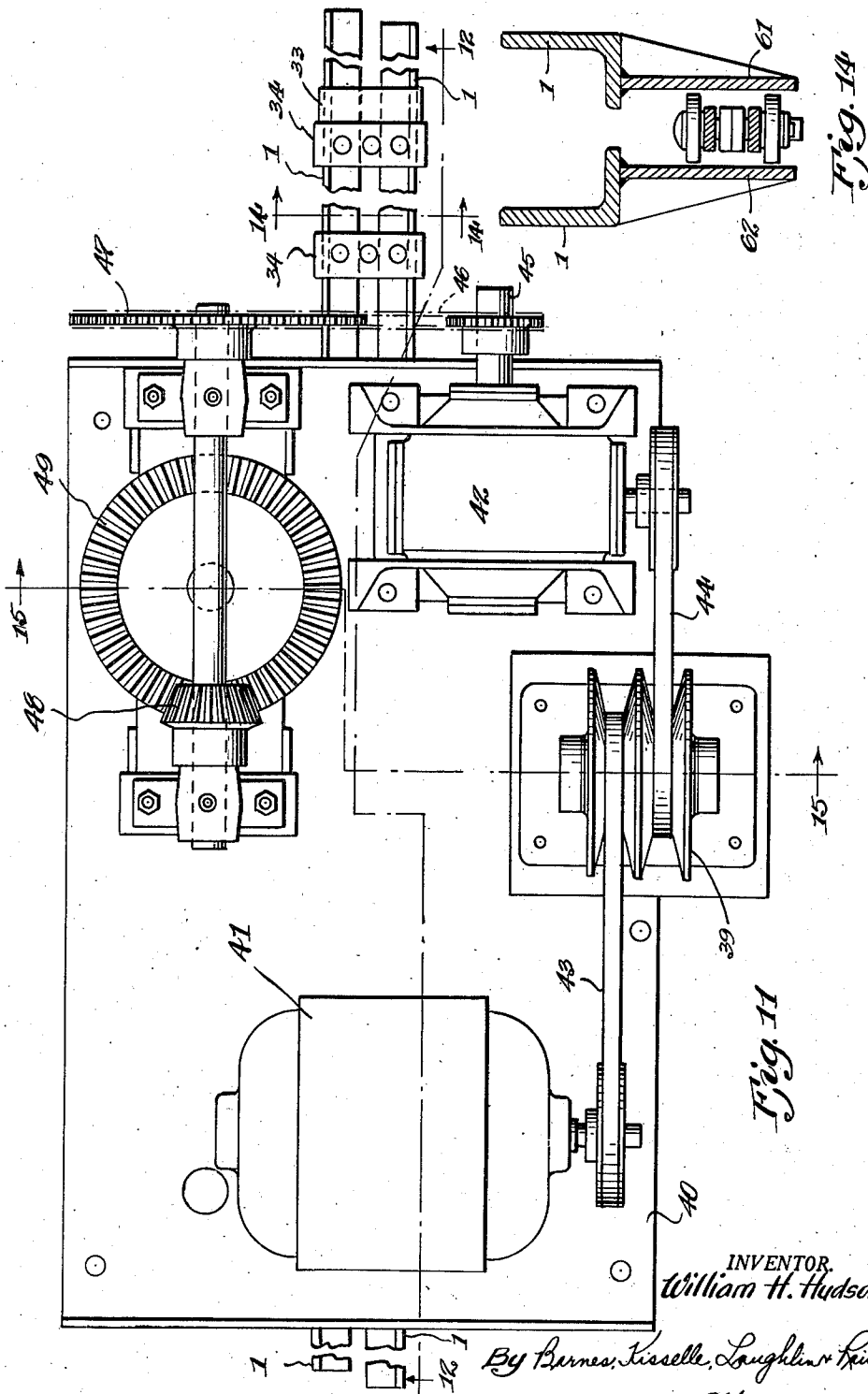
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CONVEYER

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7 Sheets-Sheet 5



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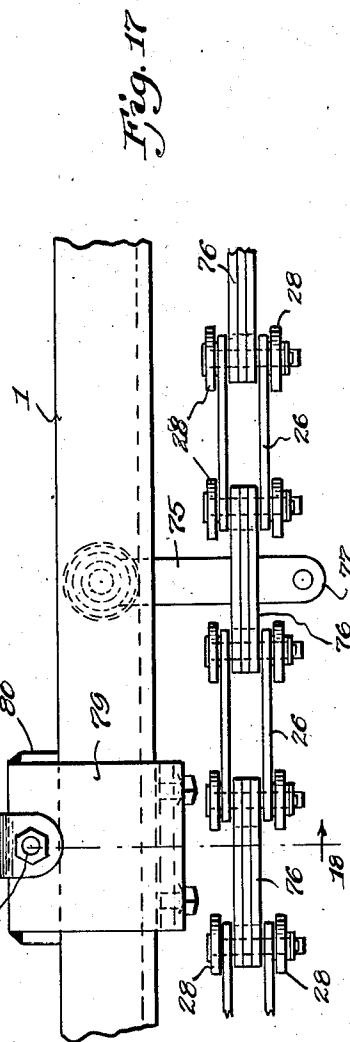
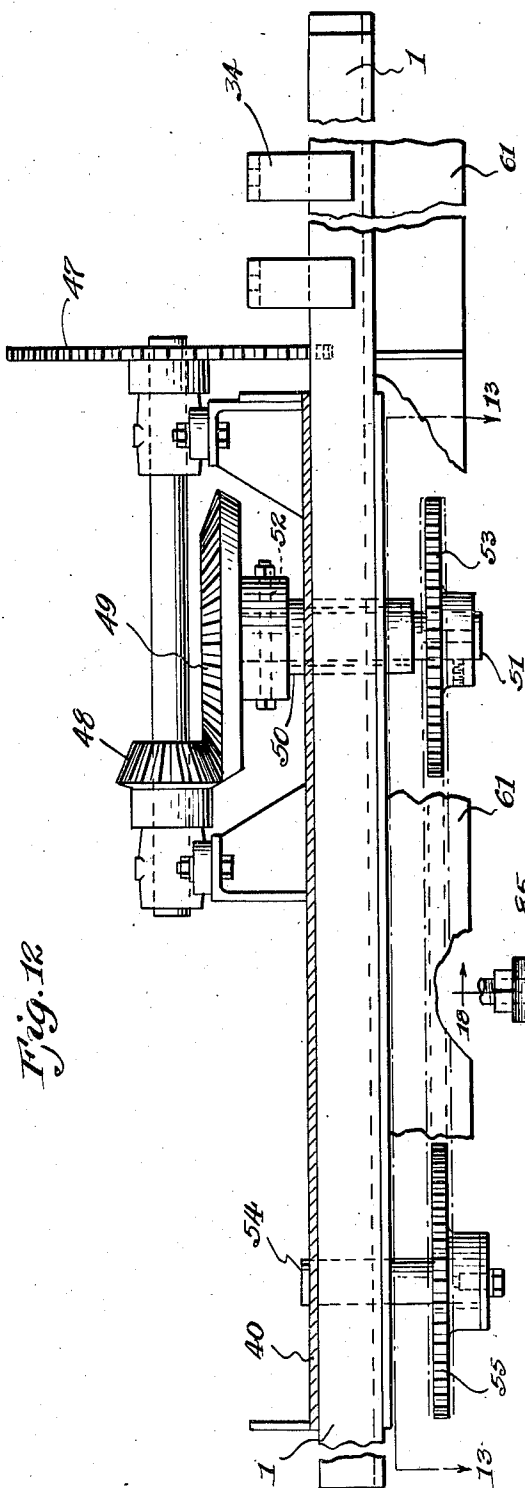
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CONVEYER

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7 Sheets-Sheet 6



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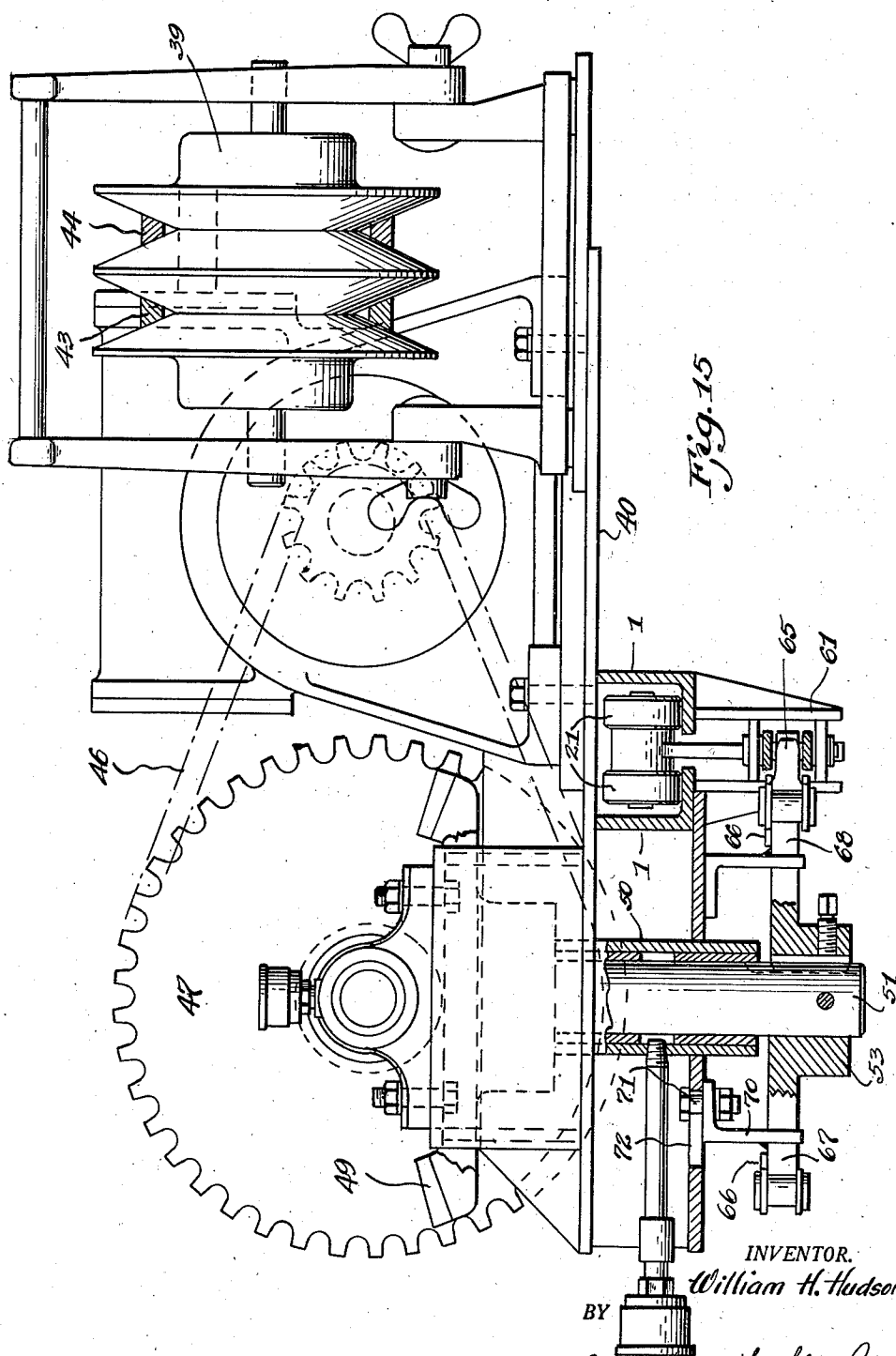
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CONVEYER

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7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE

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CONVEYER

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5 Claims. (Cl. 198—177)

This invention relates to conveyers for carrying and conveying work pieces in a factory or the like.

While such conveyers have been extensively used, particularly in the automotive and related industries, the manufacture, fabrication and installation of a conveyer in a particular plant or factory has been and is now quite expensive. Since the factories or buildings vary in construction and layout and since the requirements of different factories vary over a wide range, it has been practically the universal practice to first send a conveyer engineer into the plant and then, based on his findings and recommendations, a conveyer system is "tailor made," so to speak, for that particular installation. Moreover, many factories require only a relatively light conveyer system but they are obliged to use an unnecessarily heavy and accordingly unnecessarily expensive construction.

The principal object of this invention is to provide a conveyer system which can be manufactured more or less on the production basis and which, due to its nature and construction, can be relatively easily installed. It is the aim of the invention to provide a conveyer system comprised largely of standard parts and elements, and, moreover, a system where such standard parts or elements are relatively few in number. The purpose and idea is to provide a conveyer which will carry a reasonably heavy load but which, due to its simplicity of construction and installation, and due to the fact that it can be made of standard parts, the conveyer can be obtained and used at costs which are economical for work of a very light nature.

There are a number of features of novelty in the conveyer which makes possible the above purposes. These include a novel track construction for the trolleys which can be fabricated largely from standard iron lengths, such as angle iron, supported and united together by novel connectors which may serve either as connectors or hangers or both. At the location of curves or turns in the track standard sections are provided. The conveyer includes a chain and a novel chain construction is afforded for facilitating movement thereof through the track and through the curves therein in any direction.

One of the difficult problems in a chain conveyer is that of the provision of means for taking up the slack in the chain. Heretofore this has required a rather expensive installation embodying an adjustable sprocket whose axis must be strongly and adjustably mounted. In many cases the sprocket has to be of considerable size so that

the radius is large enough to permit of the work pieces carried by the chain to move through an arc on the radius without objectionable interference. In accordance with my invention I dispense with means for taking up slack in the chain; to the contrary, I provide a novel arrangement for the accumulation of slack while at the same time supporting the chain and the work as efficiently and strongly as though there were no slack in the chain.

These and other items of novelty, including other objects, will be more readily understood as the following detailed description is considered in conjunction with the accompanying drawings.

In these drawings:

Fig. 1 is a side elevational view illustrating, somewhat diagrammatically, a part of a conveyer system.

Fig. 2 is a view showing a horizontal turn in the track.

Fig. 3 is an enlarged view with parts cut away showing the track, the conveyer chain and the trolleys.

Fig. 4 is a cross-sectional view taken substantially on line 4—4 of Fig. 3, showing a connector and supporting bracket and showing the track and trolley structure.

Fig. 5 is a top plan view of a section of the conveyer chain.

Fig. 6 is a view showing a curved track section for a curve or bend in the track in a horizontal plane.

Fig. 7 is a sectional view taken on line 7—7 of Fig. 6.

Fig. 8 is a view of a section of track providing a curve or bend in a vertical plane.

Fig. 9 is a view showing a section of track providing another bend or curve in a vertical plane.

Fig. 10 is a perspective view showing the end of the curved section illustrated in Fig. 9.

Fig. 11 is a top plan view of the drive unit, which unit also includes a track section.

Fig. 12 is a sectional view taken substantially on line 12—12 of Fig. 11 showing some of the drive unit structure.

Fig. 13 is a view taken substantially on line 13—13 of Fig. 12 showing the drive means and the conveyer chain associated therewith.

Fig. 14 is a sectional view taken substantially on line 14—14 of Fig. 11 showing the arrangement for the accumulated slack in the chain.

Fig. 15 is a sectional view taken substantially on line 15—15 of Fig. 11.

Fig. 16 is a view showing a modified form of trolley for carrying heavier work pieces.

Fig. 17 is a view showing a modified form of track and chain structure.

Fig. 18 is an enlarged sectional view taken substantially on line 18—18 of Fig. 17.

By referring first to Figs. 3 and 4, it will be seen that the track for the conveyer system takes the form of angle iron rails positioned so that one leg is vertical and the other horizontal. A combined connector and hanger which may be a malleable casting is illustrated at 2. The interior of the hanger is provided with faces 3 for engaging the vertical legs of the angles and with projections 4 which provide a groove for the reception of the edge of the upstanding leg of the angle. The hanger has supporting parts 5 underlying the track sections. Preferably the joint in one rail is offset relative to the joint in the other, as shown in Fig. 3, where the joint in one rail is shown at 6 and the other at 7. The hanger is provided with bosses 8 drilled and tapped for the reception of clamping screws 9 which may be locked by nuts 10. These bosses and the screws therein are disposed so that the clamping or setting screws project angularly in two directions so that when the screws bite into the track, the track sections are lined up with each other and held in the connector. As shown in Fig. 4, the setting screws are positioned to converge inwardly toward each other so that as one screw bites into one track section and the other bites into the meeting track section, the two sections are urged and held toward each other in abutting relationship. As shown in Fig. 4, the setting screws also diverge upwardly and outwardly so that the top of each rail is abutted against and accurately positioned in the groove formed by the projection 4, and with the vertical leg of the rail abutted and held against the surface 3. It will be seen, therefore, that the element 2 serves as a connector for joining the ends of the track sections. However, the element 2 can not only be used as a connector but also as a hanger as any number of them can be placed along the track for hanging purposes, as illustrated in Fig. 1.

A yoke 14 is pivotally connected to the hanger as at 15 and this yoke has an arcuate bight 16 provided with a slot so that one or two supporting rods 17 may be secured thereto by nuts as shown. Due to the fact that the yoke can swing on its pivotal connection, the rods 17 may be extended angularly upwardly to be attached to an overlying supporting structure which does not happen to be directly vertically above the point where the track must be supported. Also, the rods 17 may extend angularly relative to the bight of the yoke by the adjustment thereof in the elongated slot. This construction makes for flexibility in the installation of the system and minimizes special work and the provision of special supporting means or the like. A hanger rod does not even have to be bent to properly locate it as the yoke structure practically forms a universal joint between the track and the supporting rods.

The trolley comprises a body member 20 which depends from a pair of rollers 21, each riding on a horizontal leg of the angle track members. The axle 22 for the rollers passes through an aperture in the body, preferably with an anti-friction bearing, such as a roller bearing, comprising rollers 23. The member 20 may be a malleable casting and it is formed with an integral link section 24 and a depending part or clevis 25 upon which the work is to be hung. The chain is completed by links 26 pinned to the ends of the

link sections 24 and on each pin 27 are rollers 28, the purpose of which will presently appear. Moreover, the ends of the link sections 24 have rounded upper and lower surfaces as at 29 and the apertures for the pins are elongated as shown at 30 so that the chain is capable of providing considerable slack. Also the rounded surfaces 29 in conjunction with the slack permit the chain to move through an arc in a vertical plane so that the conveyer can be extended to different elevations.

In Fig. 6 a 90° horizontal curve section is shown comprising the two curved angle tracks 1 with their ends offset as previously described. This section is a one-piece part or element, the tracks being united by means such as bars 33 welded thereto while hangers 34 of inverted U-form may also be welded thereto. The bight portions of these hangers are apertured for receiving the supporting rods. An additional guide plate is provided on the inside track section. This guide plate is shown at 35 and it depends from the inside track and provides a surface upon which the rollers 28 function in the operation of the conveyer.

The section shown in Fig. 8 at 32 is for a curve or radius in a vertical plane, the two track sections being bent as shown and united by the bars 33 welded thereto and the section may also be provided with one or more of the hangers 34. This curved section is for use in joining a horizontal run of track with an inclined section extending downwardly. (See Fig. 1.)

The section shown at 37 in Fig. 9 is for a curved part of the track which connects a section of low elevation with sections which incline upwardly therefrom, as shown in Fig. 1. The two track sections are curved as shown and overlying the sections is a plate 36 which closes the top of the track and which preferably extends tangentially beyond the ends of the curve. This plate may serve to hold the two track sections together and the section may also be provided with one or more of the hangers 34. Again the ends of the two tracks are offset of each other.

Now it will be observed that with this construction a factory or plant, which may be relatively remote from the manufacture of the conveyer parts, may purchase standard lengths of angle iron for a main track section. The conveyer manufacturer may supply the factory or plant with the chain, the combined hangers and connectors, a requisite number of curved sections for the horizontal and vertical curves. If the lengths of the angle iron are all the same the offset at the ends of the tracks on the curved sections insure that the track ends will be offset at all joints. As the chain is pulled around a curve in a horizontal plane, the rollers 28 function on the plate 35 (see Figs. 6 and 7). As the chain is pulled through a curved section 37 the trolley rollers may be lifted from the track due to the tension in the chain but the trolley rollers then ride against the under surface of the plate 36. The plate 36 is of sufficient length to insure the entrance of a trolley thereunder before the tension in the chain tends to lift it from the track. Obviously, as the chain moves over the curved section 32 the tendency is for the trolley rollers to remain on the track. As explained above, the elongated apertures 30 provide adequate flexibility for the bending of the chain as it moves over the curved sections 32 and 37. It will also be understood that these curved sections may be made up in a standard manner and the extent of

their angularity may vary. For example, some may turn through an angle of 30°, others 45°, others 90°, others 180°, etc.

The drive unit and also a track section and a chain slack accumulating section are preferably made up as a single unit. As shown in Fig. 11, this entire structure may be mounted upon a supporting plate 40. A driving motor is at 41 for driving a suitable speed reducer 42 advantageously through belts 43 and 44 associated with a speed ratio change pulley structure generally indicated at 39. The speed ratio reducer has a drive shaft 45 which may operate through chain 46 to drive a sprocket 47 mounted on a shaft having a pinion 48 for driving the final ring gear 49. Suitable supports and journals for the drive structure and shafts are used as shown. This ring gear may rest upon a collar 50 and is secured to a drive shaft 51 through the means of a shear pin 52 and upon the shaft 51 is a drive sprocket 53 located under the supporting plate structure. Spaced from the sprocket 53 is a stud 54 upon which is journaled an idler sprocket 55.

On the under side of the supporting plate is a track section (Fig. 15) including the angle tracks 1 through which the trolleys pass and this track section extends beyond the ends of the supporting plate as shown in Figs. 11 and 12. At the end where the chain enters the drive unit the track section may extend only a short distance long enough to receive one of the connectors. On the other or outgoing side of the drive unit the track extends for a considerable distance, this being shown at the right-hand side of Figs. 11 and 12, and this track section is suitably secured together by one or more holding bars 33 and has hanger straps 34 attached thereto. The track underlying the supporting plate extends adjacent and parallel to a run of a drive chain 60 and at this location the track is provided with a depending plate 61 against which the rollers 28 of the conveyer chain function for purposes which will presently appear. Also the portion of the track which extends from the supporting plate for the outgoing chain has depending side plates for engaging opposite sides of the conveyer chain as shown in Fig. 14. One of these plates may be the plate 61 extended (Fig. 13) while the other 62 terminates adjacent the sprocket 53, as shown at 63.

The drive chain 60 which is driven by the sprocket 53 has lugs 65 which mesh with the links of the conveyer chain as shown to propel the same from left to right as Fig. 13 is viewed. Some of the chain links have inwardly extending lugs 66 and these overlie supporting bars 67 and 68 so that the horizontal runs of the chain between the sprockets are supported. As illustrated in Fig. 15, the plate 61 backs up the conveyer chain and thus holds it in engagement with the driving lug 65. The bar 67 which is on the idling side of the drive chain engages the rollers of the chain, as shown in Fig. 15, and this bar is adjustably mounted as by means of its support 70 mounted by bolts 71 in slots 72 of a supporting bracket. Thus, by shifting the bar 67 outwardly relative to a center line between the axes of the sprockets, the drive chain may be maintained in a taut condition.

This type of drive may be termed a "Caterpillar" drive although for purposes herein it can be termed a chain or track type drive. Thus the two sprockets of the drive have fixed centers and no adjustment is needed of the centers for taking up of the drive chain. The lugs on the drive chain may be welded on to the chain links.

It will accordingly be appreciated how a number of standard parts can be furnished and how the installation thereof is relatively simple. The curved sections, as shown in Fig. 6, are reversible in that they can be used either for a right-hand or left-hand curve by merely reversing the structure end for end.

In the operation of the conveyer it will be understood that the drive unit propels the chain which is held suspended from the track and that the track may extend wherever desired throughout the plant. The hangers 2, which also serve as connectors where there is a joint in the track, can be placed wherever desired along the length of the track and they can easily be suspended even though there is no supporting structure immediately above the location of the hanger. Wherever the track is to dip down or upwardly one or more of the curved sections 32 or 36 are used.

The slack in the chain is handled so as to make it unnecessary to have any extra mechanism for taking up slack in the conveyer chain. This is as follows: In considering Fig. 13, the conveyer chain immediately to the left of the sprocket 55 is under tension as it is being pulled by the drive chain and the lugs 65 are spaced so as to fit the conveyer chain. That part of the conveyer chain just to the right of the sprocket 53, as Fig. 13 is viewed, is being pushed and is, in effect, under compression. Any slack in the chain manifests itself and accumulates on the immediate downstream side of the drive unit. This is where the side plates 61 and 62 perform their function of guiding the chain, through its rollers 28, thus keeping the chain with the slack therein held positively in a determined path of movement. The length of the side plates 61 and 62 is to be such as to accommodate the minimum slack which can be taken up by the removal of chain links. For example, where the conveyer chain links have normal 3" centers, a pair of such links totaling 6" is the least which can be removed to shorten the chain. If the slack movement at each chain pintle is $\frac{3}{8}$ ", then 4" for the plates 61 and 62 will accommodate 6" of slack. Where there is a full 6" of slack, two links may be removed to shorten the chain. This method is carried out in initial installation to get the right length for the chain and it also may occur after periods of use because of wear or other reasons.

A modified form of trolley is shown in Fig. 16 where two rollers are used instead of one. This form of trolley may be used where the loads to be carried are relatively heavy.

The modified construction as shown in Figs. 17 and 18 embodies parts fashioned from sheet metal or plate in place of malleable castings. In this form the trolley may comprise a metal piece 75 welded to the trolley hub and to a link structure 76 composed of several parts welded together. A clevis 77 may be welded to the link structure. The connector, which may also be used as a hanger, is formed of two sheet or plate metal parts 79 welded together with cross pieces 80 and having their lower edges turned in as at 81 for receiving the screws 82. The angle tracks 1 rest upon the tightening screws and these screws are angularly disposed outwardly. Welded on the inside faces of the members 79 are engaging pieces 83 for engaging and holding the upper edges of the track as the screws 82 are tightened. Due to the fact that the members 79 are of sheet or plate form, the screws 82 do not extend angularly toward the joint between the tracks but this con-

struction may, nevertheless, be satisfactorily used as a connector of track sections. Where this connector is to be used as a hanger, a yoke 85 may be pivotally connected to the elements 79 through the means of a bolt 86 and the bight portion of this yoke may be provided with an elongated slot or several apertures 87 for the reception of one or more hanger rods 17.

I claim:

1. In a chain conveyer, a track having two spaced rails arranged in a closed path, a plurality of load supporting trolleys having wheels operating on the rails, said trolleys depending between the rails and extending below the track, an endless chain below and free of the track and comprising alternately arranged center links and side links and vertically disposed pintles connecting the center and side links, each trolley having a center link formation connected into and forming a center link of the chain whereby the chain is supported by the trolleys, a pair of horizontally disposed rollers journaled on each pintle and positioned one above and one below the center link, driving means for engaging the chain at a location along its length for moving the chain and trolleys along the track, said chain having slack therein which gives the chain a total length in excess of the closed path of the track and which slack tends to increase as the chain is worn and extended in use, whereby the chain upstream from the driving means is under tension and is pulled by the driving means, and whereby the slack in the chain accumulates immediately downstream from the driving means where the chain is under compression, and guides on opposite sides of the chain spaced apart a distance substantially corresponding to the diameter of the rollers for engagement thereby, said guides extending from the driving means in a downstream direction a distance sufficient to accommodate the length of the chain under compression with accumulated slack therein substantially equal to the length of at least one center and one side link.

2. In a chain conveyer, a track having two spaced rails arranged in a closed path, a plurality of load supporting trolleys having wheels operating on the rails, said trolleys depending from the track, an endless chain also disposed in said closed path and comprising links pivotally connected together on vertically disposed pins, each trolley having a link formation connected into and forming a link of the chain whereby the chain is supported by the trolleys, horizontally disposed rollers on the said pins projecting laterally beyond the vertical sides of the chain, driving means for engaging the chain at a location in the closed path for moving the chain and trolleys along the track, said chain having slack therein which gives it a total length in excess of the length of the closed path of the track and which slack tends to increase as the chain is worn and extended in use, whereby in operation the chain upstream from the driving means is under tension and is pulled by the driving means, and whereby the slack in the chain accumulates immediately downstream from the driving means where the chain is, for a distance, under compression, and guides on opposite sides of the chain spaced apart a distance substantially corresponding to the dimension across the rollers so as to be engaged by the rollers, said guides extending from the driving means in a downstream direction a distance sufficient to accommodate the length of chain under compression with accumulated slack therein equal to at

least the slack represented by one full link of the chain.

3. In a chain conveyer, a track having two spaced rails arranged in a closed path, a plurality of load supporting trolleys having wheels operating on the rails, said trolleys depending from the track, an endless chain also disposed in said closed path and comprising links pivotally connected together on vertically disposed pins, each trolley having a link formation connected into and forming a link of the chain whereby the chain is supported by the trolleys, at least one of the links connected to each pin having an aperture for the pin which is elongated lengthwise of the chain to provide lost-play in the chain, horizontally disposed rollers journaled on the pins, driving means for engaging the chain at a location in the closed path for moving the chain and trolleys along the track, the lost-play between the links providing for slack in the chain which gives it a total length in excess of the length of the closed path of the track and which slack tends to increase as the chain is worn and extended in use, whereby in operation the chain upstream from the driving means is under tension and is pulled by the driving means, and whereby the slack in the chain accumulates immediately downstream from the driving means where the chain is under compression, and guides on opposite sides of the chain arranged to be engaged by said rollers to hold the chain in a confined path, said guides extending from the driving means in a downstream direction a distance sufficient to accommodate the length of chain under compression with accumulated slack therein substantially equal to the length of at least one full link.

4. In a chain conveyer, a track having two spaced rails arranged in a closed path, a plurality of load supporting trolleys having wheels operating on the rails, said trolleys depending from the track, an endless chain also disposed in said closed path and comprising links pivotally connected together on vertically disposed pins, each trolley having a link formation connected into and forming a link of the chain whereby the chain is supported by the trolleys, at least one of the links connected to each pin having an aperture for the pin which is elongated lengthwise of the chain to provide lost-play in the chain, a horizontally disposed roller journaled adjacent the ends of each pin with the chain links disposed between the rollers, driving means for engaging the chain at a location in the closed path for moving the chain and trolleys along the track, the lost-play between the links providing for slack in the chain which gives it a total length in excess of the length of the closed path of the track and which slack tends to increase as the chain is worn and extended in use, whereby in operation the chain upstream from the driving means is under tension and is pulled by the driving means, and whereby the slack in the chain accumulates immediately downstream from the driving means where the chain is under compression, and guides on opposite sides of the chain arranged to be engaged by said rollers to hold the chain in a confined path, said guides extending from the driving means in a downstream direction a distance sufficient to accommodate the length of chain under compression with accumulated slack therein substantially equal to the length of at least one full link.

5. In a chain conveyer, a track arranged in a

closed path, a plurality of load supporting trolleys having wheels operating on the track, said trolleys depending from the track, an endless chain disposed in said closed path and connected to the trolleys so that the chain is supported by the trolleys, said chain comprising multiplicity of links connected together by vertically disposed pins, at least one link connected to each pin having an aperture for the pin which is elongated lengthwise of the chain to provide a lost-play connection, horizontally disposed rollers on the chain, driving means for engaging the chain at a location in the closed path for moving the chain and the trolleys along the track, the lost-play connections providing slack in the chain which gives it a total length in excess of the

closed path and which slack tends to increase as the chain is worn and extended in use, whereby in operation the chain upstream from the driving means is under tension and is pulled by the driving means, and whereby the slack in the chain accumulates immediately downstream from the driving means where the chain is under compression, and guides on opposite sides of the chain arranged to be engaged by said rollers, said guides extending from the driving means in a downstream direction a distance sufficient to accommodate the length of chain under compression with accumulated slack therein substantially equal to one complete link of the chain.

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