

Oct. 14, 1952

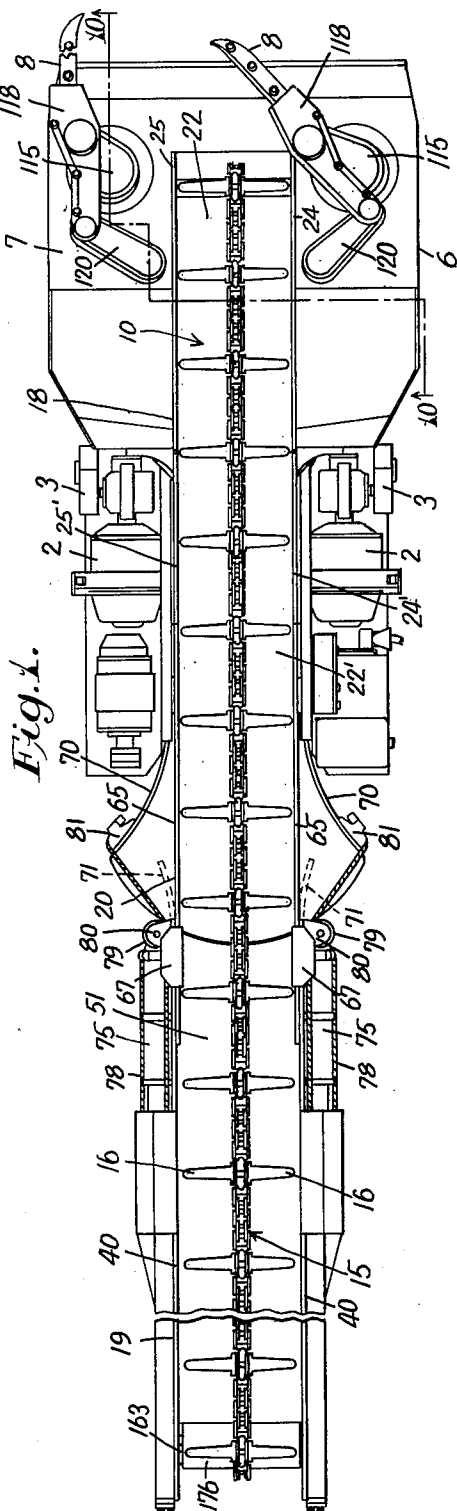
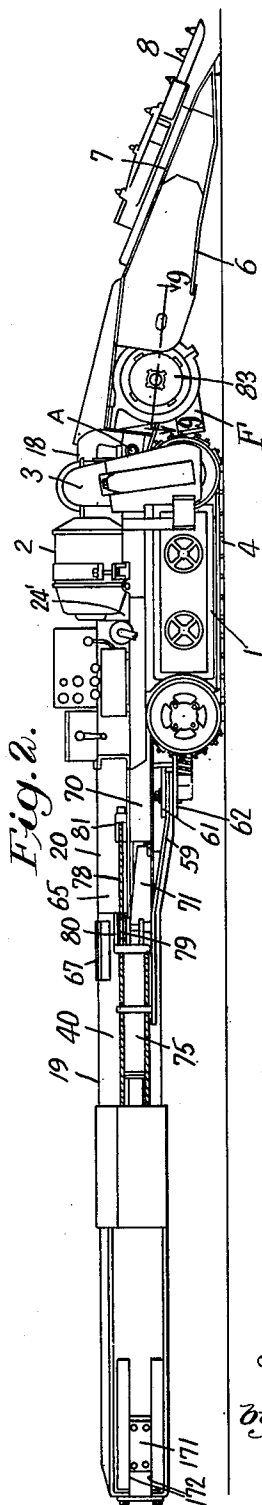
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2,613,800

ARTICULATED CONVEYER TAKE-UP

Filed Nov. 3, 1947

4 Sheets-Sheet 1



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Oct. 14, 1952

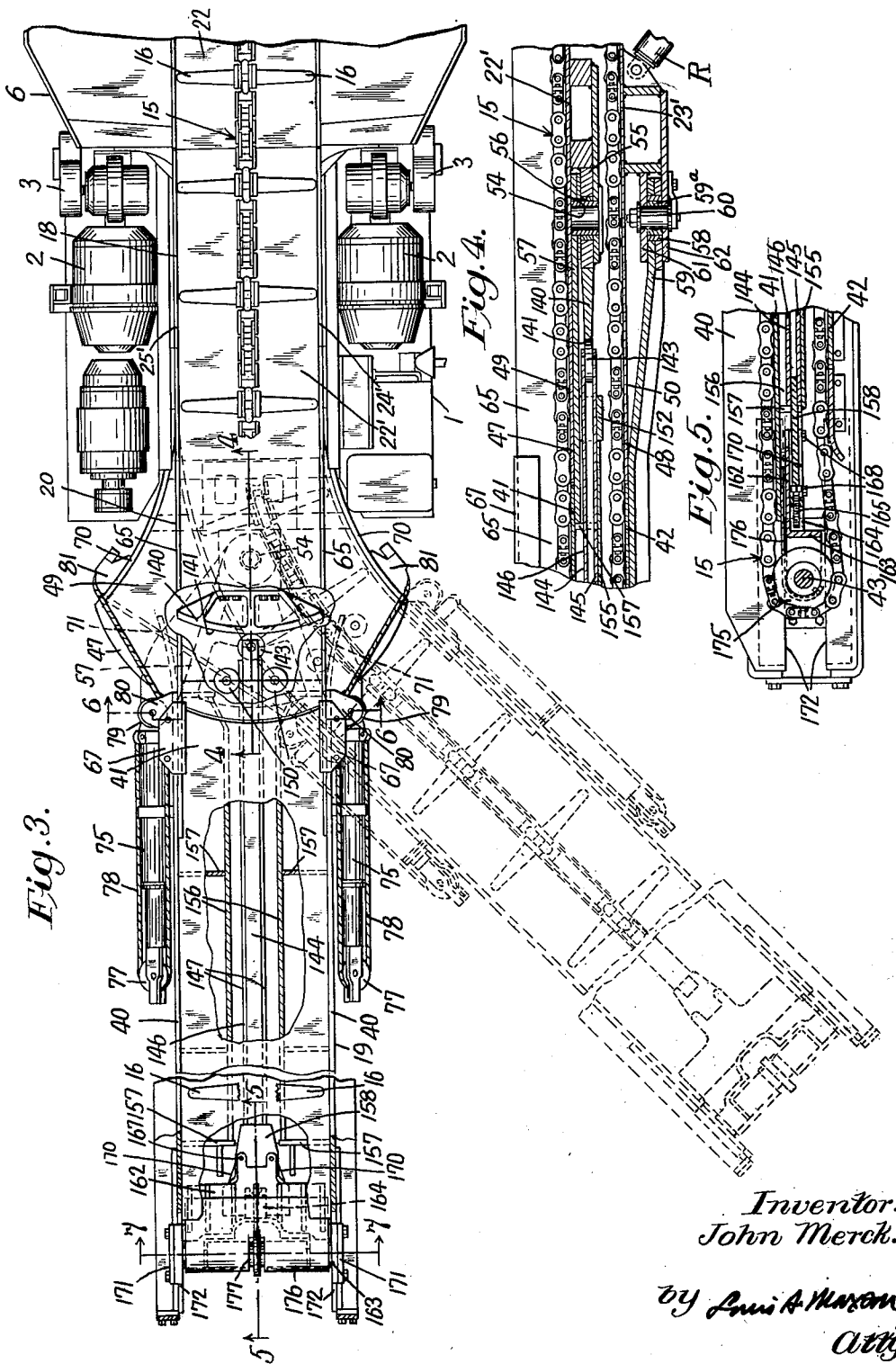
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ARTICULATED CONVEYER TAKE-UP

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4 Sheets-Sheet 2



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ARTICULATED CONVEYER TAKE-UP

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4 Sheets-Sheet 3

Fig. 6.

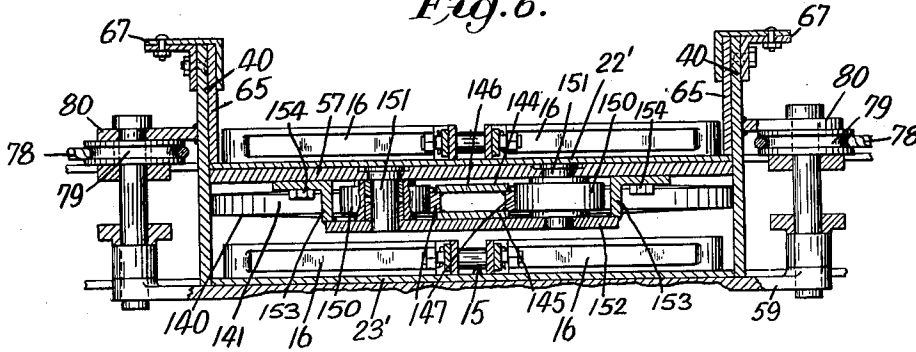


Fig. 7.

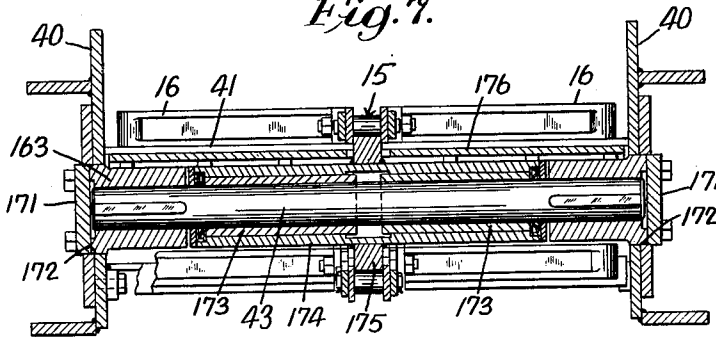


Fig. 8.

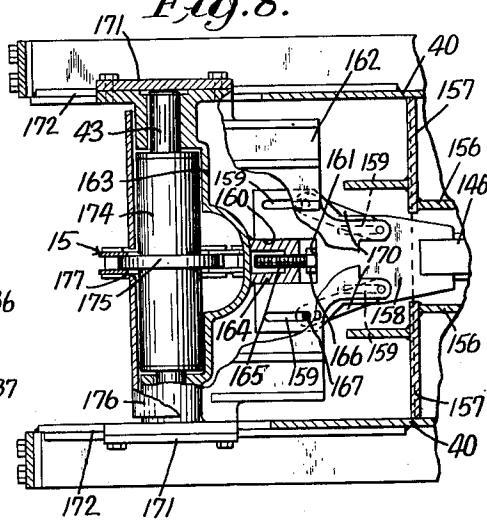
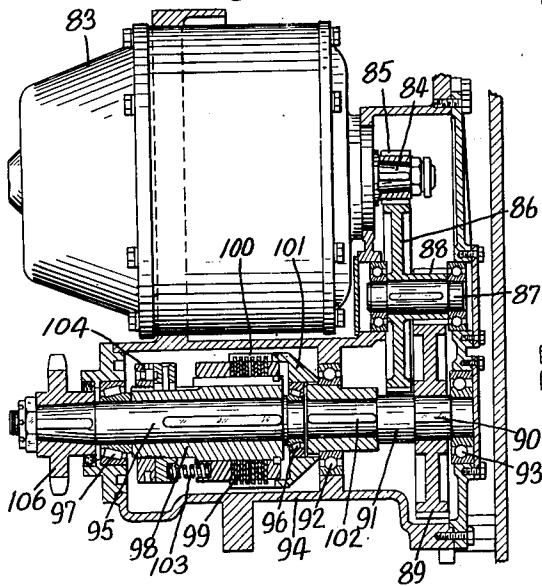


Fig. 9.



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ARTICULATED CONVEYER TAKE-UP

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4 Sheets-Sheet 4

Fig. 10.

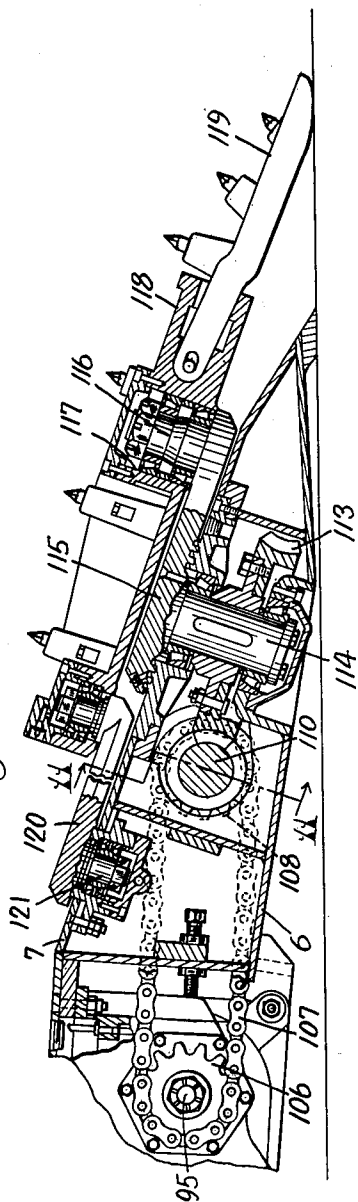
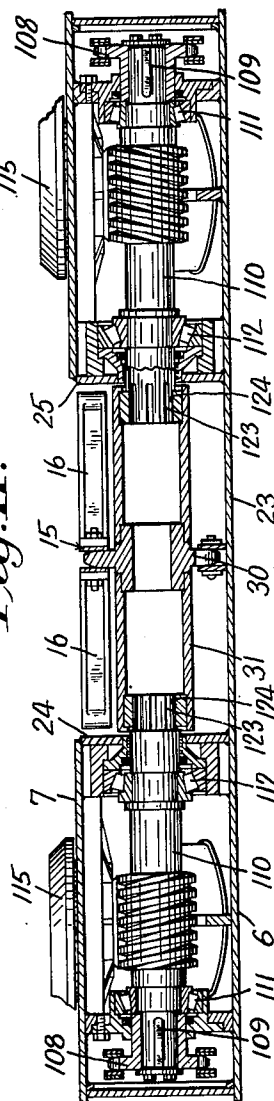


Fig. 11.



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UNITED STATES PATENT OFFICE

2,613,800

ARTICULATED CONVEYER TAKE-UP

John Merck, Franklin, Pa., assignor to Joy Manufacturing Company, a corporation of Pennsylvania

Application November 3, 1947, Serial No. 783,758

24 Claims. (Cl. 198—109)

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This invention relates to improvements in material gathering and loading machines particularly adapted to underground loading, and, from another and broader aspect, may be said to relate broadly to articulated conveyors of the chain and flight type.

Loading machines of the character mentioned commonly include material gathering devices, which bring the material to be loaded into the field of operation of an elevating conveyor portion or section, at the rear end of which there is a delivery section, which is ordinarily connected by an appropriate pivot mechanism for lateral swinging, so as to permit the delivery of the material to a desired point. It is common to employ a single chain and flight conveyor extending from the front end of the gathering section to the rear end of the delivery section, the whole flight conveyor being a single unit for the machine.

When an articulated conveyor structure is employed consisting ordinarily, as above indicated, of a front elevating section and a rear delivery section, and there is further provided, to prevent the escape of material between these sections, a pair of flexible wall elements extending between them, it is found that there is a tendency, as the delivery section is swung laterally, for an introduction of slack into the conveyor chain; and, in the extreme lateral position of the conveyor rear end there may be so much slack that, in the absence of some form of tightening device, serious difficulty might be encountered. With material such as coal, it is possible to provide an adjustable mounting, say, for the idler at one end of the conveyor, and to employ springs whose strength and compression will be sufficient to maintain the requisite tension in the chain during the lateral swinging movements of the tail conveyor section. However, in the handling of hard rock or heavy ores, it is possible that the load upon the conveyor may be so great that the springs, if made strong enough to maintain the necessary tension or tautness of the chain, would place an excessive load on the bearings and result in undesirable wear, and also in excessive consumption of power in driving the flight conveyor. It is also evident that, regardless of the material to be handled, if it be possible to dispense with springs, and to employ more positive tension-adjusting means, it will be advantageous.

It is accordingly an object of my invention to provide a new and improved arrangement for keeping undesired slack out of a flight con-

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veyor chain while at the same time avoiding the excessive driving loads and undue amounts of friction which spring positioned devices involve. It is another object of my invention to provide an improved conveyor. It is a further object of my invention to provide an improved articulated conveyor of the chain and flight type. It is still a further object of my invention to provide an improved articulated conveyor of the chain and flight type having driving and idler elements at the opposite ends of the chain loop, and having improved means for adjusting the position of the element at the delivery end of the conveyor for the purpose, and to the extent required, to prevent undue slack in the conveyor chain. It is still another object of my invention to provide an improved articulated conveyor of the chain and flight type having drive and idler elements at the opposite ends of the chain loop and having improved cam and follower devices for adjusting the position of a mounting mechanism for an idler arranged at one end of the conveyor and adapted to cooperate with a chain of the center run type. It is still another object of my invention to provide an improved articulated conveyor construction in which there may be housed within the tail section of such articulated conveyor the necessary mechanism for providing for the required tension of the flight-moving chain. Other objects and advantages of my invention will appear in the course of the following description.

In the accompanying drawings, in which one embodiment which my invention may assume for purposes of illustration has been shown,

Fig. 1 is a top plan view, in somewhat simplified form, of a loading machine in which my invention is embodied.

Fig. 2 is a side elevational view of the loading machine of Fig. 1.

Fig. 3 is a top plan view of the rear end of the forward trough section, of the rearward trough section with parts broken away, and of the intermediate connecting trough section and pivot mechanism, showing the arrangements for maintaining the necessary tension of the conveyor chain.

Fig. 4 is an enlarged vertical longitudinal sectional view on the plane of the line 4—4 of Fig. 3, illustrating the pivotal connection between the forward and rearward sections of the conveyor.

Fig. 5 is a central longitudinal vertical sectional view on an enlarged scale taken on line 5—5 of Fig. 3 through the rear end of the delivery sec-

tion of the conveyor, illustrating the adjustable mounting of the idler at that point.

Fig. 6 is a transverse vertical section on an enlarged scale, taken on the line 6—6 of Fig. 3.

Fig. 7 is an enlarged vertical transverse section on the plane of the line 7—7 of Fig. 3 showing the arrangements at the idler sprocket at the rear end of the delivery section of the conveyor.

Fig. 8 is a somewhat enlarged view, with parts in section and other parts broken away of the structure at the left hand end of Fig. 3, showing details of the idler element mounting.

Fig. 9 is an enlarged fragmentary view, on the composite section line 9—9 of Fig. 2, but turned through 90°, showing the drive, in part, for the gathering mechanism of the loading machine and for the flight conveyor.

Fig. 10 is an enlarged longitudinal vertical section taken on the planes of the line 10—10 of Fig. 1 with parts broken away to show details of construction.

Fig. 11 is an enlarged, substantially vertical transverse section on the planes of the line 11—11 of Fig. 10, with parts omitted, showing the drives for the gathering mechanism and for the drive element of the flight conveyor.

Referring to the drawings, it will be observed that in Fig. 1 there is shown a loading machine which, except for the changes introduced by my present invention, corresponds very closely to well known constructions sold by my assignee, the Joy Manufacturing Company. There is provided in these loading machines a tractor supported base 1 carrying motors 2 by which, through suitable driving connections not shown but enclosed in part in covers 3, power is transmitted to flexible driving and supporting tread elements 4 whereby the machine may be fed and maneuvered. The machine includes a forward gathering section 6 comprising an inclined upper plate 7 over the surface of which gathering elements 8, 8 are adapted to be moved in such a manner that their points trace orbits of such a nature as to move the material to be handled by the loading machine into the zone of operation of a conveyor mechanism 10. The structure of the gathering mechanism per se does not enter in any material way into the present invention, but the drive sprocket, later described, for the conveyor mechanism is actuated by the same mechanism which causes the operation of the gathering devices.

The conveyor constitutes in effect a discharge conveyor for delivering the material collected by the gathering mechanism, and this conveyor mechanism 10 is of the single central chain, oppositely extending flight type. The chain is indicated at 15 and carries, and is adapted to move, flight elements 16 extending in opposite directions from the opposite sides of the chain. The chain and flights have associated with them trough sections, namely a forward trough section 18, a delivery trough section 19, and a flexible trough section 20, the latter connecting the trough sections 18 and 19. The forward trough section 18 consists of relatively tiltable portions each pivotable in an up and down direction about a common axis A fixed relative to the body of the machine. The forward portion of the forward trough section swings up and down with the gathering section 6 and has upper and lower deck plates 22 and 23 rigidly mounted between side members 24 and 25. The rearward portion of the forward trough section 18 has upper and lower deck plates 22' and 23' rigidly mounted between side members 24' and 25'. The forward

portion of the trough section 18 is adjustable angularly in elevation, as by a hydraulic cylinder and piston mechanism F, and the rearward portion by a hydraulic cylinder and piston mechanism R, which hydraulic cylinder and piston mechanisms, with their fluid supply, need no description as they are standard features of apparatus of my assignee, Joy Manufacturing Company. The flexible trough section has side walls consisting of flexible plates, and its construction will be more fully described shortly. The rearward conveyor section 19 has an articulated connection with the first conveyor section to permit lateral swinging adjustment of the rearward section for discharging the material at opposite sides of the machine, as will shortly be described in detail.

The upper strand of the conveyor chain 15 moves rearwardly along the upper deck plate 22 of the forward conveyor section 18, and the lower strand returns on the lower deck plate 23, as may be seen principally in Fig. 11. The conveyor chain is driven by a drive sprocket 30 fixed to a composite hollow drive shaft 31 which is supported and driven as will shortly be explained. The rearward or delivery conveyor section 19 has side walls 40, 40, and upper and lower deck plates 41 and 42. An idler supporting shaft 43 is mounted at the rear end of the rearward section, and upon this shaft an idler, later described, and about which the conveyor chain 15 is trained, is rotatably supported.

The rear ends, 47 and 48, of the upper and lower deck plates 22' and 23' of the trough section 18 are both widened, and terminate along arcuate edges to form similar enlarged deck members 49 and 50. The two arcuate edged deck members have coaxial pivotal connection with the corresponding deck plates 41 and 42 of the rearward conveyor section 19 as will be shortly described. In the form shown herein, the pivotal connection for the upper deck plates consists of an upright pivot sleeve member 54 extending downwardly and journaled in a composite supporting bracket 55 secured to the underface of the plate portion 47 in spaced relation therefrom, and the pivot sleeve member 54 is received in an annular bearing sleeve 56 carried by the supporting bracket. The sleeve member 54 is carried by a plate 57 which is rigidly secured as by welding to the underface of the upper deck plate 41 of the rear section 19. The abutting end of the upper deck plate 41 terminates in a concave arc concentric with the pivot sleeve member 54, so that the upper surfaces of the upper deck plates 22' and 41 are flush with each other to afford uninterrupted movement of the conveyor chain and the material carried thereby in all positions of lateral swinging movement of the rear section 19.

The lower deck plates 23' and 42 are also pivotally connected, but this time about the axis of an upright cylindrical sleeve 58 coaxial with the pivot sleeve member 54. This sleeve is formed integrally with a supporting bracket 59 connected to the lower deck plate 42 of the rearward trough section 19 and extending beneath the rear end of the widened lower deck portion 48. The sleeve 58 is journaled on a bearing sleeve 59a supported upon a pin 60 which is in turn suitably supported at its upper and lower ends by arms 61 and 62 carried by the lower deck plate 48.

To prevent the escape of material in its passage over the widened plate portions 49 and 50 the fol-

lowing provision is made. Flexible plates 65, 65 are suitably secured to the side walls of the rearward end of the forward trough section. The rearward ends of these flexible plate portions 65 are held by guides 67 in sliding relation to the forward ends of the side trough walls 40 associated with and forming a part of the rearward trough section 19. The lower edges of the flexible plate portions 65 lie close to the top of the widened plate portion 49, and as the rearward trough section 19 swings laterally, the flexible plate portions 65 guide the ends of the flights 16 and keep the material from lateral escape. There are rearwardly diverging side plate portions 70, 70 secured to the edges of the lower widened plate portion 50, but instead of employing the flexible side boards, there are provided forwardly diverging guide board portions 71, 71 integral with the side wall members 40 of the delivery trough section. Thus the lower or return strand of the conveyor is also guided laterally in its return movement in all positions of swinging adjustment of the rear conveyor trough section 19.

The rear section 19 is swung laterally by fluid means herein consisting of a pair of longitudinally disposed hydraulic cylinder and piston mechanisms 75, 75, fixedly connected to the opposite sides of the delivery section and including telescoping parts, the innermost and rearmost one of which carries a sheave 77 at its rearmost end. These sheaves cooperate with cables 78 fixed at one end adjacent the forward ends of the cylinder and piston mechanism, extending rearwardly around the sheave 77, then forwardly and around stationary sheaves 79 fixed or mounted on brackets 80 secured to the sides of the delivery section and then to stationary terminal connections 81 fixed to the widened rearward portion 49 of the forward section of the conveyor. This construction is not new in this present application, and is generally used on certain of the loading machines of my assignee, the Joy Manufacturing Company, and, as will be obvious, will effect the swing of the delivery section of the conveyor in one direction or the other, the direction being determined by which cylinder and piston mechanism is supplied with fluid, and the motion being, as it were, towards the side of the apparatus at which the cylinder and piston mechanism which is energized lies. The fluid supply and control mechanism for these cylinder and piston mechanisms need not be described as it is a standard arrangement on apparatus of my assignee, Joy Manufacturing Company.

The drive for the drive sprocket element 30 may be now observed. There are motors, 83, arranged at opposite sides of the driving mechanism (but one of which is shown in the drawings) and rotating on transverse axes. These motors have drive shafts 84 carrying drive pinions 85 meshing with, and driving, gears 86, which are in turn carried on transverse stub shafts 87 and have formed integrally with them drive pinions 88. The drive pinions 88 mesh with and drive gears 89 keyed as at 90 to transverse shafts 91 journaled, as at 92 and 93, in a frame structure or housing 94 secured beneath the deck 7. Shafts 95 are journaled in bearing means 96 and 97, also in the frame or housing 94, and carry sleeves 98 to which certain of the friction discs 99 are keyed, while others of these discs are keyed at 100 to members 101 which are keyed at 102 to the shafts 91. It will be noted that the journalings of the shafts 91 in the bearings 92 are through the members 101, and the bearing means 96 are car-

ried by the members 101 which are journaled in the bearings 92. Suitable spring loading means for the friction discs is provided at 103, and manual operating means for applying the force of the spring loading means to the discs is shown in part at 104. The shafts 95 carry drive sprockets 106, which are connected by chains 107 to other driven sprockets 108 keyed at 109 to worm shafts 110 journaled in bearings 111 and 112, there being pairs of these bearings at either side of the gathering mechanism. The worm shafts are adapted to drive worm wheels 113 which are secured to generally upright shafts 114 which carry crank arms 115 at their upper ends, said crank arms having crank pins 116 fixed in bores 117 formed in arms 118 which carry digging elements 119 at their forward ends. The other ends of the arms are connected pivotally to links 120 swingable about stationary pivot points 121. The structure just described, as will be noted, is duplicated at both sides of the machine, and the shafts 110 have suitably splined ends 123 received in correspondingly grooved bores 124 in the composite shaft structure 31, so that the gathering mechanisms are maintained in synchronized relation through their interconnection through the composite shaft 31, and each delivers power for the driving of the drive sprocket 30.

Arranged between the upper and lower runs of the conveyor chain and mounted between the plate 57 and the bracket 55 and secured to the latter is a cam member 140 having a curved surface 141 which is formed on an arc of greater radius than the distance between the center point of said cam surface and the axis of pivotal movement of the delivery conveyor section. Arranged to cooperate with the cam surface 141 is a cam follower roller 143 mounted between the top and bottom plates 144 and 145 of a longitudinally extending thrust element 146 which extends rearwardly and centrally between the sides of the delivery conveyor section 19. The roller is suitably journaled in bearings in the top and bottom plates 144 and 145, and these plates are connected together, by welding, to intermediate plates or bars 147, so that a box-like or hollow rod structure is produced for the thrust element 146. This box-like rod structure is guided adjacent its forward end between guide rollers 150, 150 journaled on fixed pins 151. These pins 151 are secured at their upper ends in the plate 57 and at their lower ends in a cross plate 152 supported by brackets 153 bolted at 154 to the plate 57. The thrust element 146 is slidable above a plate member 155, and lies between upright plates 156 extending longitudinally of the tail conveyor section 19 and welded to transverse plate sections 157 which in turn are welded to the side plates 49 and have the plate members 155 welded to them. The rear end of the thrust element 146 has welded to it a member 158 provided with longitudinally extending slots 159 and a rearward notch 160 having a transverse forward wall 161. A longitudinally ribbed horizontal plate portion 162 has integral with its rearward end a housing 163 for the accommodation of bearing means, including the supporting shaft 43, for the idler for the chain 15. The housing 163 has integral therewith a yoke-like portion 164 carrying a screw 165 whose head 166 is engageable with the surface or wall 161. Studs 167 project downwardly from the plate portion 162, through the slots 159, and carry nuts 168. Clamping plates 170 are adapted to be forced upwardly against the bottom of member 158 to clamp to the latter the horizontal

plate 162. The screw 165 is used to tension the chain 15 and the clamping of the parts together relieves the screw of the heavy thrusts encountered at times in use.

The housing 163 has opposite ends in which the shaft 43 is keyed and which have secured to them end plates 171 slidably received in guides 172 formed in the side plates 40. Bearing sleeves 173 mounted on the shaft 43 rotatably support a tubular shaft 174 on which a rear idler ring or roller 175 is mounted for coaction with the chain 15. A plate 176, slotted at 177 to fit around the idler 175, overlies the housing 163, and is secured in any suitable manner to the latter.

The mode of operation of my invention will be clear from what has been said. The drive described for the gathering mechanism and for the drive sprocket 30 will be operated in the usual manner to effect circulation of the chain 15 and the flights 16, and the chain will be guided by the roller 175 at the rear end of the delivery trough section 19. The proper initial tension of the chain 15 will be established with the delivery section 19 in line with the forward trough section 18, and with the nuts 168 backed off slightly on the studs 167 so as to permit sliding of the housing 163 relative to the member 158, the screw 165 will be adjusted in such manner as through the coaction of its head 166 with the wall 161 to effect the proper overall length of the orbit of the chain 15. The nuts 168 will then be tightened up and clamp the housing 163 to the member 158.

When the tail section 19 is swung laterally, the roller 143 will travel along the cam surface 141, and as the distance between points in this cam surface and the axis of pivotal movement increases towards the opposite ends of the cam surface, the roller will be forced outwardly, that is longitudinally, toward the rear of the conveyor section 19 as this section progressively moves further and further to either side. Thus the slack which would otherwise be introduced into the chain 15 will be prevented from developing because the bodily movement of the roller 143 will be attended by longitudinal movement of the thrust element 146 with a resultant movement rearwardly of the housing 163 and accordingly of the idler roller 175. Correspondingly, as the tail section 19 is swung back towards alinement with the forward section 18, there would result, through an elimination of the corner-cutting action of the chain adjacent the pivot mounting of the rear conveyor section, a requirement for forward movement of the idler roller 175, and this will be permitted by reason of the fact that as the roller 143 approaches the middle of the cam surface 141, it will also be permitted to approach the pivot axis about which the tail conveyor portion swings. Obviously by properly shaping the cam surface 141, the necessary movements of the idler roller can be precisely effected. Because the parts are arranged and housed as indicated, a well protected and durable construction will be provided, and because of the guiding of the housing 163 in the side frames 40, there will be no tendency for a loss of alinement with the parts at the rear of the delivery section 19.

While there is in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the invention is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without

departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In an articulated conveyor, a pair of trough sections, one of which is horizontally swingable with respect to the other about an upright axis, flexible trough side wall providing elements extending between said trough sections and flexing upon relative swinging between said sections to move the median line between said elements laterally relative to said upright axis, an endless conveyor extending along said trough sections from one end of one trough section to the opposite end of the other and having at its opposite ends drive and idler means, said endless conveyor having an active run guided, between said trough sections, by said flexible elements and a return run below said active run, and means extending through one of said trough sections between said active and return runs for effecting bodily movement of one of said drive and idler means to maintain substantially uniform tension on said conveyor automatically during horizontal swinging movement of said movable trough section.

2. In an articulated conveyor, a pair of trough sections, one of which is horizontally swingable with respect to the other about an upright axis, flexible trough side wall providing elements extending between said trough sections and flexing upon relative swinging between said sections, such flexure attended by movement of the median line between said elements laterally relative to said upright axis, an endless conveyor extending along said trough sections, said endless conveyor having an active run guided, between said trough sections, by said flexible elements and a return run below said active run, and further having driving means and idler means rotatably supported by said trough sections, one of said means having a support slidable relative to the trough section which supports such means, and means extending through said last mentioned trough section and disposed for its full length between said active and return runs for effecting sliding of said support automatically to maintain the tension on said conveyor substantially uniform in all positions of relative horizontal swing between said trough sections.

3. In an articulated conveyor, a pair of trough sections, one of which is horizontally swingable with respect to the other, an endless conveyor extending along said trough sections from one end of one trough section to the opposite end of the other and having at its opposite ends drive and idler means, said conveyor having active and return runs, and means disposed between said active and return runs, including a thrust element and a cooperating cam for automatically effecting bodily movement of one of said drive and idler means to maintain substantially uniform tension on said conveyor during horizontal swinging movement of said movable trough section.

4. In an articulated conveyor as recited in claim 3, the improvement that the thrust element is carried by the horizontally swingable trough section and the cooperating cam is fixed relative to the other trough section.

5. In an articulated conveyor, a pair of trough sections, one of which is horizontally swingable with respect to the other, an endless conveyor including upper and lower runs extending along said trough sections and having driving means and idler means rotatably supported by said

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trough sections, said trough sections having a pivotal connection between said runs, one of said means having a support slidable relative to the trough section which supports such means, and means for effecting sliding of said support automatically to maintain the tension on said conveyor substantially uniform in all positions of relative horizontal swing between said trough sections, said last mentioned means including a thrust bar lying between the runs of the conveyor and a cooperating cam disposed between said runs and relative to which the trough section which is horizontally swingable with respect to the other trough section is swingable.

6. In an articulated conveyor, a pair of trough sections, one of which is horizontally swingable with respect to the other, an endless conveyor extending along said trough sections and having upper and lower runs and also having driving means and idler means rotatably supported by said trough sections, one of said means having a support slidable relative to the trough section which supports such means, and means including a thrust element supported for longitudinal movement by the swingable trough section and lying along the median longitudinal line of the latter and further including cam means disposed between said runs and coacting with said thrust element to effect longitudinal movement thereof upon relative swinging movement between said trough sections, for effecting sliding of said support automatically to maintain the tension on said conveyor substantially uniform in all positions of relative horizontal swing between said trough sections.

7. In an articulated conveyor, a pair of pivotally connected trough sections, one of which is horizontally swingable with respect to the other, an endless conveyor extending along said trough sections and having upper and lower runs and also having driving means and idler means rotatably supported by said trough sections, one of said means having a transversely extending support slidable relative to the trough section which supports such means, the pivotal connections between said trough sections including a pivot located between said runs and means including a thrust element operatively connected with said support adjacent the transverse center thereof and supported for longitudinal movement in planes intersecting said pivot by the swingable trough section, and means, including a cam located between said runs, coacting with said thrust element to effect longitudinal movement thereof upon relative swinging movement between said trough sections, for effecting sliding of said support automatically to maintain the tension on said conveyor substantially uniform in all positions of relative horizontal swing between said trough sections.

8. In an articulated conveyor, a pair of pivotally connected trough sections, one of which is horizontally swingable with respect to the other, an endless conveyor extending along said trough sections and having upper and lower runs and also having driving means and idler means rotatably supported by said trough sections, one of said means having a support slidable relative to the trough section which supports such means, and means disposed between said runs and including a cam fixed relative to one of said trough sections and a single thrust element movable longitudinally of the other of said trough sections for effecting sliding of said support automatically to maintain the tension on said conveyor sub-

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stantially uniform in all positions of relative horizontal swing between said trough sections, the pivotal connection between said trough sections including a pivot between said runs.

9. In an articulated conveyor, a pair of trough sections, one of which is horizontally swingable with respect to the other, an endless conveyor including active and return runs extending along said trough sections and having driving means and idler means rotatably supported by said trough sections, one of said means having a support slidable relative to the trough section which supports such means, and means including a cam fixed relative to one of said trough sections and disposed between said active and return runs and a thrust element disposed for its full length between said runs and having means for adjustably fixing its length and movable longitudinally of the other of said trough sections for effecting sliding of said support automatically to maintain the tension on said conveyor substantially uniform in all positions of relative horizontal swing between said trough sections.

10. In a conveyor, a pair of conveyor trough sections one of which is swingable about a generally upright axis relative to the other, an endless flexible conveyor extending along said trough sections and including upper and lower runs, means arranged between said runs for maintaining substantially uniform tension of said endless flexible conveyor in the different angular relations of said swingable trough section to the other of said trough sections, said means for maintaining substantially uniform tension of said endless flexible conveyor including a cam element relative to which said swingable trough section moves on swing of the latter, and a thrust element of substantially the length of and carried by said swingable section and movable longitudinally of the latter midway between the sides thereof and operative on adjustment to vary the tension of said endless flexible conveyor, said conveyor trough sections having a pivotal connection intersected by the longitudinal median line of said thrust element.

11. In an articulated conveyor, a pair of troughs, one of which is horizontally swingable with respect to the other, an endless conveyor extending along said troughs from one end of one trough to the opposite end of the other and including active and return runs and an idler supported by one of said troughs and a drive element supported by the other of said troughs at the end of the latter more remote from said idler, a movable mounting for said idler arranged to move said idler rectilinearly with respect to its trough upon horizontal relative swinging movement between said troughs to maintain a uniform tension on said conveyor in all the different angular relations between said troughs, said mounting including cam means adjacent the point of articulation of said conveyor, a cam follower associated with said cam means, and operative connections between said idler mounting and said follower for rectilinearly moving said idler with respect to its trough upon movement of said cam follower relative to said cam, said operative connections disposed for the full length thereof between said active and return runs.

12. A conveyor organization of the endless chain and scraper type comprising, in combination, a first trough section, a relatively movable second trough section pivotally supported to swing laterally with respect to said first trough section, and means connecting said trough sec-

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tions together to form a continuous trough from one end of one trough section to the opposite end of the other including a pair of flexible side walls, an endless conveyor of the endless, flight-equipped, center chain type movable along said trough sections from a point adjacent the front end of said first trough section to the opposite end of the other trough section and having top and bottom runs, rotatable drive and idler elements for said chain at the mutually opposite ends of said trough sections, means for driving said drive element, and means for bodily adjusting the position of one of said elements relative to the trough section at the end of which it is disposed including a cam, a follower for said cam, thrust means supporting said follower and extending along the center line of the trough section last mentioned, and means for rotatably supporting said last mentioned element positioned for actuation by said thrust means, said cam, follower, and thrust means all disposed between the top and bottom runs of said conveyor.

13. A conveyor organization of the endless chain and scraper type comprising, in combination, a first trough section, a relatively movable, second trough section pivotally supported to swing laterally with respect to said first trough section, and means connecting said trough sections together to form a continuous trough from one end of one trough section to the opposite end of the other including a pair of flexible side walls, an endless conveyor of the endless, flight-equipped, center chain type having upper and lower runs and movable along said trough sections from a point adjacent the front end of said first trough section to the opposite end of the second trough section, rotatable drive and idler elements for said chain at the mutually opposite ends of said first and second trough sections respectively, means for driving said drive element, and means for bodily adjusting the position of said idler element relative to the second trough section including a cam, a follower for said cam, thrust means supporting said follower and extending along the center line of the second trough section for its own full length, and means for rotatably supporting said idler element positioned for actuation by said thrust means, the pivotal support of said second section on said first section including a pivot pin between the upper and lower runs of said conveyor.

14. In an articulated conveyor, pivotally connected receiving and delivery troughs, said delivery trough horizontally swingable with respect to said receiving trough, an endless conveyor extending along said troughs from one end of one trough to the opposite end of the other and including an idler mounted on said delivery trough, and a movable mounting for said idler supporting the same for rectilinear movement with respect to its trough upon horizontal swinging movement of said delivery trough across the rear end of said receiving trough, to maintain a uniform tension on said conveyor in all positions of said swingable delivery trough with respect to said stationary receiving trough and including a stationary cam surface extending across said conveyor adjacent the point of articulation thereof, a follower member engaging said cam surface, and operative connections between said follower member and said idler for rectilinearly moving said idler with respect to its trough in one direction or for permitting said conveyor to move said idler rectilinearly in an opposite direction upon movement of said follower member along said

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cam, said conveyor having upper and lower runs and said cam surface and follower member both disposed between said runs.

15. In an articulated conveyor, a pair of aligned troughs, one of which is horizontally swingable with respect to the other, an endless conveyor extending along said troughs from one end of one trough to the opposite end of the other, a transverse shaft mounted at one end of said conveyor for slidable movement with respect thereto longitudinally thereof, an idler on said shaft, and means connected with said shaft, for rectilinearly moving said shaft with respect to said swingable trough upon horizontal swinging movement of said swingable trough for maintaining a uniform tension on said conveyor in all positions of articulation thereof including a stationary cam extending across said conveyor adjacent the point of articulation thereof, a follower engaging said cam and movable longitudinally of said conveyor, and an operative connection between said follower and said shaft, for rectilinearly moving said shaft relative to said conveyor longitudinally of the latter upon movement of said follower along said cam, said conveyor having upper and lower runs and said cam, follower and operative connection all arranged between said runs.

16. In a conveyor, a pair of conveyor trough sections one of which is swingable about a generally upright axis relative to the other, an endless flexible conveyor extending along said trough sections and including upper and lower runs, and means arranged between said runs for automatically maintaining substantially uniform tension of said endless flexible conveyor in the different angular relations of said swingable trough sections to the other of said trough sections, said substantially uniform tension maintaining means including an adjusting element lying for its full length between said runs and arranged for movement longitudinally by swinging of the swingable one of said sections.

17. In a conveyor, a pair of conveyor trough sections one of which is swingable about a generally upright axis relative to the other, an endless flexible conveyor extending along said trough sections and including upper and lower runs, means for supporting the one of said trough sections which is swingable relative to the other for such swinging movement including a pivotal connection between said trough sections lying between said runs, and means arranged between said runs for automatically maintaining substantially uniform tension of said endless flexible conveyor in the different angular relations of said swingable trough section to the other of said trough sections, said substantially uniform tension maintaining means including a stationary cam in fixed relation to said upright axis and disposed between said upper and lower runs.

18. In an articulated conveyor, a pair of trough sections, one of which is horizontally swingable with respect to the other and which has upper and lower aligned pivots for supporting it for swing, an endless conveyor extending along said trough sections and having driving and idler means, one of which is adjustable relative to the other, said endless conveyor having upper and lower runs between which said driving and idler means and one of said aligned pivots are all disposed, and means for automatically effecting adjustment of said adjustable means to maintain uniform conveyor tension during conveyor swing including cooperating elements also arranged between the upper and lower runs of said conveyor

19. In an articulated conveyor, a pair of trough sections, one of which is horizontally swingable with respect to the other and which has upper and lower alined pivots for supporting it for swing, an endless conveyor extending along said trough sections and having driving and idler means, one of which is adjustable relative to the other, said endless conveyor having upper and lower runs between which said driving and idler means and the upper one of said alined pivots are all disposed, and means for automatically effecting adjustment of said adjustable means to maintain uniform conveyor tension during conveyor swing including cooperating elements also arranged between the upper and lower runs of said conveyor.

20. In an articulated conveyor, mutually adjacent trough sections one of which is swingable with respect to the other, elements providing flexible trough side walls extending between said trough sections and flexible upon relative swing between said sections, the median line between said elements moving, upon such relative swing, relative to the apex of the angle formed by the center lines of said sections, an endless conveyor extending along said trough sections and having an active run guided, between said trough sections, by said flexible elements and a spaced return run and further having driving means and idler means, one of which means has a support on one of said trough sections movable longitudinally relative to the latter, and means extending through said last mentioned trough section and disposed for its full length between said active and return runs for effecting movement of said support longitudinally of the trough section which supports it automatically to maintain the tension of said conveyor substantially uniform in all of the angularly related relative positions of said trough sections.

21. In an articulated conveyor, a pair of trough sections one of which is swingable with respect to the other, an endless conveyor extending along said trough sections and having drive and idler means associated therewith, one of said drive and idler means at the extremity of one of said trough sections remote from the other, said conveyor having active and return runs, and means, disposed for its full length between said active and return runs and including a thrust element and a cooperating cam, for automatically effecting bodily movement of said one of said drive and idler means to maintain substantially uniform tension on said conveyor in the various angularly related positions between said trough sections attained by relative swing.

22. In an articulated conveyor, a pair of trough sections, an endless conveyor including active and return runs extending along said trough sections and having driving means and idler means one of which means has a support mounted on one of said trough sections and movable bodily lengthwise of the latter, a pivotal mounting providing for swing of one of said trough sections with respect to the other, and means including a cam fixed relative to one of said trough sections and

disposed between the active and return runs of said conveyor and a thrust element disposed for its full length between said runs and movable longitudinally of the other of said trough sections for effecting bodily longitudinal movement of said support relative to the trough section which supports it automatically to maintain the tension of said conveyor substantially uniform in all positions of relative swing between said trough sections.

23. A conveyor organization of the endless chain and scraper type comprising, in combination, a first trough section, a second trough section having a free end and swingably mounted with respect to the first trough section to position its free end at different locations in a common series of planes, means including a pair of flexible side walls connecting said trough sections together to form a continuous trough, a conveyor of the endless, flight-equipped, center chain type movable along said trough sections and having active and return runs, rotatable idler and power driven drive elements for said conveyor, one of said elements at said free end, and means for bodily adjusting the position of said one of said elements at said free end relative to the latter including a cam, a follower for said cam, thrust means operatively connected with said follower and extending along the center line of the trough section at the end of which said last mentioned element is disposed, and means for rotatably supporting said last mentioned element positioned for actuation by said thrust means, said cam, follower and thrust means all disposed between the active and return runs of said conveyor.

24. In a conveyor, a pair of conveyor trough sections, one of which has a free end and which is swingable about an axis to vary the location in a series of common planes of said free end, an endless flexible conveyor extending along said trough sections and including active and return runs, and means arranged between said runs for automatically maintaining substantially uniform tension of said endless flexible conveyor in the different positions of said free end attained by swinging of the trough section having said free end, said substantially uniform tension maintaining means including an adjusting element lying for its full length between said runs and arranged for movement longitudinally by swinging of said section having a free end relative to said other section.

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