June 1, 1926. 1,586,573

N. A. NEWDICK

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Fig. 1.

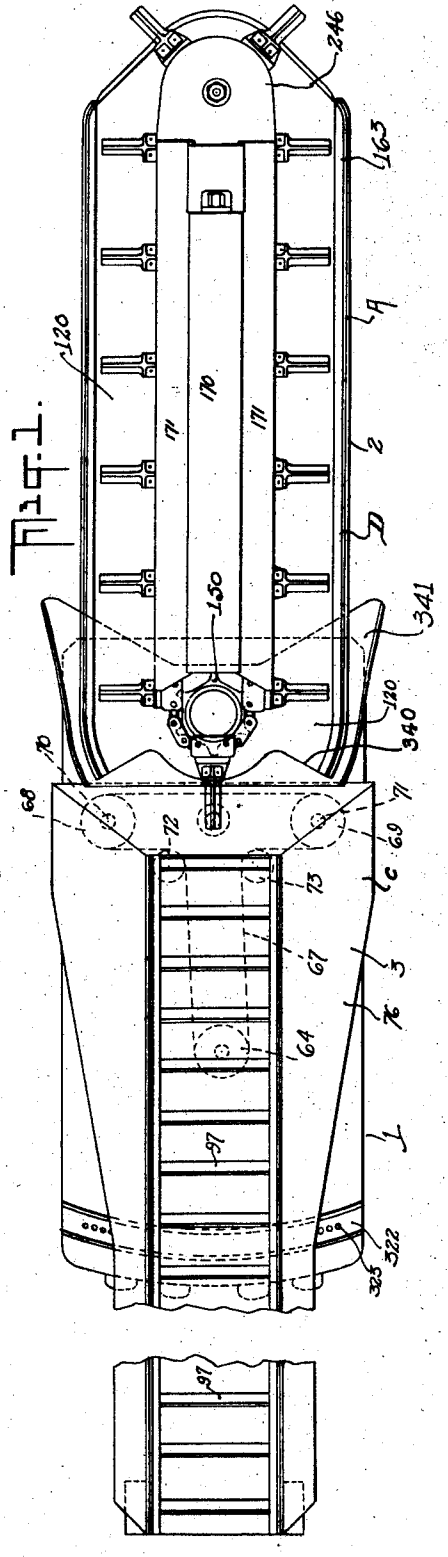
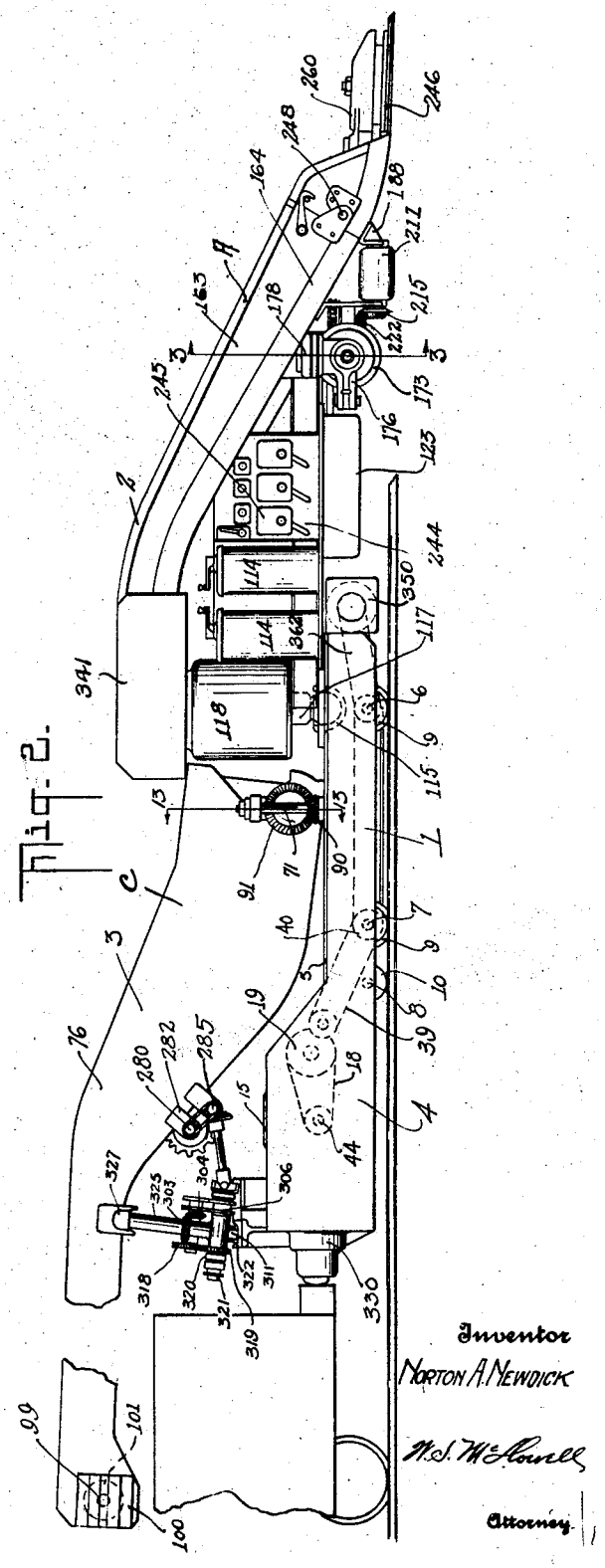


Fig. 2.



Inventor
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Attorney

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N. A. NEWDICK

LOADING MACHINE

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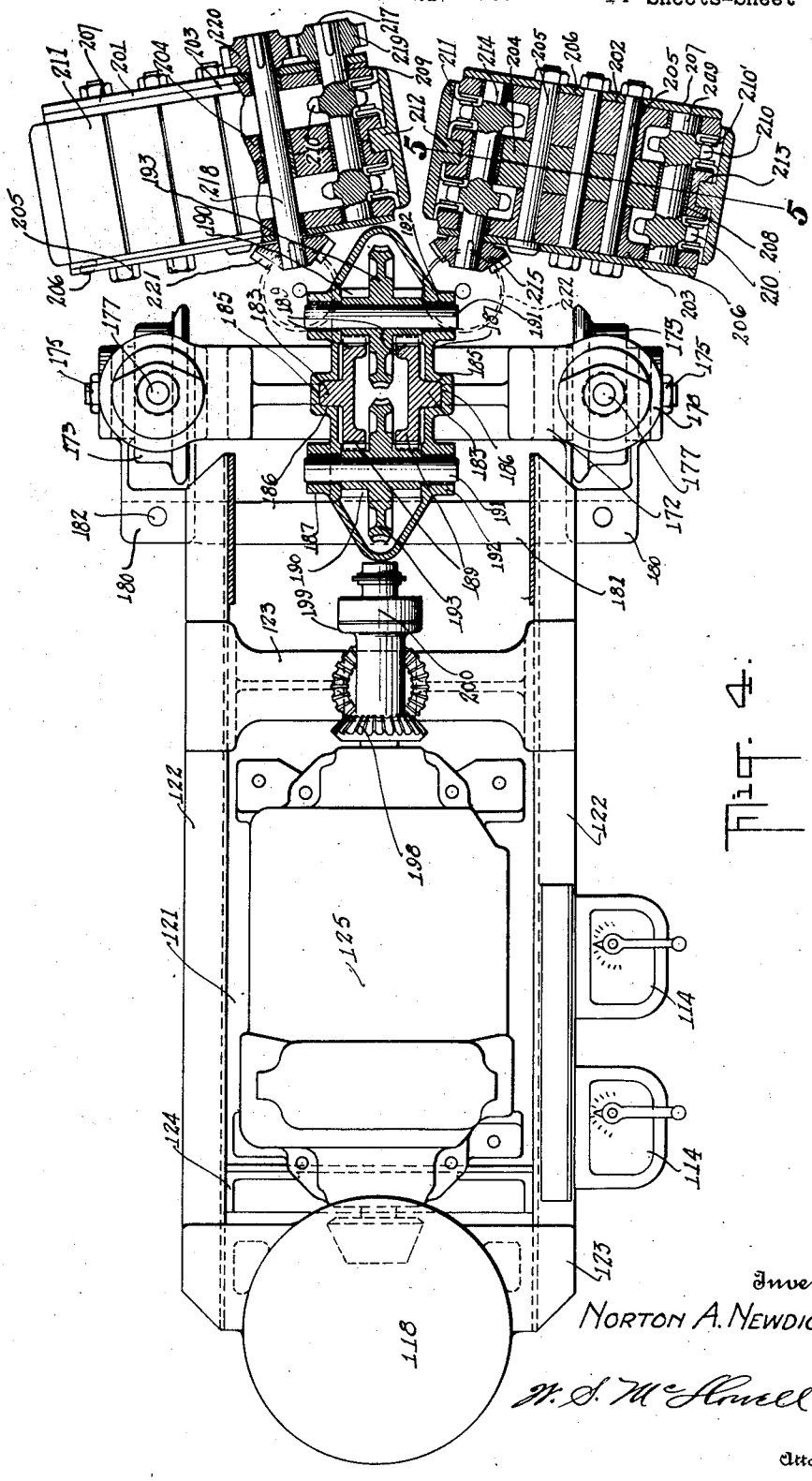

Fig. 4.

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N. A. NEWDICK

LOADING MACHINE

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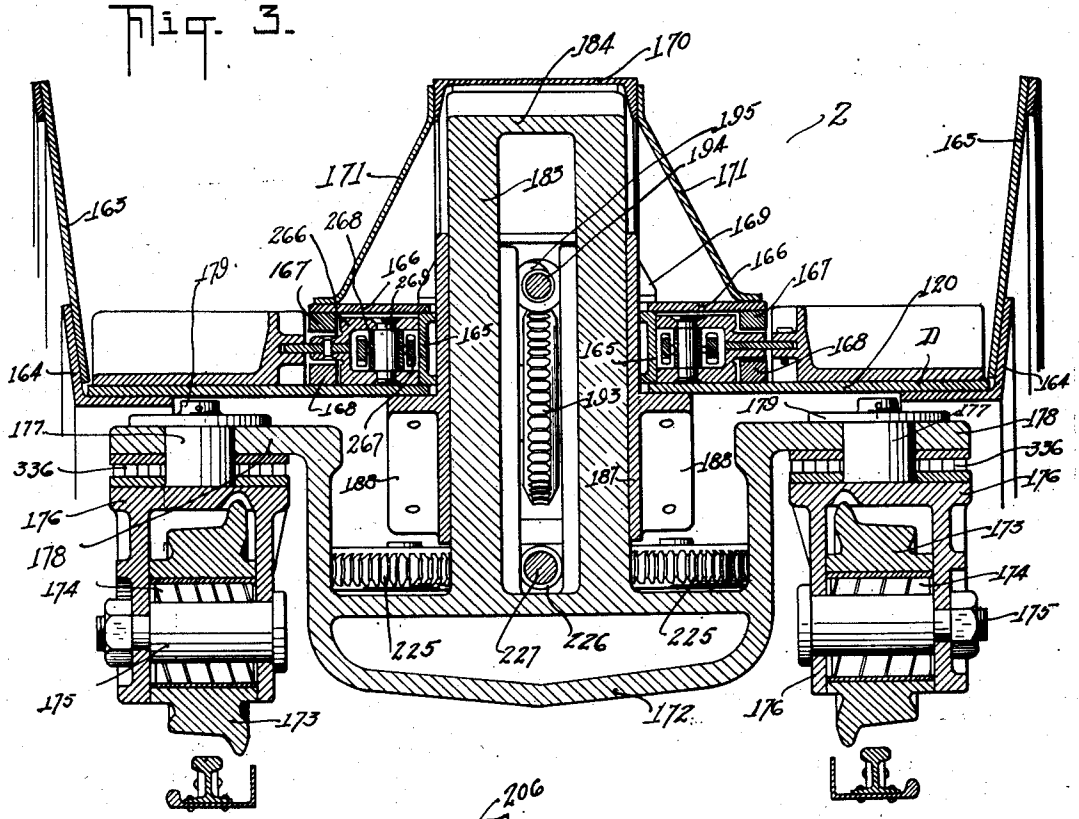
Fig. 3.



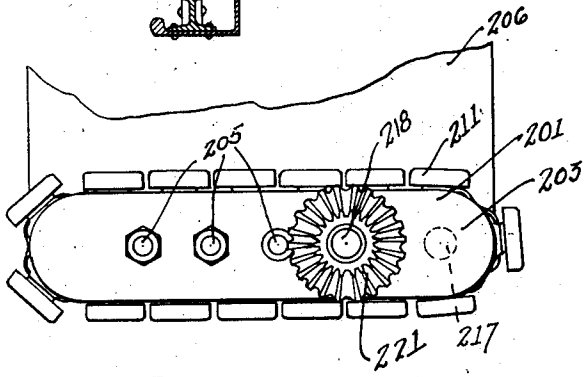
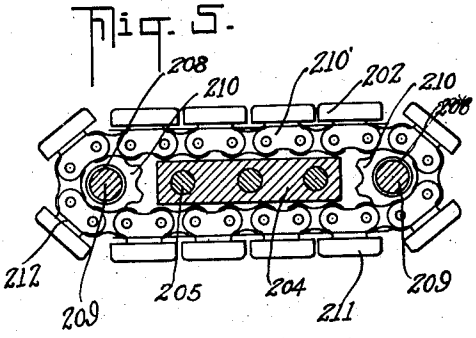


Fig. 6.

Fig. 5.



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June 1, 1926.

1,586,573

N. A. NEWDICK

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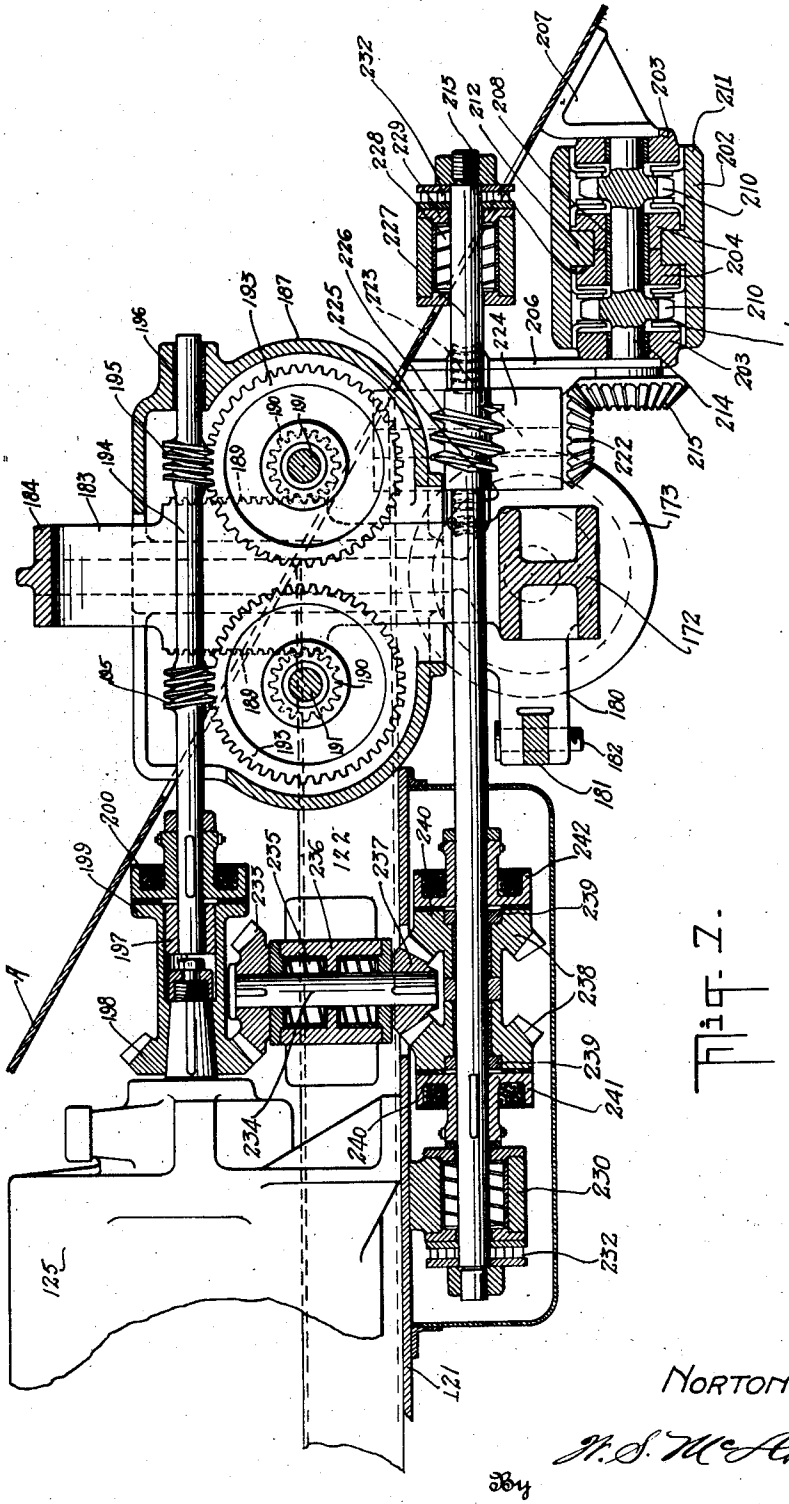

Fig. 7.

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N. A. NEWDICK

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Fig. 8.

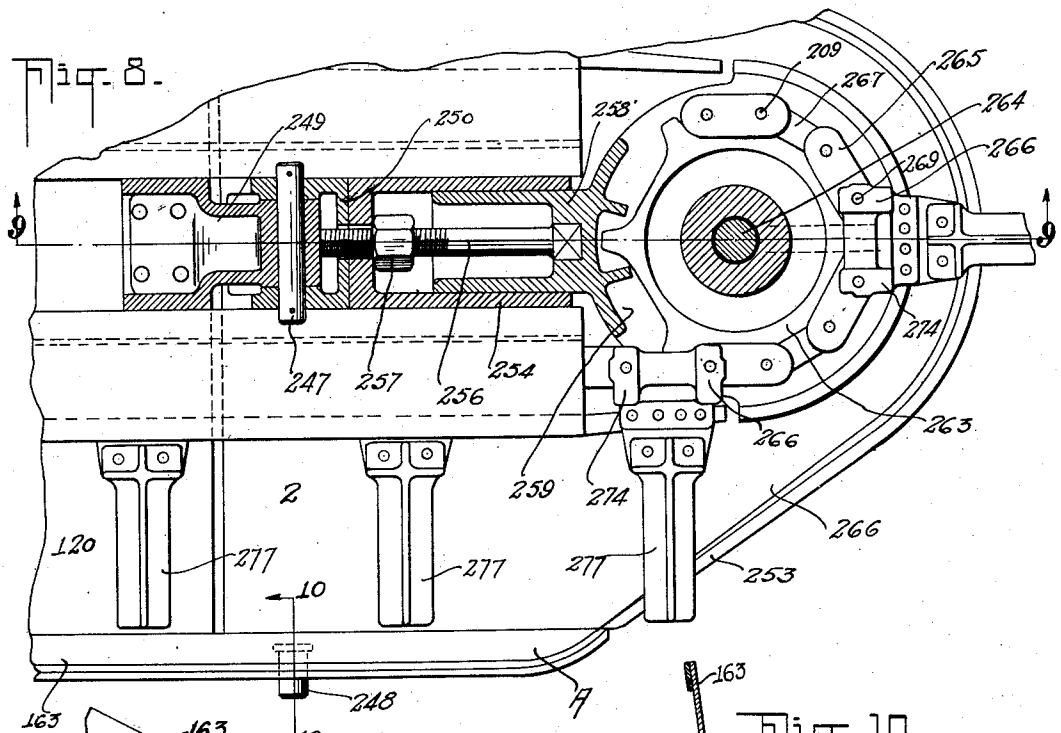


Fig. 9.

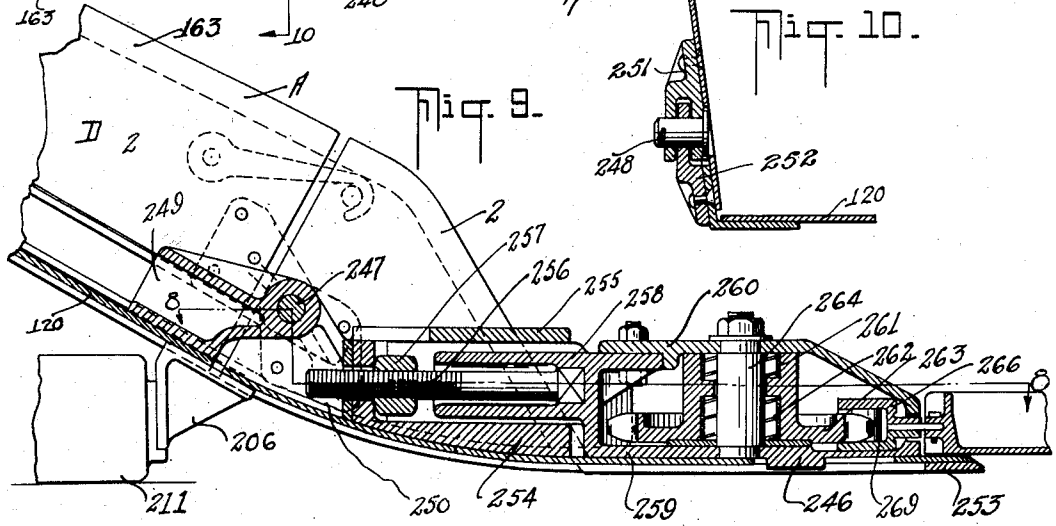
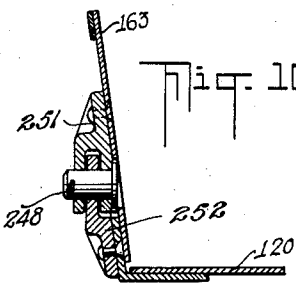


Fig. 10.



Inventor

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June 1, 1926. 1,586,573

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LOADING MACHINE

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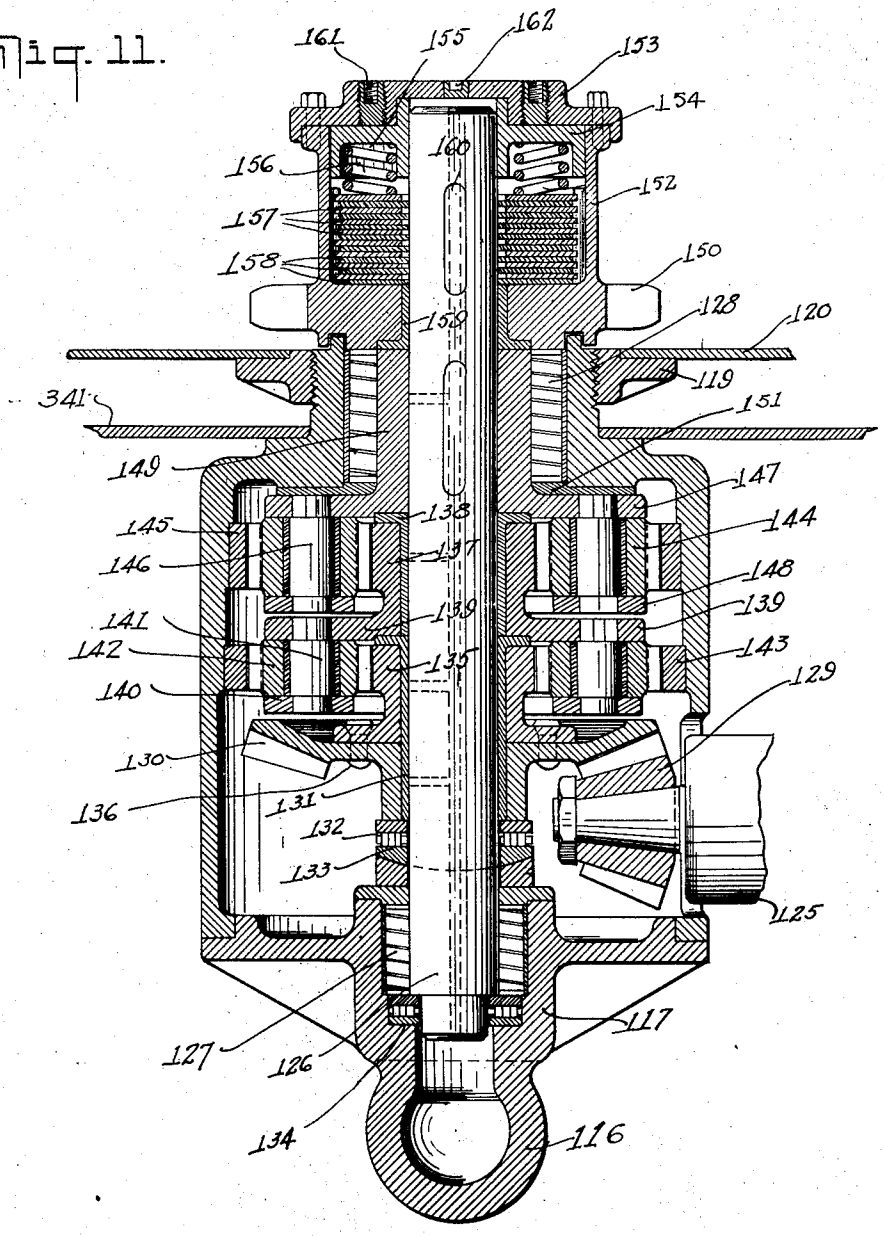
Fig. 11.



Inventor

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June 1, 1926. 1,586,573

N. A. NEWDICK

LOADING MACHINE

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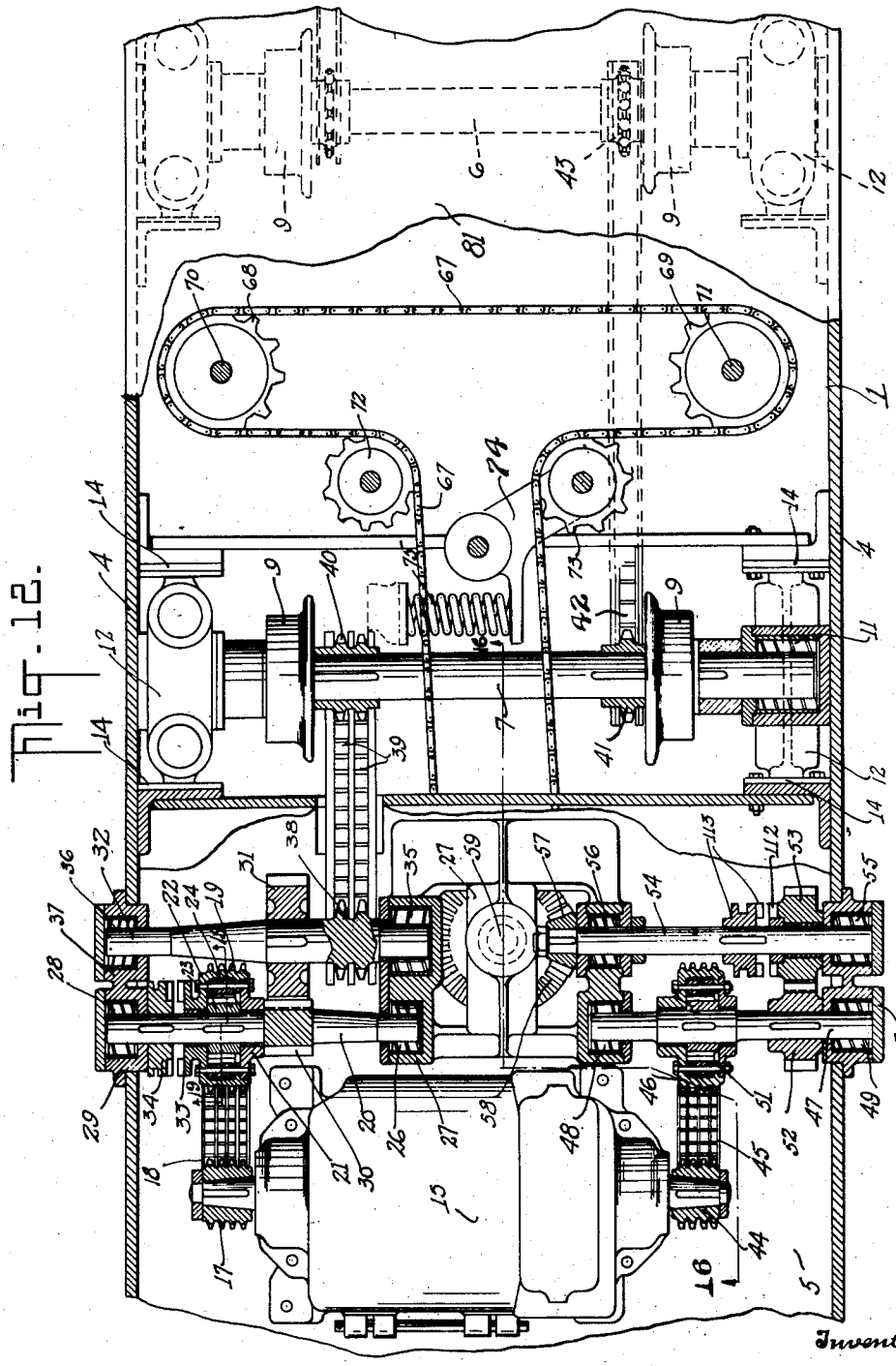
Fig. 12.



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N. A. NEWDICK

LOADING MACHINE

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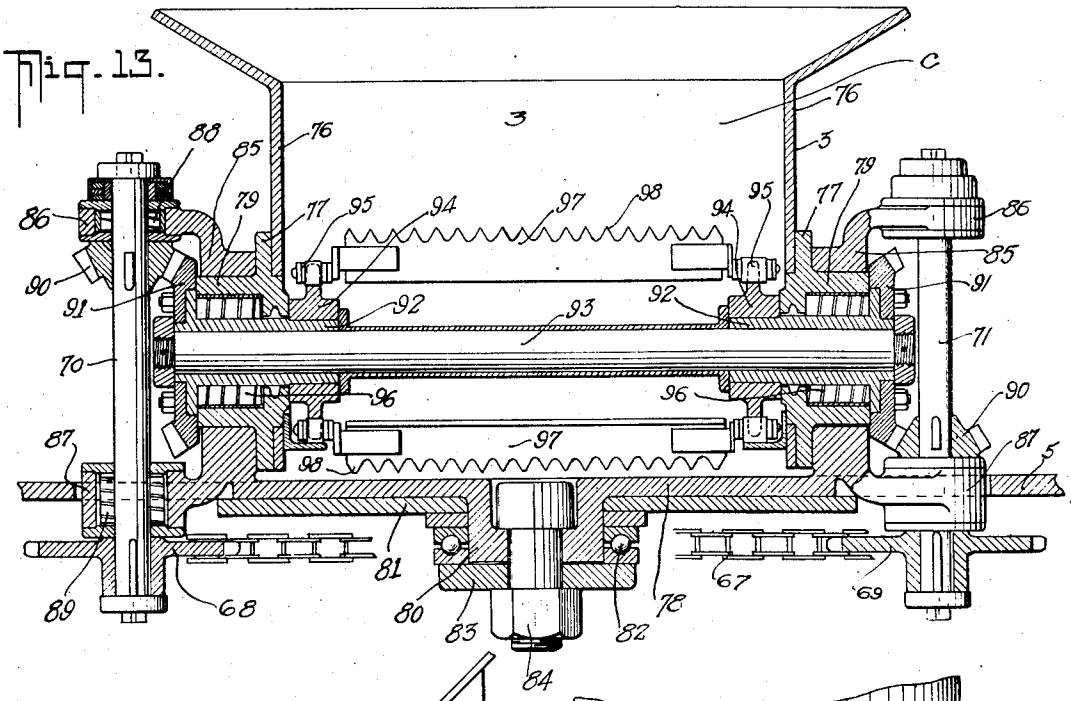
Fig. 13.



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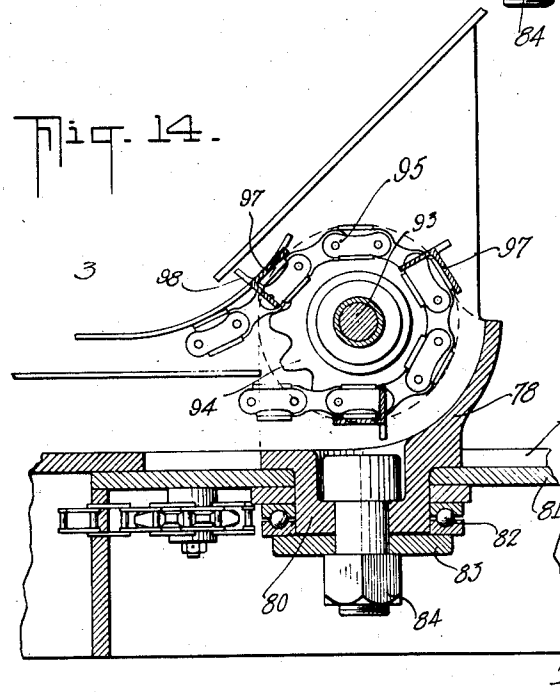

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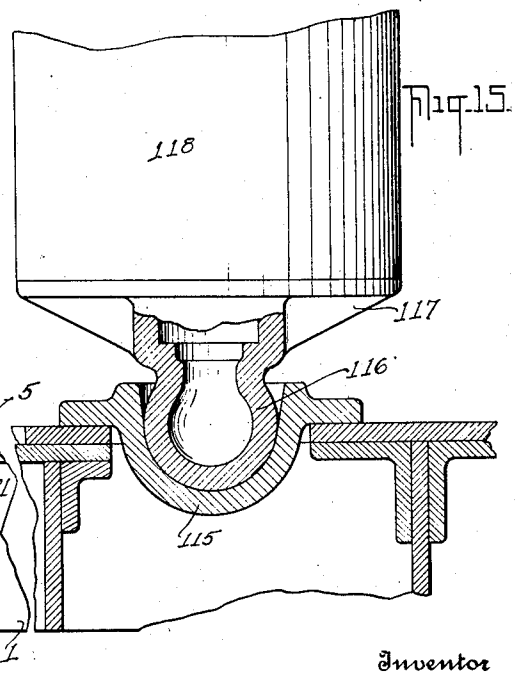

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N. A. NEWDICK

LOADING MACHINE

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Fig. 16.

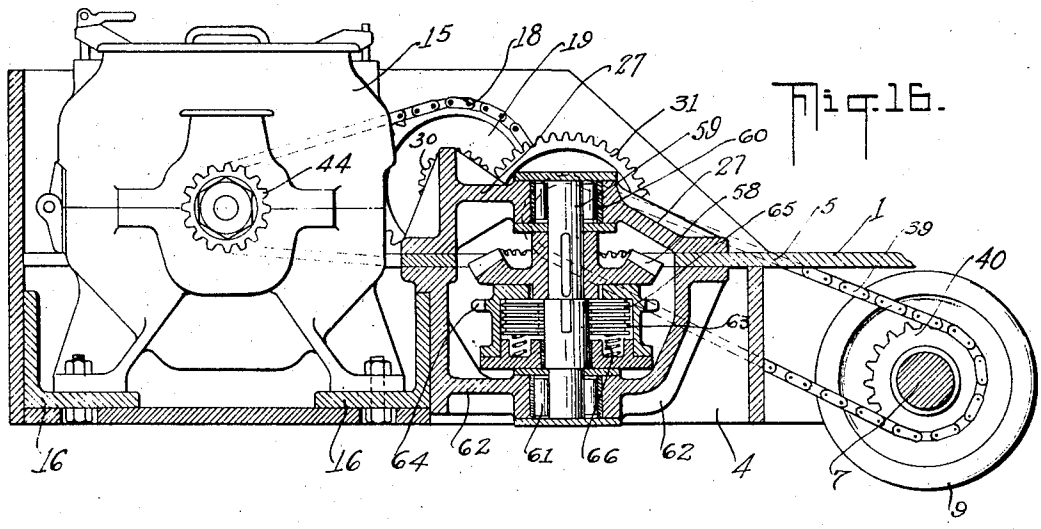
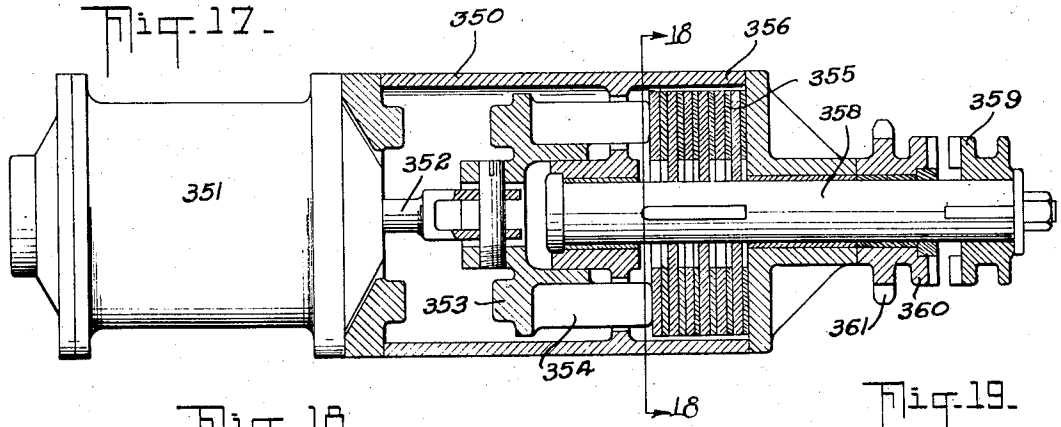


Fig. 17.



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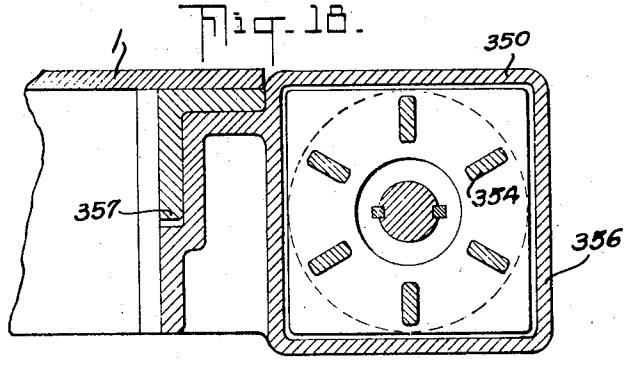

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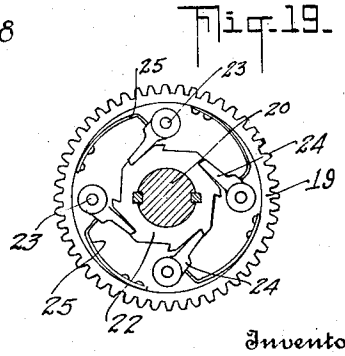

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LOADING MACHINE

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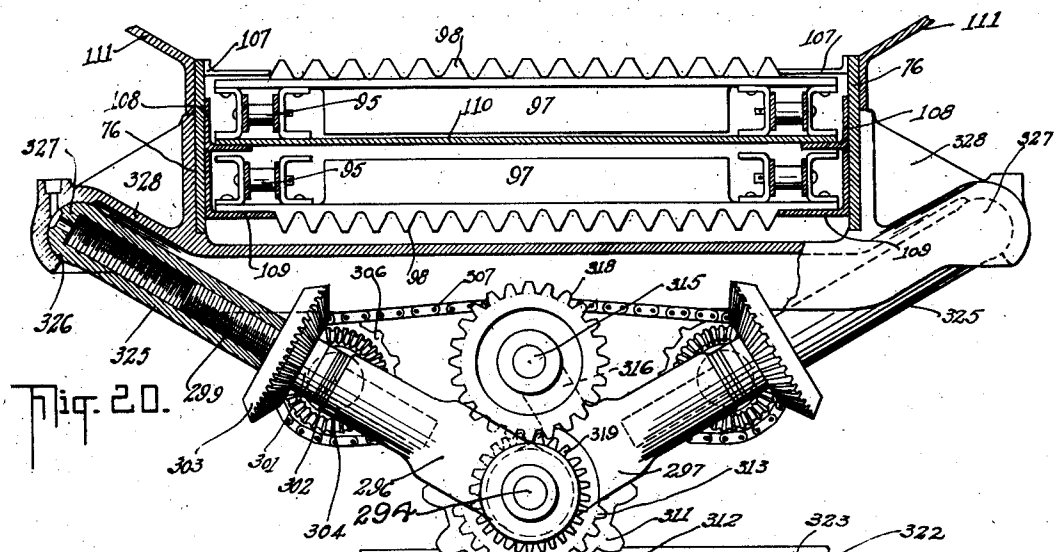

Fig. 20.

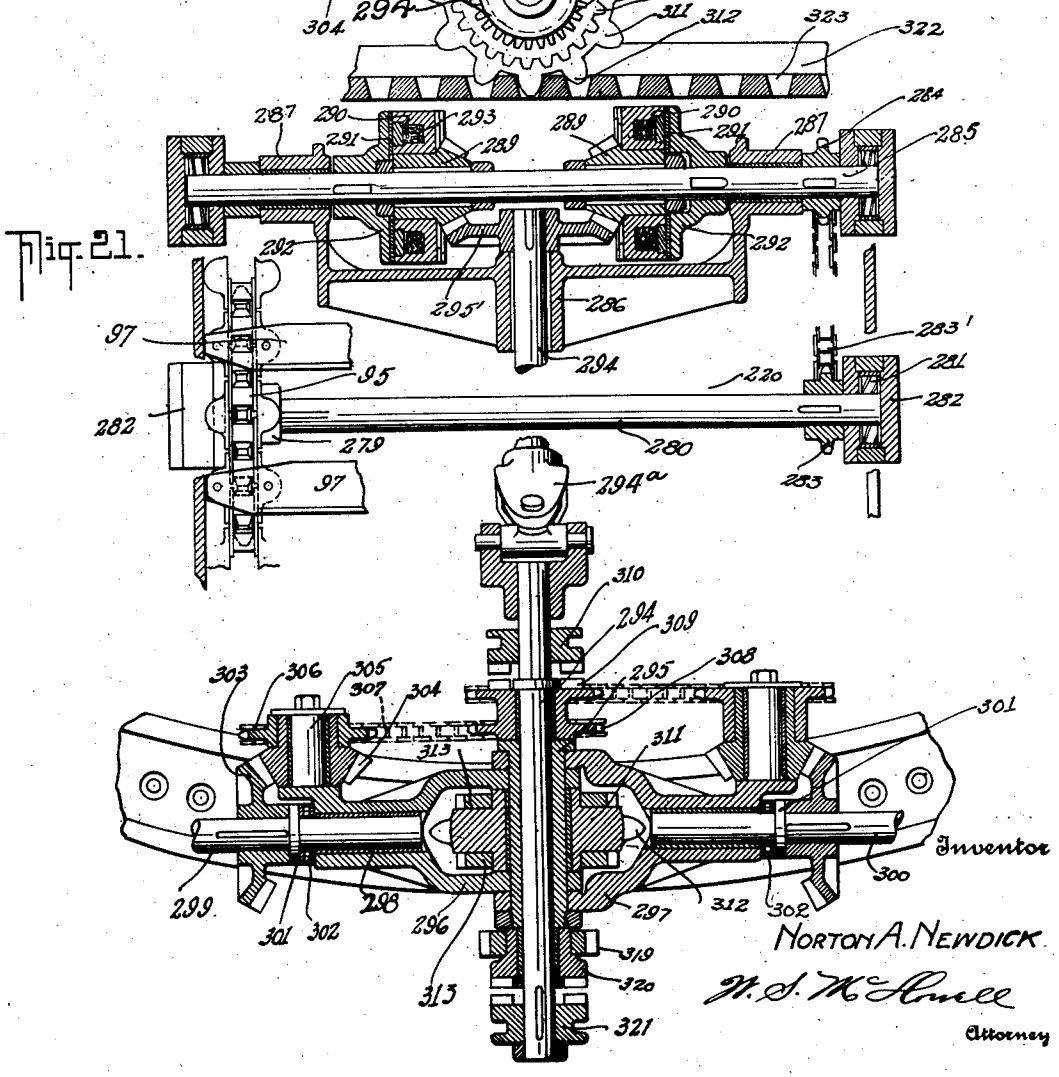

Fig. 21.

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LOADING MACHINE

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Fig. 22.

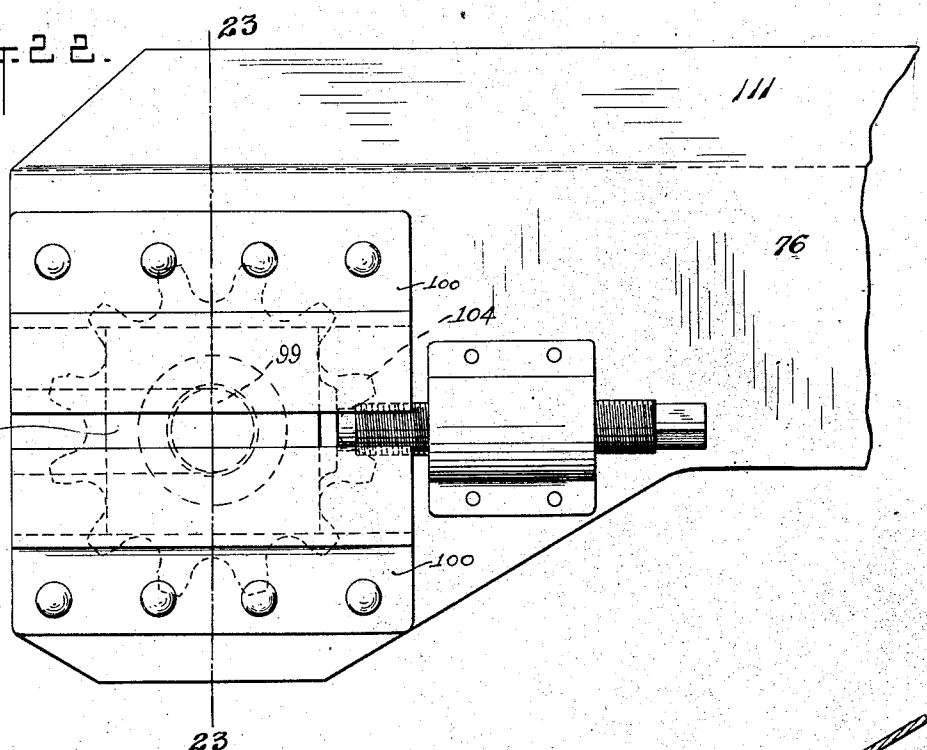
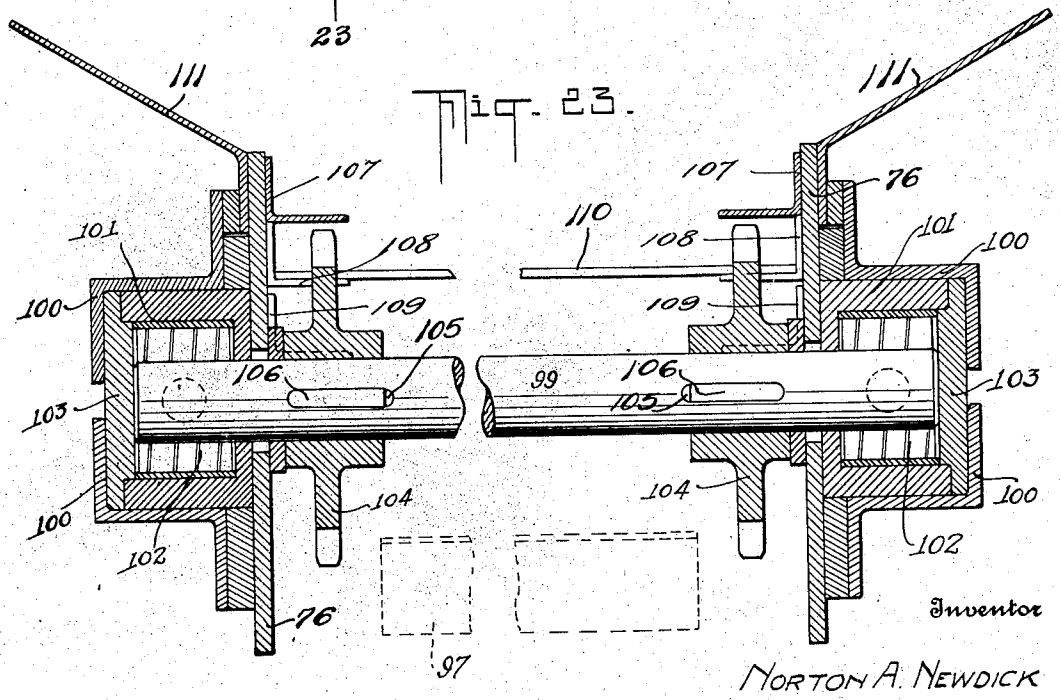


Fig. 23.



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LOADING MACHINE

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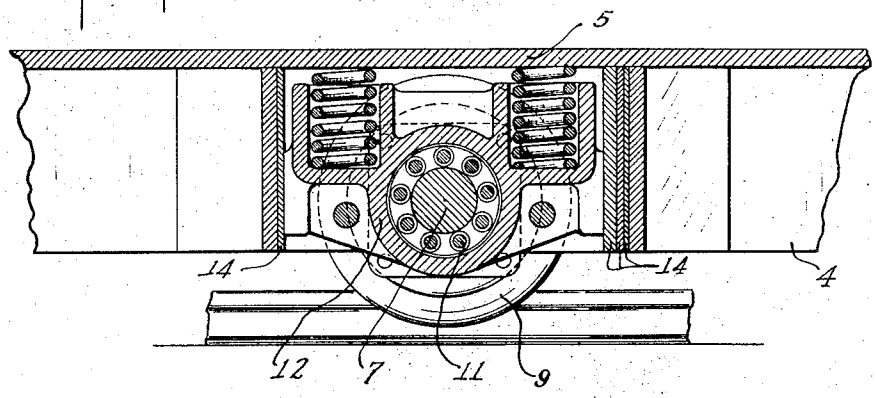
Fig. 24.



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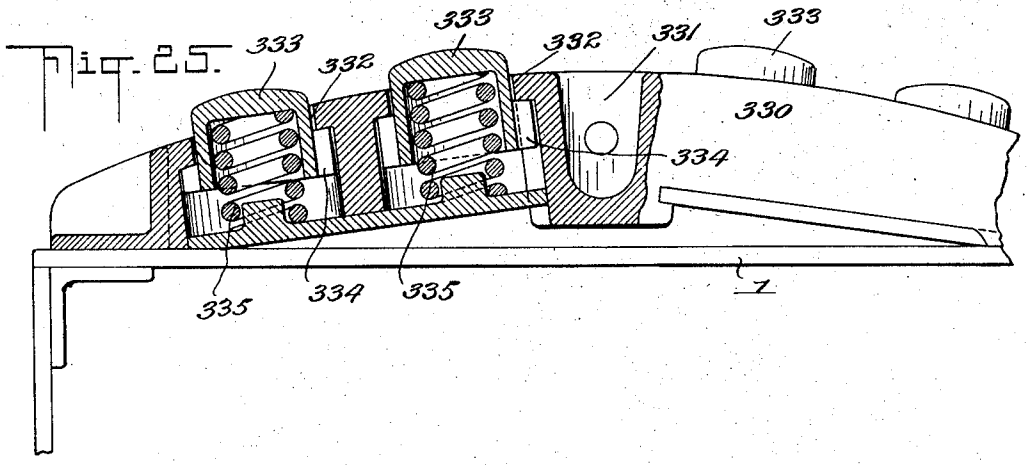

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LOADING MACHINE

Filed June 21, 1922 14 Sheets-Sheet 13

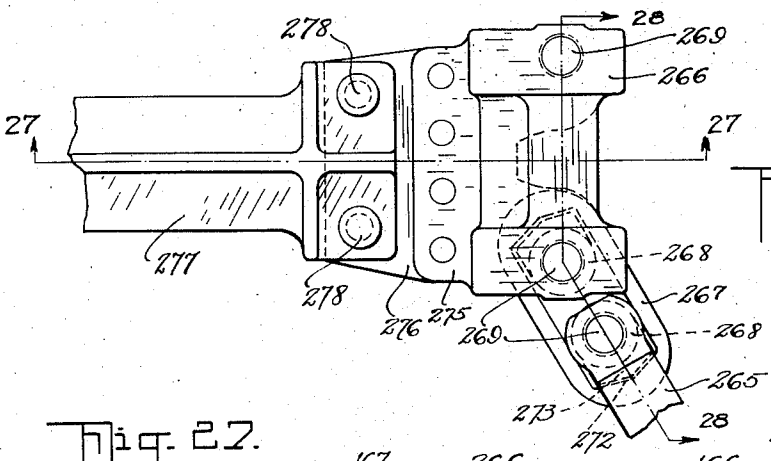


Fig. 26.

Fig. 27.

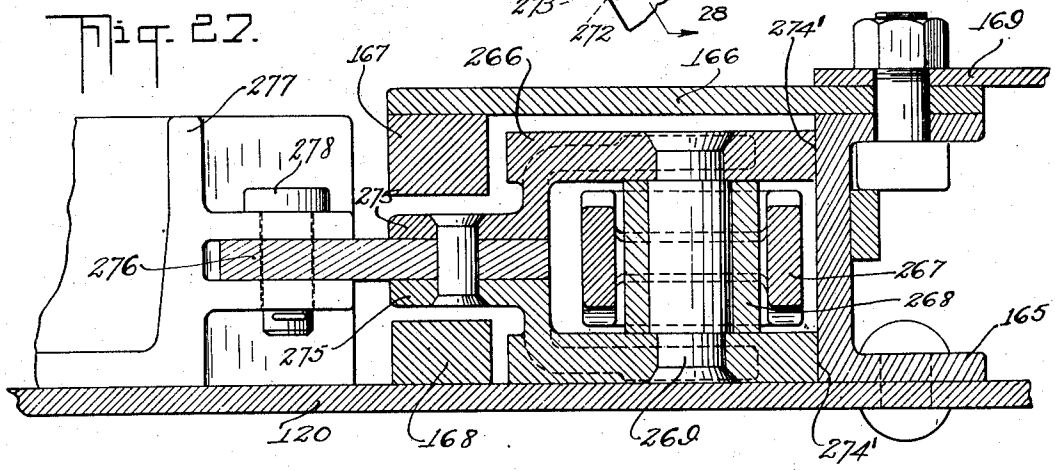
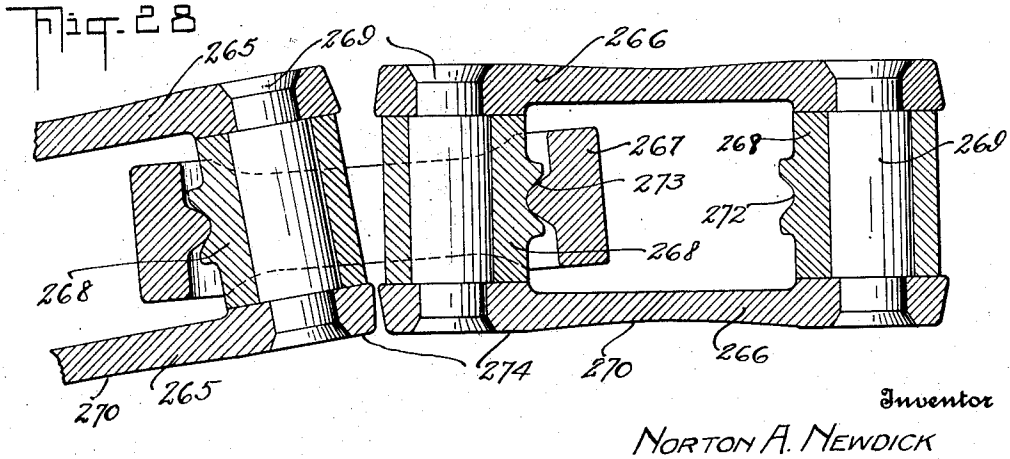


Fig. 28



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LOADING MACHINE

Filed June 21, 1922 14 Sheets-Sheet 14

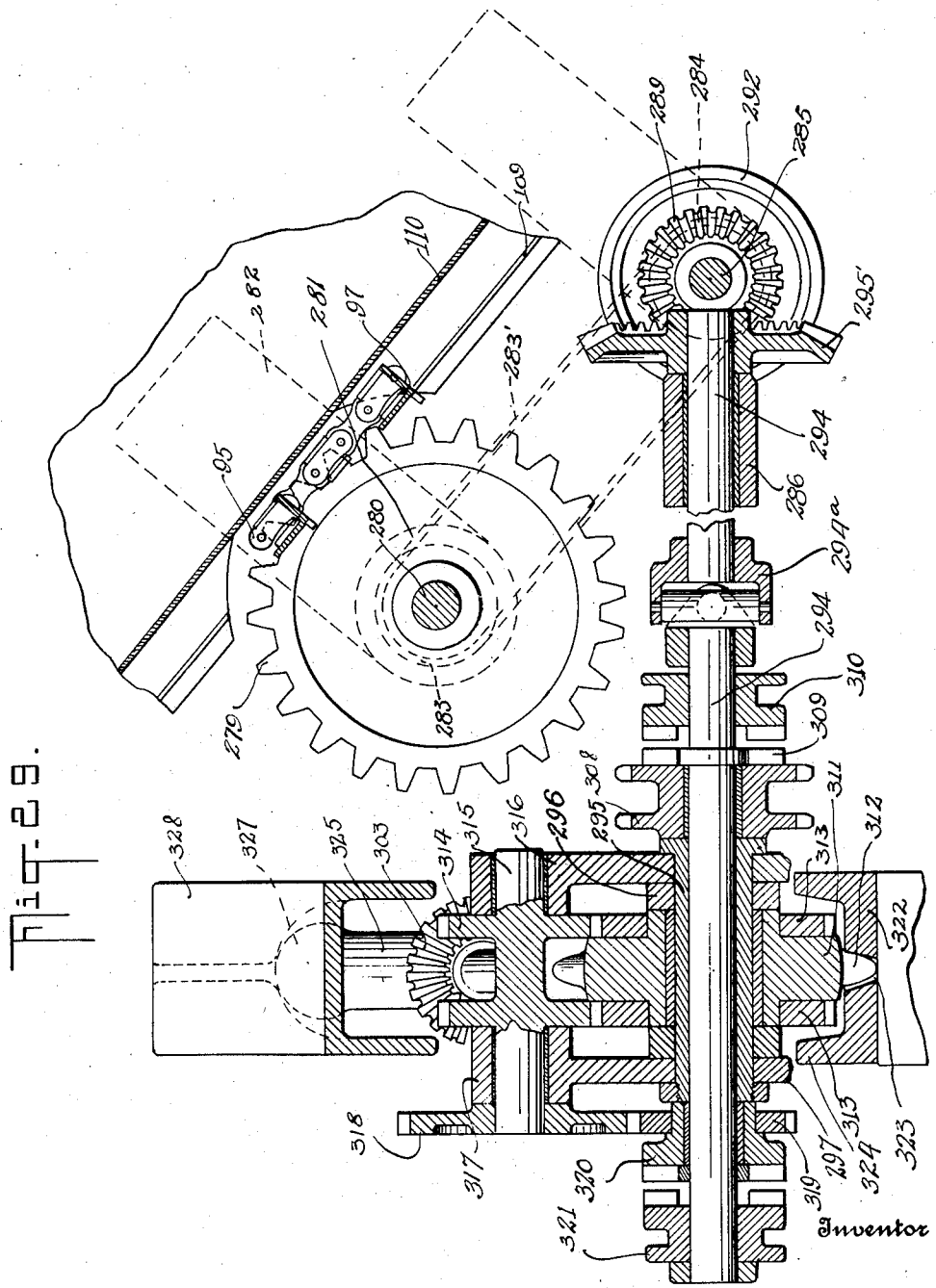

Fig. 29.

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Attorney

Patented June 1, 1926.

1,586,573

UNITED STATES PATENT OFFICE.

NORTON A. NEWDICK, OF COLUMBUS, OHIO, ASSIGNOR TO THE COLODER COMPANY, OF COLUMBUS, OHIO, A CORPORATION OF DELAWARE.

LOADING MACHINE.

Application filed June 21, 1922. Serial No. 569,998.

This invention relates to improvements in loading and conveying machinery and is especially directed to a loading machine adaptable for use in coal mines for the purpose of providing power operated means for transferring loose or broken down coal from the face or breast of a mine working to pit or mine cars into which the loose coal is delivered and removed from the mine.

A principal object of the invention resides in the provision of a loading machine of this character which is formed to include a portable base unit having mounted thereon a gathering conveyer, the said conveyer having its front end arranged to swing in a substantially horizontal plane across the floor of a mine and in advance of said base unit, its rear end being terminated above said base unit and mounted upon a substantially vertical support constructed to provide a vertical swinging axis about which the conveyer may swing bodily horizontally so that its front end may be maintained in gathering engagement with the materials to be loaded, and to provide in combination with the conveyer an endless, floor engaging power actuated, traction device constructed to impart a powerful side swinging movement to the conveyer, so that the latter may be positively forced under and maintained in loading engagement with the materials to be gathered, which lie loosely upon the floor of a mine, subsequent to the shattering of the solid vein of coal by blasting or other suitable methods.

Another object of the invention rests in the provision of a loading machine wherein the base unit or truck carries a vertically and horizontally swinging loading or secondary conveyer, arranged in receiving relation with respect to the rear discharge end of the gathering or primary conveyer, and wherein the loading conveyer is provided with an endless belt means for leading the materials, discharged from the gathering conveyer to a relatively elevated point at the rear or discharge end of the machine, so that such materials may be discharged into underlying pit cars, the construction is such that the loading conveyer may, by the operation of power driven means, be swung horizontally and vertically with respect to the base unit so that the discharge end thereof is vertically and horizontally adjustable relatively to the pit cars or other means into which the material from the loading machine is discharged.

A still further object resides in providing the loading conveyer with a belt including an endless movable chain, whereby upon the operation of the conveyer the movement of said chain may be employed to effect the operation of the mechanism for raising and lowering and horizontally swinging the loading conveyer bodily.

Other objects of the invention rest in the provision of a loading machine of this type wherein the rear end of the gathering conveyer is mounted for horizontal swinging movement upon the upper end of a vertically arranged support, which latter has its lower end provided with a ball and socket joint construction seated in cooperation with the base unit, and by means of which the gathering conveyer may swing vertically as well as horizontally in a new and improved manner in any position of angular adjustment with respect to the base unit; in forming the said vertical support to constitute a casing wherein is provided a planetary gear train by means of which motion from a drive motor will be imparted to the endless belt of the gathering conveyer; in providing power actuated means for raising and lowering the front end of the gathering conveyer, whereby when the machine is transported from place to place in the mine the front end thereof will be positioned above the mine floor or trackway, together with the endless traction means employed for swinging the gathering conveyer laterally; in providing an improved flexible mounting for supporting the front end of the loading conveyer in connection with the base unit for the purpose of permitting of angular adjustments of the loading conveyer with respect to the base unit and yet to impart power to the endless conveyer thereof irrespective of its operative positions; in providing improved electrical controls for the various mechanisms of the machine which controls admit of the selective operation of the various parts of the machine from a centralized and protected operator's position; in the pro-

vision of a loading machine having a large loading capacity together with simplicity in construction, convenience in control and operation, of a design to reduce friction to a minimum and thus admit of the employment of but two operating motors of relatively small size; and in other general and specific improvements which will become more readily apparent by reference to the following description and accompanying drawings.

With these and other objects in view, as will appear as the description proceeds, the invention accordingly consists in the novel features of construction, combinations of elements and arrangements of parts, hereinafter to be fully described and particularly pointed out in the appended claims.

In the accompanying drawings, forming a part of this specification, and in which similar characters of reference denote like and corresponding parts throughout the several views thereof:

Figure 1 is a top plan view of the improved loading machine comprising the present invention.

Figure 2 is a side elevation thereof.

Figure 3 is a vertical transverse sectional view taken on the plane indicated by the line 3—3 of Figure 2.

Figure 4 is a plan view of the shiftable motor frame for the gathering conveyer of the machine, parts of the lateral feed conveyer being shown in section.

Figure 5 is a longitudinal sectional view taken on the line 5—5 of Figure 4 and disclosing the endless traction devices employed in effecting the lateral movement of the gathering conveyer.

Figure 6 is a side elevation of the structure disclosed in Figure 5.

Figure 7 is an enlarged vertical sectional view disclosing the drive mechanism between the motor of the gathering conveyor, the means for raising and lowering said conveyer and the endless traction devices for shifting the conveyer laterally.

Figure 8 is a plan view, partially in section, of the nose end of the gathering conveyer.

Figure 9 is a vertical sectional view taken on the line 9—9 of Figure 8.

Figure 10 is a sectional view on the line 10—10 of Figure 8.

Figure 11 is a vertical sectional view taken through the planetary gearing and associated structure employed for supporting and driving the gathering conveyor.

Figure 12 is a horizontal sectional view taken through the main supporting truck of the machine and setting forth the mechanism for propelling the machine in driving the loading conveyer.

Figure 13 is a transverse vertical sectional view taken on the line 13—13 of Figure 2.

Figure 14 is a detail vertical sectional view taken through the forward sprocket construction of the loading conveyer.

Figure 15 is a detail view disclosing the ball and socket mounting for the supporting standard or casing of the gathering frame.

Figure 16 is a vertical sectional view taken on the line 16—16 of Figure 12.

Figure 17 is a vertical sectional view taken through the magnetic brake construction.

Figure 18 is a sectional view on the line 18—18 of Figure 17.

Figure 19 is a detail sectional view on the line 19—19 of Figure 12.

Figure 20 is a vertical transverse sectional view taken through the structure for raising and lowering the loading conveyer frame and shifting the said frame laterally.

Figure 21 is a horizontal sectional view taken through the structure for raising and lowering and laterally shifting the loading frame or hopper.

Figure 22 is an enlarged view in side elevation of the head shaft construction of the loading conveyer.

Figure 23 is a vertical transverse sectional view taken on the line 23—23 of Figure 22.

Figure 24 is a vertical sectional view taken through one of the spring boxes of the truck.

Figure 25 is a horizontal sectional view taken through the resilient bumper mechanism of the truck.

Figure 26 is a plan view of the chain structure employed in the gathering conveyer.

Figure 27 is a vertical transverse sectional view taken on the line 27—27 of Figure 26.

Figure 28 is a similar view on the line 28—28 of Figure 26, and,

Figure 29 is an enlarged vertical sectional view disclosing the mechanism for effecting the raising and lowering and side swinging movements of the loading conveyer.

Referring more particularly to the specific details of construction of the single embodiment of the invention disclosed in the accompanying drawings, there is provided a loading machine which includes in its general construction a portable base unit, in this instance in the form of a truck 1, a front primary or gathering conveyer 2, and a rear secondary or loading conveyer 3. The front conveyer includes a pan or frame A which has its rear end pivoted so that the front or nose end of the said gathering conveyer will be enabled to sweep horizontally back and forth across the floor of a mine and forced beneath the coal to be loaded, for the purpose of gathering such coal within the confines of the machine and leading the same rearwardly into a portable mine car situated beneath the discharging end of the loading conveyer 3. It will be understood that in the operation of machines of this character the coal is blown down ordi-

narily by blasting operations from the original vein, and the present machine is adapted to be forced into this loose coal to gather the latter from the floor of the mine and discharge the same into the portable mine cars. To effect this object economically, rapidly and in a labor saving manner is the primary purpose of the present invention, and secondly, to mechanically improve upon machines heretofore proposed and employed for this purpose.

In this instance the truck or portable base unit 1 is composed generally of structural steel members wherein is included spaced longitudinally extending side bars 4 and a connecting horizontally disposed top plate 5. The truck is supported by a front axle 6, an intermediate axle 7 and, if desired, a rear axle 8. The front and intermediate axles are longitudinally spaced an appreciable distance and are provided with flanged track wheels 9, while the rear axle 8, if used, is located comparatively contiguous to the intermediate axle 7 and is provided with plain faced track wheels 10, the ends of these axles are mounted preferably in roller bearings 11 contained in axle boxes 12, the latter in this instance being spring supported and guided by the truck side bars 4 and guide angles secured thereto. Liners 14 are provided in conjunction with the axles to vary the distance between the centers thereof, whereby adjustments may be made in drive chains, hereinafter specifically described, connected with said axles.

An electric motor 15 is mounted on angle shaped cross members 16 disposed at the rear of the truck, said motor being employed to furnish power to propel the truck, drive the rear or loading conveyer 3 and to raise and swing the rear conveyer. At the left side or end of the motor 15, the armature shaft of the latter is provided with a sprocket 17 for a roller chain 18, which latter is employed to drive a sprocket 19 loosely mounted on a shaft 20, journaled in connection with the truck and arranged in parallelism with the armature shaft of the motor. The sprocket 19 forms a casing having a cover plate 21 at one end. On the shaft 20 and within the sprocket 19 there is placed a ratchet wheel 22, which is keyed, as shown, to the shaft 20. A plurality of bolts 23 extend through the sprocket casing 19 and carry pivoted pawls 24, which engage the teeth of the ratchet 22. Springs 25 are employed to maintain the pawls normally in contact with the ratchet 22 at speeds below substantially half the maximum speed of the shaft 20. In the power transmitting direction the rake or inclination of the ratchet teeth and pawl ends keep these members in contact on account of thrust at any speed, either slow, intermediate or high, but in the idling direction speeds above half that of the maximum speed of the shaft 20, the pawls respond centrifugally and fill out against the resistance exercised thereon of the springs 25, and thus avoid the noise and wear of contact with the ratchet teeth.

The shaft 20 is supported at one end by a roller bearing 26, mounted in a bracket 27 secured to the top plate 5 of the truck, and at the other end by a similar bearing 28 mounted in a bearing box 29 secured to one of the side bars 4 of the truck. The shaft 20 is provided with an integral spur pinion 30, which drives a larger gear 31 upon a counter shaft 32, journaled in connection with the truck 1 adjacent to and disposed in parallelism with the shaft 20. The sprocket casing 19 is provided with clutch jaws 33 which engage a slidable jaw clutch 34 operated in any suitable manner on the shaft 20, which locks the sprocket casing 19 to the shaft 20 for unitary rotation, irrespective of the direction of rotation of the sprocket 19. As the motor 15 is of the reversible type the shaft 20 may, therefore, be driven in either direction when the clutch 34 is engaged or in one direction only when it is disengaged.

One end of the shaft 32 is mounted in a roller bearing 35 contained in the bearing bracket 27, and the other end of the shaft 32 is similarly mounted in a roller bearing 36 contained in a box 37 secured to one of the sides 4 of the truck. The shaft 32 in this instance is provided with an integral sprocket 38 for a double chain 39, which, in turn, is trained around and drives a sprocket 40 fixed upon the intermediate axle 7. A second sprocket 41 on the axle 7 drives a single roller chain 42 which, in turn, drives a sprocket 43 fixed on the front axle 6.

The axles 6, 7 and 8 have their ends received in spring pressed journal boxes, as shown in Figure 24, whereby the machine is resiliently supported, shocks and jars on the mechanism thereof reduced to a minimum when the service is considered and the machine rendered thoroughly track worthy.

At the opposite end, or the right hand side, of the motor 15 there is disposed a sprocket 44, for a quadruple chain 45, and a similarly formed sprocket 46 loosely mounted on a countershaft 47, journaled in the truck substantially in registration with the shaft 20. It will be observed that these sprockets and chains are duplicates of the corresponding sprockets 17 and 19 and the chain 18 on the other side of the motor and previously described. It will be apparent that the chains 18 and 45 may be tightened by shifting the motor 15 rearwardly. The shaft 47 is mounted in bearings 48 and 49, the former being located in the bracket 27, and the latter in a bracket 50, attached to the top plate 5 of the truck. On the shaft 47, within the sprocket casing 46,

there is mounted a ratchet wheel 51 which, with its pawls, is the duplicate of the ratchet 22, but is set to transmit power in the opposite direction with respect to the ratchet 22.

From the ratchet 51 power is transmitted through the shaft 47 to a gear 52 and thence to a second gear 53 carried by a shaft 54, journaled in the truck for rotation and disposed in parallelism with the shaft 47. The shaft 54 is mounted in roller bearings 55 and 56, formed in the brackets 50 and 27 respectively and carries at its inner end a bevel pinion 57. This pinion drives a bevel gear 58, carried rigidly on a short vertical shaft 59 mounted in roller bearings 60 and 61, the former being contained in the bracket 27 and the latter in a lower bracket 62, suitably secured in connection with the truck frame. Below the bevel gear 58 there is placed a slip clutch 63 of a multiple disc type, whose casing is provided with sprocket teeth 64 on the outside thereof, the interior of the casing being provided with the usual disks 65 and springs 66. It will be understood that the disks are arranged so that alternate members thereof will be keyed to the shaft 59 and to the interior of the clutch casing 63, and that by the medium of the springs 66, sufficient frictional pressure will be maintained between adjoining faces of said disks to normally cause unitary rotation on the part of the shaft 59 and the casing 63. Upon overloading, however, relative movement will take place between the adjoining disks, preventing injury to associated gearing and drive mechanism. This clutch is in this particular instance non-adjustable and is therefore initially set, by the agency of an ammeter test, at about twice the usual maximum load placed on the rear or loading conveyor 3.

A wide roller chain 67 operates in a horizontal plane around the sprocket 64, and drives a pair of chain sprockets 68 and 69 provided on the lower ends of substantially vertically disposed shafts 70 and 71, located near the front ends of the loading conveyor 3, all of these sprockets being located beneath the top plate 5 of the truck. The chain 67 also passes over a fixed idler sprocket 72, located on the tight or pulling side of the chain, and a swinging idler 73 is mounted on an arm 74 pivoted to the under side of the top plate of the truck and actuated, by a spring 75, to form a take-up for the purpose of maintaining the chain 67 at proper tension and to eliminate slack therein. As will be hereinafter described the sprockets 68 and 69 are, capable of swinging on an arc, and it is therefore important that the movable idler 73 be provided to compensate for the varying positions assumed by the sprockets 68 and 69.

The rear conveyor includes a relatively enlarged hopper C, which is employed to receive material discharged from the front or gathering conveyor and to lead such material rearwardly of the machine for discharge into portable pit or mine cars placed beneath the rear or discharge end of the hopper. The hopper C is formed to include side plates 76, which are secured in any suitable manner at their forward ends to bearing housings 77, which, in turn, are journaled in a yoke shaped pivoted bracket 78 as indicated at 79. The bracket 78 is preferably formed to provide a centrally located integral pivot 80, which is of generous proportions and projects through a sub-plate 81 secured to and constituting a part of the truck 1. This pivot 80 has a ball thrust bearing 82, a washer 83 and a holding bolt 84, which serve to retain the thrust bearing in its operative position and permit of relatively free swinging movement on the part of the rear loading conveyor 3 about the vertical axis defined by the pivot 80. By this construction the hopper C and the loading conveyor may be bodily oscillated in a substantially horizontal plane, and by reason of the journals 79 the said hopper and loading conveyor are capable of being vertically oscillated for the purpose of controlling the relationship between the discharge end of the conveyor 3 and the mine or pit car underlying the same.

Bearing bosses 85 surround the journals 79 and upper and lower arms 86 and 87 respectively of a yoke shaped nature project from the bosses 85 to carry roller bearings 88 and 89 for the reception of the shafts 70 and 71. Each shaft 70 and 71 carries a bevel pinion 90 each of which drives a bevel gear 91 bolted or otherwise secured to a sleeve 92. The sleeves 92 are loosely mounted on a transversely extending foot shaft 93 and each of said sleeves carries a sprocket 94 at its inner end, the sprockets being keyed, as shown, to the sleeves. These sprockets 94 have trained thereabout steel thimble roller chains, which are spaced transversely and form the conveyor or loading chains 95, the sleeves 92 rotate in bearings 96 mounted in the bearing housings 77. Angle flights 97 are connected to the chains 95 at longitudinal intervals and the same are provided at their outer edges with teeth 98 to assist in gripping lump coal.

It will be noted that each conveyor chain 95 is independently driven by one of the bevel pinions 90 and connected parts, but since both sprockets 68 and 69 are driven by the same chain 67 the effect is the same as if the conveyor were driven from one side only, except the drive is of double strength. Again, it will be observed that the rear conveyor 3, including the hopper C is pivoted to swing horizontally about the pivot 80 and vertically about the journals

79, and irrespective of these various positions which the loading conveyor is capable of assuming the drive thereof will be completely effective. The side plates 76 of the rear or loading conveyor are extended to the rear or discharge ends thereof, at which point a take-up is supplied for the head shaft 99, which consists of a pair of Z bars 100, forming slides for the bearing boxes 101 which contain roller bearings 102 in which the shaft 99 is mounted for rotation. It will be observed that the shaft 99 is prevented from endwise movement by end plates 103 and sprockets 104 over which the chains 95 pass are positioned upon the shaft 99 and restrained from endwise movement thereon by lugs 105 provided on keys 106.

It will be observed that the side plates 76 are provided on their inner surfaces with upper, lower and intermediate angle bars 107, 109 and 108 respectively, which extend longitudinally of the hopper and conform generally to the longitudinal shape thereof. The upper angles 107 are positioned immediately above the upper runs of the conveyor chains 95 and are utilized to keep the coal out of the chains. The intermediate angles 108 connect the side plates 76 and the bottom plate 110 of the hopper, the upper strands of the conveying chains 95 being disposed to ride on the plate 110, and the lower or return strands or runs of the chains 95 being disposed to ride over the lower angles 109. By this construction the hopper will possess all requisite strength to support materials imposed thereon and efficient guides will be provided for the conveying chains. Flaring side plates 111 are riveted to the plates 76 and are proportioned and situated to direct material upon the bottom plate 110 and into engagement with the conveying chains 95 and the flights 97.

The gear 53 is provided with clutch jaws 112, which engage a jaw clutch 113 slidably provided and keyed on the shaft 54. When the clutch 113 is engaged power may be transmitted to operate the rear or loading conveyor in one direction only, this being due to the ratchet construction 51. When the clutch 113 is disengaged, however, no movement of the shaft 54 results, and consequently motion on the part of the loading conveyor will be precluded. The motor 15 is preferably controlled by means of a reversing controller 114 mounted in connection with and beneath the rear end of the front or gathering conveyor 2. When the clutch 34 is engaged and the clutch 113 disengaged, the traction wheels may be driven in either direction at speeds ranging from zero up to several miles per hour. When the clutch 34 is disengaged the ratchet 22 still connects the motor 15 and tractor wheels for movement in a forward direction, and this movement is utilized primarily for a "sumping" or powerful forcing of the front or nose end of the gathering conveyer into and beneath the loose coal, lying on the floor of a mine, adapted to be gathered. If now the clutch 113 is engaged the rear conveyer drive is connected for movement in one direction only, and this is in the opposite direction from the sump feed and in the proper direction of conveyance. In this condition, therefore, which is the normal loading condition, the control 114 controls both the sump feed and the operation of the rear conveyor, movement of the control handle in one direction guiding the sump feed and in the other direction starting the loading conveyor, and since the resistance for the motor 15 is designed for continuous operation on any notch, either of these motions may be operated at any speed within their ranges. It will be noted that when the sump feed is applied the rear conveyer is stopped, due to the oppositely working ratchets 22 and 51, but as the sump feed is quickly accomplished and the rear conveyer has about twice the capacity of the front conveyer, the accumulated coal in the hopper C is capable of being quickly disposed of. Since the sump feed and rear conveyer are never operated together, the whole power of the motor 15 is available for either.

At the front end of the truck 1, substantially over the forward axle 6, and secured to the top plate 5, there is placed a cup 115 in which is positioned the ball pivot 116 for the front conveyer 2. It will be observed that the cup 115 and the pivot 116 constitute a ball and socket joint construction by means of which a completely flexible support is provided for the rear part of the front conveyer, which will enable the said front conveyer to possess limited movement in substantially any direction, so that the forward nose end thereof will readily follow and conform to irregularities in the floor of a mine over which the said nose end passes. The pivot 116 is formed on the under side of a flanged circular casting 117, which is bolted to the closed end of the lower part of the barrel shaped gear casing 118, which latter is provided with a flange 119 at the top thereof secured to the under side of the bottom plate 120 of the front conveyor 2.

Referring more particularly to Figure 4 it will be observed that there is provided an electric motor 125 for driving the front conveyor, which is supported by a plate 121, secured to a pair of forwardly extending channel bars 122. These bars have their rear ends secured to the lower part of the gear casing 118, and their forward ends secured to the under side of the plate 120 by gusset plates 123 and angles 124. It will

be observed that by this construction there is provided a frame for supporting the front motor 125, and that the casing 118, the motor 125 and the supporting frame therefor will produce a unitary rigid structure capable of being supported by and oscillating from the pivot 116. The front motor 125 in this instance is an exact duplicate of the rear motor 15 and drives the front conveyor 2 as follows:

The head shaft 126 is mounted at its lower end in a roller bearing 127 and has its upper end indirectly mounted in a roller bearing 128, both bearings being contained in the casing 118. The motor 125 has a bevel armature pinion 129, which drives a beveled gear 130 mounted horizontally upon a bushing 131, which runs loosely on the shaft 126. The weight of the gear 130 and the super-imposed parts are carried by a roller thrust bearing 132, resting on a cap plate 133 of the bearing 127, the weight of the shaft 126 being carried by a separate thrust bearing 134 located in the bottom of the casing 118. Surrounding the bushing 131, above the gear 130, is a flanged spur pinion 135 fixed to rotate in unison with the gear 130 by means of rivets or their equivalents 136. Above the gear 135 there is a second gear 137 of equal diameter with respect to the gear 135 but having a wider face. A bushing 138 is loosely positioned upon the shaft 126 and receives the gear 137. The latter in this instance is provided with a flange 139 and a connecting ring 140, between which flange and ring are mounted a plurality of pins 141, each carrying a spur pinion 142 loosely mounted thereon. An internal gear 143 is secured within the casing 118 and is engaged by the planetary pinions 142 which roll around within it and thus impart motion to the gear 137.

The gear 135, the pinions 142 and the gear 143 form a first planetary gear train, and a second train of planetary gears is formed by the gear 137, the pinions 144 and the internal gear 145. Pinions 144 are carried upon pins 146 secured to the flange 147 and the ring 148. The flange 147 is provided with a hub 149, which in this instance is a press fit on the shaft 126 and keyed thereto, the outer surfaces of said hub being engaged with the rollers of the bearing 128. It will now be seen that power is transmitted from the pinion 129 through the various gears to the hub 149 which, in turn, drives the shaft 126. The direct reduction provided by these gears between the gear 130 and the shaft 126 in this instance is substantially 10 to 1. A bronze facing 151 is provided between the gear case and the flange 147 to take any upward thrust of the gears.

The head sprocket 150, which is driven by the shaft 126 and is located above the plate 120 for the purpose of driving the front or gathering conveyor 2, is provided with a casing 152 having a removable cover 153. Within the casing 152 there is a spider or ring 154 having a series of cored pockets 155, provided with springs 156 to put pressure on the clutch disks 157 and 158. The spider 154 is made of bronze and its inner surface is a loose fit on the shaft 126. A bushing 159 in the sprocket 150 is also loosely provided on the shaft 126. The disks 157 and 158 are free to move longitudinally or endwise of the shaft 126, and the larger disks 157 being keyed to the interior of the casing 152 while the smaller disks 158 are similarly keyed as at 160 to the shaft 126, the said disks being arranged in the usual alternate relationship, and are maintained in frictional contact by the springs 156. It will be understood that under normal loads the shaft 126 will rotate the sprocket 150 in unison therewith, but on overloads relative movement between the disks will take place, permitting of a slipping of the clutch which will avoid injury to the movable parts of the machine associated with the clutch. Hollow set screws 161 are provided to adjust the spider 154 and consequently the pressure which the springs 156 exercise upon the disks of the clutch, and an oil plug 162 is provided in the top of the casing for oiling purposes. This oil may be carried down through a central port in the shaft 126 to lubricate all the bearings and gears below. It will be understood that when the above described slip clutch is set to carry the normal load on the conveyor 2 it will slip on an overload and thus protect the motor and gearing.

The structural portion of the frame or pan D of the front or gathering conveyor 2 of the machine consists of the bottom plate 120 which has its body portion inclined longitudinally with respect to the horizontal and disposed to substantially overlie the forward end of the loading conveyor. Connected with the bottom plate are two side plates 163 of varying height, which are connected to the plate 120 by angles 164. The chain guides for the forward or gathering conveyor 2 consist in this instance of a pair of opposed channel bars 165, located centrally of and extending longitudinally with the bottom plate 120. Connected with the channels 165 is a pair of top plates 166 which have their outer edges equipped with depending bars 167 and spaced from a pair of similarly formed bars 168 fastened to the bottom plate 120. Bracing brackets 169 are fastened at intervals to channels 165, and a cover channel 170 is secured to the brackets 169. Inclined side guards 171 are connected to the channels 170 and plates 166. By this construction it will be observed that the shape of

the gathering pan or frame D will result in the formation of longitudinally extending run-ways disposed between the side plates 163 and the chain guiding structure, and material to be loaded is adapted to be forced longitudinally and rearwardly through either of said run-ways. Also, by the provision of the channels 165, the bottom plate 120, the top plates 166 and the bars 167 and 168, guides will be produced for guiding the movements of the conveying chain, hereinafter to be specifically described, of the gathering and front conveyor 2.

Referring to Figure 3 it will be observed that a pony axle 172 is provided with a pair of swiveled pony wheels 173, provided with roller bearings 174 mounted on axles 175. The axles 175 are each contained in a forked casting 176, provided at its upper end with a vertical trunnion 177, which is pivoted to a heavy horizontal flange 178 provided on each end of the axle 172. A roller thrust bearing 336 transfers the weight from the axle 172 to the casting 176 and a washer 179, threaded on the upper end of each of the trunnions 177 retains the parts of this pony truck construction in operative position. Each casting 176 is provided with a rearwardly extending bracket arm 180 to which a cross steering link 181 is pivotally connected by means of pins 182, the said link and bracket arm serving to maintain proper relation between the vertical planes of the wheels 173. These wheels steer each other by the flange pressure on the rail and are particularly adaptable to curves of short radii.

The pony axle 172 is provided centrally with a pair of upwardly extending guide struts 183 connected at their upper ends by a cap 184. The struts 183 are each provided with an exteriorly extending vertical guide rib 185, which is mounted to slide vertically in a guide slot 186 formed in a carrying housing 187, this housing having a pair of inclined flanges 188, which are bolted or otherwise secured to the under side of the conveyer bottom plate 120. Upon the struts 183 there are formed four sets of toothed racks 189, which engage with the teeth of a pair of long spur lifting pinions 190, mounted on short shafts 191, which latter are journaled in bearings 192 formed horizontally in the housing 187. On the middle portion of each pinion 190 there is mounted a worm gear 193, one of these being right hand and the other left hand. A worm shaft 194, provided with right and left hand worms 195, engaging the worm wheels 193, has one end journaled in a bearing 196 formed in the casing 187, and the other end journaled in a bushing 197 set in a sleeve extension on the bevel gear 198, this gear being mounted on the front end of the motor 125 to rotate with the armature shaft thereof. The gear 198 has a flange 199, which forms a friction surface to engage the magnetic electrically operated clutch 200. It will be noted that there is no end thrust on the shaft 194, the same floating endwise in its bearings, the thrust of the worms being absorbed each by the other. The clutch 200 is connected to the shaft 194 by a key mounted to slide slightly on the shaft 194 when current is applied. By applying the clutch and reversing the motor the pony wheels may be raised or lowered. When raised, as shown in Figure 3 the same are free of the rails, allowing the front end of the machine to rest directly on the mine floor and when lowered, the said pony wheels lift the front end of the machine off the floor and adapt it to the rails for transportation, from place to place, around the mine.

To swing the front end of the machine across the mine floor, to gather the loose shot down coal, I preferably provide, in lieu of jacks and cables, a pair of caterpillar or endless belt traction devices 201 and 202, located beneath and on opposite sides of the bottom plate 120 of the front elevator. These devices in their present embodiment, consist of steel frames formed in four sections, there being two outside sections 203 and two middle sections 204 held together by transversely extending tight fitting bolts 205, which also secure the frame sections to exteriorly located plates 206 and angle brackets 207, riveted to the under side of the conveyer plate 120. Two short traction devices of this type are provided rather than one long one, to secure better tractive effort and avoid the resistance due to "slewing" a long caterpillar on a curved path. These belts are mounted on the arc of a circle centered at the main pivot 116.

Bushings 208 are provided in the frame sections 203 and 204 of the belt 202 to receive the sprocket shafts 209, which are provided with integral sprockets 210 over which pass roller chains 210′ having angle sections formed with the outside links thereof. The caterpillar treads 211 are each fastened to the angle sections of the chains 210′. Each tread 211 has a central lug 212, and these lugs fit loosely in a groove 213 formed in the middle sections 204. This construction allows the caterpillar to slide sidewise over the ground when the machine is fed forward or backward, relieving the sprockets 210 of shear stresses and allowing said stresses to be absorbed by the frame sections 204. At the opposite end of the belt from the shaft 209, a similar shaft 214 is provided having an extended end carrying a bevel gear 215, which drives the chain 210′.

The caterpillar 201 has a shaft 217 which

is driven from a parallel shaft 218 by a pair of spur gears 219 and 220, the shaft 218 being driven by a bevel gear 221. The bevel gears 215 and 221 are, in turn, driven by bevel gears 222, each of these being mounted on a short vertical shaft 223, carried in bearings 224 secured to one of the plates 206. Each shaft 223 carries a worm gear 225, these gears are horizontally disposed, of the same hand and driven by a common worm 226, mounted on a longitudinally extending shaft 227. One end of the shaft 227 is carried in a bearing 228 mounted in a bracket 229 secured to the bottom plate 120, and the other end is carried in a similar bracket 230 mounted in a bracket secured to the plate 121. A roller thrust bearing 232 is provided at each end of the shaft 227.

The bevel motor pinion 198 drives an equal gear 233 on the upper end of a short vertical shaft 234, the same being mounted in roller bearings 235 enclosed by a bracket 236 secured to the channel bars 122. At its lower end the shaft 234 carries a bevel pinion 237, which drives a pair of bevel gears 238, the same being loosely mounted on the shaft 227 between the collars 239. Each gear 238 is provided with a friction face 240, which may be engaged by one of the magnetic clutches 241 and 242, both of which are feather keyed to the shaft 227 and have a slight endwise or longitudinal motion. It is avident that since the gears 238 rotate in opposite directions the clutches 241 and 242 provide an electrically operated mechanical reverse for the shaft 227 and consequently the endless belt tracks 201 and 202 by means of which, at the will of the operator, the front or gathering end of the front conveyor is capable of being forced horizontally and laterally under the material to be gathered by a horizontal sweep movement across the floor of the mine.

The provision of the caterpillars, or the endless traction devices, eliminates the employment of jacks and cables, heretofore generally used in imparting horizontal movement to the front elevator. The endless traction devices produce all needed power to mechanically thrust the nose end of the gathering conveyer under the coal and to effect its lateral feed movement with all necessary speed and power, and with the added advantage of rendering the machine self contained and more rapid and convenient to operate. The clutches 241 and 242 are ordinarily controlled by a double throw switch 243, mounted on a panel 244 carried by the front conveyer 2. Normally, when the front conveyer has been swung fully to either side, the side feed is reversed to swing it in the opposite direction, and the direction of movement of the conveyer chains is also reversed. Since both of these motions are derived from the motor 125, the reversal of the controller 245 simultaneously reverses them, provided, however, that one of the clutches 241 or 242 is engaged. However, it sometimes occurs that it is necessary to reverse the conveyor chain without reversing the feed, and since in this case the motor 125 must be reversed it is necessary to reverse the feed from the new direction of rotation in order to keep it the same as it was previous to the reversing of the motor. This is readily accomplished by the double throw switch 243, and the clutches 241 and 242. These clutches also serve as power limitation elements, as either will slip on an overload and protect the driving elements. It is obvious that any of the magnetic clutches above described could be replaced by resort to manually operated friction clutches of any desired kind if such a construction is to be preferred.

Coming now to the front end of the machine, the front or nose section 246 of the front conveyor 2 is hinged to the forward end of the main upwardly inclined portion of said conveyor in front of the center of the endless traction devices or to the rear of the front sprocket center. By this construction excessive weight on the front of the machine, which ordinarily obstructs or interferes with the side feed, is transferred to the said traction devices, where it increases their traction and assists in the side feed. To pivotally mount the nose 246, there is employed hinge pins 247 and 248, situated substantially in transverse registration on a common axis, which is located above the pitch line of the conveyor chain so that the pull of the chain tends to lower the front or nose section 246 and not raise it. The center pin 247 is mounted in suitable brackets 249 and 250 secured respectively to the main and hinged front sections, and the outside pins 248 connect narrow hinges 251 and 252 riveted to the outside plates of the conveyor pan. The bottom plate of the hinged nose section is beveled peripherally, as shown and provided with a depending reinforcement 253 around and under its outer edge, the said reinforcement being scarfed to a sharp beveled edge. This bevel construction is of prime importance in maintaining the front section 246 beneath the coal to be loaded when the front conveyer is being shifted horizontally.

A take-up guide 254 is bolted to the hinged section 246 and provided with a cover plate 255, a take-up screw 256 and a nut 257 for adjusting the tension on the conveyer belt, which in this instance is of the link variety. A take-up slide 258 works in the stationary guide 254 and is provided with an integral lower web 259 and a detachable upper guard casting 260 bolted

to the slide 258. A shouldered pin 264 is mounted in the parts 259 and 260 and engages spaced bearings 261 and 262, which carry the forward or nose sprocket 263.

Passing around the head sprocket 150 and the forward sprocket 263, and movably retained within the longitudinal guides provided by the parts 165 to 168 inclusive is a reversible conveyer belt or chain of the endless type, but which is of peculiar design. As shown, this chain consists of strap links 265, flight links 266, rocker links 267, bushings 268 and steel pins 269. As shown, the middle portion 270 of the strap and flight links is curved to, in this instance, a three foot radius and bears on the conveyer plate 120 or other chain guides to conform to the angles thereof. The end portions of the strap and flight links have flat wearing surfaces 274 at each end of the links which bear on the flat portions of the plate 120. The flight links are also provided with wearing surfaces 274' on their edges which bear against the guide channels 165 and guide bars 167 and 168. The bushings 268 are provided with V shaped grooves 272, each of which being engaged by a V shaped rocker lug 273 on the rocker links 267. As the rocking motion is of limited degree the wear at this point of the chain is comparatively slight. It will be observed that as the chain is symmetrical it can be turned up-side-down when worn on the surface 270. The upper and lower flight links are duplicates and are provided with flanges 275 between which there is riveted a projecting plate 276 employed to carry the longitudinally spaced belt arms or, as they are usually called, flights 277. These flights are detachably secured to the plates 276 by means of a pair of loose rivets 278 carrying cotter keys. These rivets are frangible and capable of breaking when undue strains are placed upon the conveyer belt. By this construction a conveyer belt is provided which will operate, upon movement on the part of the head sprocket, within the guides provided in the forward conveyer. The links of the belt admit of great flexibility so that the belt may freely pass around the head and tail sprockets and the angles of the plate 120. The flanges 275 project through the spaces defined between the bars 167 and 168, so that the flight arms 277 will be positioned for longitudinal movement within the conveying troughs of the elevator pan. Since the belt is reversible it will be apparent that material engaged by said flights will be capable of being carried upwardly and longitudinally of either of said troughs toward the discharge ends thereof.

With this description of the forward end of the machine, attention is now directed to the rear conveyer which includes the hopper C located on the truck 1 and capable of being positioned at all times beneath the rear discharge ends of the conveying troughs of the front conveyer, irrespective of the various positions of relative angularity assumed in operation between the front and rear conveyers. The hopper is formed to include a wide open top which is arranged for cooperation by being positioned immediately beneath the rear discharge end of the gathering conveyer, whereby material gathered by the machine will be enabled to drop sharply and directly into the wide open mouth of the hopper without clogging or choking the machine so as to interfere with its loading capacity.

This rear conveyer, of which the hopper forms a part, is raised and lowered and swung side-wise by resort to the following mechanism. A sprocket 279 is mounted on a shaft 280 supported in bearings 281 contained in bearing boxes 282 secured to the side plate 76 of the hopper. The sprocket 279 is driven by engaging or meshing with the links of one of the rear conveyer chains, and the shaft 280 carries a second sprocket 283 which, by means of a chain 283' drives a sprocket 284 on a parallel shaft 285. The shaft 285 supports a bearing frame 286, which is provided with trunnions 287 journaled on the shaft 285. The shafts 280 and 285 rotate constantly when the rear conveyer is running.

The shaft 285 carries in this instance a pair of bevel pinions 289 mounted to rotate freely on the shaft and each connected to one member of a magnetic clutch 290 provided with a friction facing 291. A second clutch member 292 is feather keyed to the shaft 285 and may be drawn against its facing 291 by energizing the coil 293. Thus either pinion 289 may be employed to drive the longitudinally extending shaft 294 and its direction of rotation as a consequence depends upon which clutch is engaged. The shaft 294 is journaled in the bearing frame 286 at one end and in a sleeve 295 at the other and is actuated by a bevel gear 295', disposed for engagement with the pinions 289. A universal joint 294[a] is provided in the length of the shaft 294 to render the latter sufficiently flexible to adapt itself to the changing vertical positions of the loading conveyer frame. Upon the sleeve 295 there is pivoted an inner clevis 296 and an outer clevis 297, both being similar in construction. The clevis 296 is provided with a bushing 298 in which is journaled the left hand lifting screw 299, a similar screw 300 being mounted in the clevis 297. The screw 299 has a flange 301 resting on a roller thrust bearing 302. Above the flange 301 the screw 299 carries a bevel gear 303 which is driven by a similar gear 304, the latter being loosely mounted on an

integral pin 305 projecting from the outer end of the clevis 296. A sprocket 306 is mounted on the hub of the gear 304 and drives the same by means of a chain 307 which, in turn, is driven by a sprocket 308 loosely mounted on the shaft 294, the said sprocket being provided with clutch teeth 309, which may be engaged by a jaw clutch 310, feathered on the shaft 294, to drive the sprocket.

Mounted on the sleeve 295 within the inner clevis 296 there is a carrying roller 311, provided with sprocket teeth 312 on its outer circumference. A spur gear 313 is mounted on each side of the roller 311 to drive the same. The gears 313 are driven preferably by a pair of gears 314 formed integral with a shaft 315, the latter being mounted in bearings 316 and 317 integrally formed with the lower end of the clevis 297. The shaft 315 also carries at its outer end a gear 318, which is driven by a gear 319 mounted on the hub of a clutch member 320, the latter being loosely mounted, in turn, on the shaft 294. A second clutch member 321 is keyed to the shaft 294 and upon proper engagement is adapted to drive the gear 319.

The carrying roller 311 runs on a grooved track-rail 322 which is supported from the truck frame 1 and curved horizontally to a radius struck from the center of the pivot 80 for the rear conveyor. The rail 322 is provided with a series of evenly spaced tapered holes 323 which are engaged by the sprocket teeth 312 on the roller 311 and when the latter is driven it rolls on the track-rail 322, thus swinging the rear conveyor about the pivot 80. It will of course be understood that power is imparted to the sprocket 311 from the shaft 294, through the clutch mechanism 320 and 321, the gears 318 and 319, the shaft 315, and the gears 314 and 313. The rail 322 is provided with a pair of flanges 324 which act as guards for the roller or sprocket 311 and also stiffen the rail. The jaw clutch 321 controls, therefore, the swinging of the rear conveyor and the jaw clutch 310 controls the rise and fall of said rear conveyor. These motions will not be usually operated together.

The magnetic clutches 290 are controlled by push buttons on the control panel and serve to reverse the direction of either the lift or side swing gearing. The lifting screws 299 and 300 are each provided with a sleeve nut 325 having a ball end 326. These ends engage spherical sockets 327 formed in a thrust bracket 328, which extends across under the rear conveyor and is secured to the side plate 76 thereof. At their lowest positions the angle of the lifting screws to the horizontal is about 30°, and as the screws are rotated, by reason of the clutch 309 and 310, the chain and sprocket construction 306, 307 and 308, and the gearing 303 and 304, the nuts 325 move out on the ends of the screws and raise the thrust bracket 328 so as to effect the desired elevation in the height of the delivery end of the rear conveyor.

As the rear conveyor is usually in its lowered position when the machine is transported and in its upper position when loading, the operation of the above devices is as follows: On entering the place the clutch 310 is engaged and the rear end of the conveyor is raised to the height desired for working conditions, usually to its highest position. The clutch 310 is now disengaged and the clutch 321 is engaged so that the rear end of the conveyor may be swung laterally as desired and by means of power. Usually, these conditions remain permanent as long as the machine is in a particular place. When leaving the place, the swing clutch 321 is disengaged, the clutch 310 engaged and the conveyor lowered, and then the clutch 310 is disengaged and the swing clutch again engaged so that the conveyor may be swung if desired in transport. This construction admits of a power operated raising and lowering device for the rear end of a loading machine and constitutes in this respect a material improvement upon loading machines having hand operated devices which, are frequently slow and ineffectual for adjusting the rear ends of such machines. It will be understood that loading machines are frequently placed upon banked tracks, which results in causing the weight thereof to be thrown or forced toward one side, that is, the lowest side and therefore difficulty encountered, when hand operated devices are employed, to overcome this weight. However, by the present invention difficulties of this nature are eliminated and the machine may be rapidly and readily adjusted to assume any desired working position.

To protect the rear motor 15 from shock and jar imparted to the truck 1 by the engagement of the bumpers of pit cars therewith, the rear end of said truck is formed with a transversely extending rigidly positioned curved bracket 330, having a centrally formed socket 331 provided therein for the reception of a car coupling. In this instance the casting 330 includes a plurality of chambers 332, in which are slidably positioned resilient buffers 333. These buffers are provided with enlarged collars 334 upon the inner ends thereof, and relatively heavy coil springs 335 are positioned between the inner walls 336 of the casting and the buffers 333, the said springs serving to cause the buffers to be projected, so that the outer ends thereof will be located appreciably beyond the curved outer vertical wall of the casting 330. The collars 334 serving to limit such outward movement on the

part of the buffers. It will be observed that by this construction the buffers 333 will serve, in conjunction with the springs 335, to absorb shock and jar imparted to the truck by the engagement of mine locomotives or pit cars therewith, and by reducing such shock will protect the rear motor 15.

In operation the machine is advanced over the tracks of a mine to the scene of operation, and this movement of the machine over the track-way may be freely accomplished by reason of the sleeve propelling mechanism of the machine operated from the rear motor 15. The pony wheels are, of course, lowered into engagement with the rails of the track-way by power derived from the front motor 125. As previously described, when the pony wheels are lowered the endless track devices 201 and 202 are elevated above the track-way, and are located beneath the bottom plate 120 of the front elevator. Also, the front or nose end of the machine is correspondingly elevated to clear the floor. After the coal has been blown down and the draw slate, if any, removed therefrom the machine is advanced so that the nose end thereof will be positioned in loading relation with the loose coal lying upon the mine floor. The pony truck wheels are then raised allowing the nose end of the machine to settle on the floor and also permitting the endless tracks 201 and 202 to be engaged with the mine floor, so as to support the weight of the front of the machine in lieu of the pony wheels. By the operation of the forward feed mechanism, driven from the rear motor 15, the flat depressed nose end of the machine is driven into and under the material to be gathered, whereby upon the operation of the motor 125 motion will be imparted to the gathering conveyor, causing the flights thereof to engage the coal and conduct the same upwardly over either of the longitudinally extending troughs of the front elevator. The nose end of the machine is constantly maintained in engagement with thte material to be loaded by the operation of the side swinging endless traction devices 201 and 202, which cause the front conveyor to swing bodily and horizontally and to thereby enable the conveying flights to be continuously maintained in engagement with the material to be loaded. By reversing the direction of rotation of the endless traction devices, the swinging movement of the front conveyor as a whole may be accordingly controlled. The material is conveyed upwardly over either of the troughs of the gathering conveyer and these troughs terminate abruptly by cutting away the rear end of the plate 120 as indicated by the numeral 340, so that both of these troughs have definite rear ends, which are ordinarily positioned immediately over the flaring side walls of the open top hopper C. Owing to the fact that the gathering conveyer swings laterally about the vertical axis defined by the head shaft 126 the rear discharge ends of the conveying troughs will not always be positioned directly over the hopper C when the said gathering conveyor assumes a position of angularity with respect to the longitudinal center line of the rear conveyor. Therefore, to bridge the gaps formed by the swinging of the front conveyor with respect to the rear conveyor, there is provided a wing plate structure 341, which is positioned in conjunction with the gear casing 118 and serves to insure delivery of coal to the hopper, without choking, irrespective of the angular arrangement of the front conveyor with respect to the rear conveyor. The endless belt forming a part of the rear conveyor has its forward run positioned to travel over the inclined base of the hopper C, so that coal or other material deposited within said hopper will by the action of the rear conveyor be forced rearwardly and thence dropped into pit or mine cars positioned beneath the discharge end of the rear conveyor. It will be observed that the hopper possesses a considerable storage capacity, a fact which enables the forward gathering conveyor to continue operation even when the rear conveyor remains idle. As shown in Figures 17 and 18, a magnetically operated brake mechanism 350 is provided for controlling the progress of the machine and maintaining it in various operating positions upon a trackway.

This magnetic brake mechanism is disclosed as comprising a solenoid 351, having a core plunger 352 which, when the coil of the solenoid is excited will be forced longitudinally outward. The outer end of this core or plunger is provided with a head 353 carrying a plurality of longitudinally extending parallel fingers 354, which press upon a disc assembly 355 at their outer ends. This disc assembly is mounted within a rigid casing 356, secured as at 357 to the truck frame 1. This disc assembly comprises a plurality of discs which are alternately keyed first to the casing 356, and second to a shaft 358, which may loosely rotate axially within the casing 356 when pressure is removed from the disc assembly. The outer end of the shaft 358 is equipped with a slidably mounted feathered clutch section 359, movable manually into or out of clutching relation with a complemental clutch member 360, the latter carrying a sprocket 361 over which a chain is trained, as shown at 362 in Figure 2, and leads to the front axle 6. In operation, when the solenoid 351 is de-energized friction in the clutch assembly will be removed, permitting the shaft 358 to rotate freely in unison with the front axle 6. When it is desired

to brake the movement of the vehicle, pressure is applied to the disc assembly by exciting the windings of the solenoid 351. The frictional pressure created between complemental faces of the disc 355 results in retarding the rotation of the shaft 358, and when the members 359 and 360 are in clutch engagement, rotation of the front axle 6 will be correspondingly retarded.

What is claimed is:

1. In a transportable loading machine, a base unit, a gathering mechanism including an inclined frame having its forward end disposed in advance of said base unit for horizontal swinging movement, the rear end of said frame being disposed on a plane above said base unit, an endless gathering conveyer carried by said frame, a casing supporting the rear end of said frame, a mounting between the lower end of said casing and said base unit for effecting support of said frame, and affording movement thereof in any direction, a driving motor for said conveyer, and a drive mechanism mounted in said casing for transferring the power of said motor to said conveyer.

2. In a transportable loading machine, a base unit, a gathering mechanism including a main frame inclined with respect to said base unit, the rear end of said frame being disposed in a plane above said base unit, an endless gathering conveyer carried by said frame, a combined universal mounting for the rear end of said frame and drive mechanism for said conveyer comprising a casing secured to and depending from the rear end of said frame, a ball and socket joint connection between the lower part of said casing and said base unit, said connection admitting of horizontal sweep movement of the forward part of said frame and said conveyer and of limited vertical movement thereof, and drive means contained within said casing for effecting the operation of said conveyer.

3. In a transportable loading machine, a base unit, a gathering mechanism pivotally mounted upon said base unit and comprising an elongated frame having the rear end thereof disposed in a plane above said base unit, an endless gathering conveyer carried in connection with said frame, including a driven sprocket situated adjacent to the rear end of said frame, a combined pivotal support for said frame and drive for said sprocket, including a casing connected with and depending vertically from the rear end of said frame, a universal joint connection between the lower part of said casing and said base unit, a motor movable in unison with said casing, and drive gearing between said motor and the sprocket of said conveyer contained in said casing.

4. In a transportable loading machine, a base unit, a conveyer including an elongated frame having the forward end thereof arranged in advance of said base unit for horizontal swinging movement with respect thereto, the rear end of said frame being disposed in a plane above said base unit, a casing constituting a support for the rear end of said frame, a ball and socket joint construction between the lower end of said casing and said base unit, and a drive mechanism for said conveyer contained within said casing.

5. In a transportable loading machine, a base unit, a gathering mechanism including an inclined elongated frame having the forward end thereof arranged to swing horizontally in advance of said base unit, the rear end of said frame being terminated above said base unit, a conveyer carried by said frame, a casing having its upper end secured to and constituting a support for the rear end of said frame, a ball and socket connection between the lower end of said casing and said base unit, a motor mounted to oscillate in connection with said casing, and speed reducing gearing contained within said casing and employed for transmitting motion from said motor to said conveyer.

6. In a transportable loading machine, a portable base unit, a gathering mechanism including an elongated inclined frame pivotally supported upon said base unit and including a forward end arranged for bodily swinging movement in advance of said base unit and disposed for engagement with the mine floor, the rear end of said frame being located in a plane above said base unit, a support for said frame rigidly depending from the rear end thereof, and a ball and socket connection between the lower end of said support and said unit.

7. In a loading machine, a portable base unit, a gathering mechanism including an elevator consisting of an elongated frame having the rear end thereof disposed over said base unit, the forward end of said frame being arranged in advance of said base unit and capable of being forced beneath the material to be loaded, a gathering conveyor carried by said frame, a pivotal support for the rear end of said frame consisting of a casing arranged beneath the rear end of said frame, a flexible connection between the base of said casing and said base unit, a supplemental frame rigidly projecting from said casing and located beneath said gathering frame, a motor carried by said supplemental frame, and drive means between said motor and conveyor situated within said casing.

8. In a transportable loading machine, a portable base unit, a gathering mechanism including an elongated frame having the rear end thereof arranged above said base unit, the forward end of said frame being arranged to engage a mine floor in advance

of said base unit, a gathering conveyor carried by said frame, a pivotal support for the rear end of said frame including a casing situated between said base unit and the rear end of said frame, a flexible connection between the lower part of said casing and base unit, a motor mounted to move in unison with said casing, drive mechanism contained in said casing for transferring the motion of said motor to said conveyor, and said drive mechanism including a planetary gear train.

9. In a loading machine, a gathering conveyor, an operating motor for said conveyor, said conveyor including a driven sprocket operated from said motor, a head shaft, planetary reduction gearing between said motor and said head shaft, a slip clutch between said head shaft and sprocket, and an oscillatory casing surrounding said gearing and serving as a support for the rear end of said conveyor.

10. In a loading machine, a portable base unit, a gathering mechanism including a frame having the rear end thereof disposed above said base unit, a casing depending from said frame and having the lower end thereof flexibly connected with said base unit, whereby said frame may swing horizontally and vertically with respect to said base unit, a gathering conveyor including a drive element, a head shaft passing vertically through said casing and rotatable with said drive element, a motor movable in unison with said casing, and planetary gearing disposed within said casing and serving to transmit motion from said motor to said head shaft.

11. In a transportable loading machine, a traveling base unit, a gathering frame having the rear end thereof arranged above said base unit, an endless gathering conveyor carried by said frame, a drive sprocket for said conveyor, a casing pivotally mounted upon said base unit and serving as a support for the rear end of said frame, a motor mounted for movement in unison with said casing, a head shaft journaled for rotation within said casing, a planetary gear train driven by said motor and arranged within said casing to rotate independently of said head shaft, a second planetary gear train driven from said first named gear train and operable to impart motion to said head shaft, and a slip clutch between said head shaft and the sprocket of said conveyor.

12. In a loading machine, a wheeled truck, a conveyor on said truck, a reversible electric motor mounted in connection with said truck, drive mechanism between said motor and the wheeled axles of said truck, operative to propel said truck when said motor is rotating in one direction, drive mechanism between said motor and said conveyor for driving the conveyor when the motor is operating in the opposite direction, and a single controller for governing the direction of operation of said motor and to thereby selectively control the operation of said drive mechanisms.

13. In a transportable loading machine, a truck including a wheeled axle, a reversible electric motor mounted upon said truck, a conveyor on said truck, drive mechanism between said motor and said axle for imparting rotation to the axle when said motor rotates in one direction, drive mechanism between said motor and said conveyor operative only to impart power to said conveyor when said motor rotates in the opposite direction to that employed for rotating said axle, and a controller mounted on said machine remotely from said motor for governing the operation of said motor and the selective control of said propelling mechanism and conveyor.

14. In a loading machine, a propelling mechanism therefor including a truck carrying wheeled axles, a drive motor mounted upon said truck, a shaft journaled for rotation in connection with said truck, a member formed to include clutch jaws loosely rotatable about said shaft, drive connections between said motor and said member, a slidable clutch mounted to rotate with said shaft and disposed for engagement with the clutch jaws of said member, whereby when said clutch is in locked relationship with said member the direction of rotation of said shaft will be governed by the direction of rotation of said motor, means for transferring the motion of said shaft to the wheels of said truck, a ratchet member fixed to rotate with said shaft, and pivoted pawls carried by said member and serving to admit of rotation on the part of said shaft in one direction only.

15. In a transportable loading machine, a portable base unit including driven supporting elements, a loading conveyor supported from said base unit, a motor, drive mechanism between said motor and said supporting elements for effecting the propulsion of the machine, drive mechanism between said motor and said loading conveyor, and automatically and reversely operating means situated in each of said drive mechanisms for selectively propelling said base unit and operating said conveyor in accordance with the direction of rotation of said motor.

16. In a loading machine, a portable base unit including driven supporting elements, a loading conveyor supported from and arranged above said base unit, a motor carried by said base unit, independently journaled shafts mounted in connection with said base unit, means automatically operable in accordance with the direction of rota-

tion of said motor to effect selective rotation of said shafts, drive means between one of said shafts and the supporting elements of said base unit, and an independent drive mechanism between the other of said shafts and said loading conveyor.

17. In a loading machine, a portable base unit, a loading frame carried by and disposed above said base unit, a bracket having yoke shaped ends, bearings formed in the ends of said bracket and defining a horizontal pivotal axis for said frame, a substantially vertical pivotal conection between the intermediate portion of said bracket and said base unit, admitting of horizontal swinging movement of said frame, an endless loading conveyor mounted for movement within said frame, a power driven foot shaft carried by said frame and journaled in connection with said bracket to impart motion to said conveyor, drive shafts carried by the yoke shaped ends of said bracket for imparting power to said foot shaft at each end of the latter, a motor mounted upon said base unit, and means for imparting motion from said motor to said drive shafts.

18. In a loading machine, a portable base unit, a loading conveyor carrier in connection with said base unit and including a longitudinally extending trough shaped frame, an endless conveyor movable longitudinally in the bottom of said frame, a bracket extending transversely of said base unit, a substantially vertically extending pivotal connection between the intermediate portion of said bracket and said base unit, bearings formed in the outer ends of said brackets to receive horizontal trunnions carried by said frame, said bearings admitting of vertical movement on the part of said frame, and drive connections carried by the outer ends of said bracket for imparting motion to said endless conveyor.

19. In a loading machine, a portable base unit, an elevator carried by and located above said base unit, said elevator being formed to include a longitudinally extending trough shaped frame, a yoke shaped bracket extending transversely of said base unit, a vertical pivotal connection between the intermediate portion of said bracket and said base unit admitting of bodily horizontal swinging movement on the part of said frame, trunnions projecting from the sides of said frame and rotatably received within horizontal bearings provided in the ends of said bracket and permitting of vertical swinging movement on the part of said frame, an endless conveyor passing longitudinally along the bottom of said frame, a drive shaft for said conveyor journaled within said trunnions and drive connections provided at each end of said shaft.

20. In a loading machine, a portable base unit, a loading elevator arranged above and supported from said base unit and consisting of a longitudinally extending trough shaped frame having an endless conveyor movable longitudinally over the bottom thereof, a supporting bracket for the front end of said frame extending tranversely of said base unit, a substantially vertical pivotal connection connecting the intermediate portion of said bracket with said base unit, said connection providing a vertical axis to permit of horizontal swinging movement on the part of said frame, horizontally disposed trunnions projecting from the front end of said frame and rotatably received within bearings provided in the outer ends of said bracket, an operating shaft for said conveyor rotatably journaled within said trunnions, a pair of vertically extending shafts carried by the outer ends of said bracket and journaled for rotation therein, power transmitting devices between the said vertical shafts and both ends of said conveyer shaft, sprockets carried by the lower ends of said vertical shafts, motor driven chains passing around said sprockets and an automatic take-up device cooperative with said chain to compensate the latter for the changes in position of said vertical shafts due to the horizontal swinging movement of said frame.

21. In a loading machine, a portable base unit, an elevator including a frame having an endless conveyer traveling longitudinally thereof disposed over said base unit, a flexible connection between the forward end of said frame and said base unit admitting of bodily swinging movement on the part of said frame in horizontal and vertical planes, and motor driven means for effecting horizontal and vertical adjustment of said frame relatively to said base unit.

22. In a loading machine, a portable base unit, a loading elevator including an elongated frame having a longitudinally traveling endless conveyer arranged therein, a flexible connection between said frame and said base unit admitting of horizontal and vertical swinging movement of said frame relative to said base unit, and means situated between said frame and base unit and operated by the movement of said conveyer to raise and lower and horizontally swing said frame with respect to said base unit.

23. In a loading machine, a portable base unit, a loading elevator including an elongated frame having an endless conveyer traveling longitudinally thereof, a motor for said conveyer, a flexible connection between said frame and base unit admitting of vertical adjustment on the part of the rear end of said frame, and means situated between said base unit and said frame and operated

by power derived from said motor to raise and lower said frame.

24. In a loading machine, a portable base unit, a loading elevator including an elongated frame, a motor operating said conveyer, a flexible connection between the forward part of said frame and said base unit admitting of horizontal turning movement on the part of said frame relatively to said base unit, a traveling support depending from said frame and arranged in engagement with said base unit, and drive means operating from said motor for imparting motion to said support.

25. In a loading machine, a portable base unit, a loading elevator including an elongated frame, a pivotal connection between the forward end of said frame and said base unit admitting of vertical swinging movement on the part of said frame relative to said base unit, a traveling conveyer mounted in and movable longitudinally of said frame, a support between the rear portion of said frame and base unit including expansible and contractible elements, and means driven from said conveyer for effecting relative movement between said elements.

26. In a loading machine, a portable base unit, a loading elevator carried by said base unit and including an elongated frame, a loading conveyer movable longitudinally of said frame, a pivotal connection between the forward end of said frame and base unit admitting of adjustment of said frame in a vertical plane relative to said base unit, an adjustable support between the rear end of said base unit and said frame, said support including upwardly diverging threaded male and female elements, and means driven from said conveyer for shortening or lengthening the effective length of said elements to raise and lower said frame.

27. In a loading machine, a portable base unit, a loading elevator including an elongated frame mounted upon and over said base unit, a motor driven endless conveyer mounted for longitudinal movement in connection with said frame, a flexible connection between the front end of said frame and said base unit admitting of vertical adjustment of said frame with respect to said base unit, a supporting structure between the under part of said frame and said base unit controlling the vertical positions of said frame, said structure including a transversely extending bracket secured to said frame and having spherical sockets formed in the outer ends thereof, telescoped upwardly diverging screw threaded arms having the outer ends thereof received within said sockets, shaft means pivotally receiving the lower and inner ends of said arms, roller means mounted on said shaft means and disposed in engagement with said base unit, and drive means operated by said conveyer for controlling the effective length of said arms.

28. In a loading machine, a portable base unit, a loading elevator including an elongated frame arranged upon and above said base unit, a pivotal connection between the front end of said frame and said base unit admitting of vertical adjustment on the part of said frame with respect to said base unit, a supporting structure between said base unit and said frame for regulating the vertical positions of said frame, said structure including bracket means projecting rigidly and transversely from the sides of said frame and having sockets formed in the outer ends thereof, longitudinally adjustable upwardly diverging and telescoping screw threaded elements having their outer ends arranged within said sockets, the inner portions of said elements having direct engagement with said base unit, and means for relatively rotating said elements to control the effective length thereof.

29. In a loading machine, a portable base unit, a loading elevator arranged upon and above said base unit, a flexible connection between the forward end of said frame and said base unit admitting of bodily horizontal swinging movement on the part of said frame with respect to said base unit, a motor driven conveyer movable longitudinally of said frame, a shaft extending longitudinally of and beneath said frame, drive connections for rotating said shaft from said conveyer, a sprocket driven by said shaft, and a rack of arcuate formation mounted upon said base unit engaged by said sprocket.

30. In a loading machine, a portable base unit, a loading elevator including an elongated frame mounted upon said base unit, a flexible connection between the front end of said frame and said base unit admitting of horizontal swinging movement on the part of said frame with respect to said base unit, a supporting structure between said frame and said base unit, including a power driven shaft, a toothed wheel loosely mounted upon said shaft, an arcuate rack formed with said base unit and in engagement with said wheel, a counter shaft arranged above said first named shaft and driven from the latter, and means for imparting motion from said counter shaft to said toothed wheel.

31. In a loading machine, a portable base unit, a loading elevator mounted upon and arranged above said base unit, a flexible connection between the forward end of said frame and said base unit admitting of horizontal swinging movement on the part of said frame with respect to said base unit, an endless conveyor movable longitudinally of said frame, a supporting structure be-

tween the under part of said frame and said base unit, said structure including a shaft, a flexible driving connection between said conveyor and said shaft for rotating the latter upon movement of said conveyor, a toothed wheel surrounding and driven from said shaft, and an arcuate rack mounted upon said base unit and arranged for engagement with said wheel.

32. In a loading machine, a portable base unit, an elevator mounted upon said base unit and including an elongated frame, an endless conveyor movable longitudinally of said frame, a flexible connection between the forward end of said frame and said base unit admitting of horizontal swinging movement on the part of said frame with respect to said base unit, a shaft journaled transversely of and arranged beneath said frame, means for driving said shaft from said conveyor, a longitudinally extending shaft disposed at right angles to the transverse shaft, clutch means between said shafts for controlling the direction of rotation of said longitudinally extending shafts, a supporting structure between said base unit, a frame including a toothed wheel having its direction of rotation governed by said longitudinally extending shaft, and an arcuate rack mounted upon said base unit and engaged by said wheel, whereby upon rotation of said wheel said frame and supporting structure will be shifted bodily and horizontally with respect to said base unit.

33. In a loading machine, a portable base unit, an elevator arranged above said base unit and including an elongated frame, a conveyor movable longitudinally in one direction of said frame, a flexible connection between said frame and base unit admitting of horizontal swinging movement on the part of said frame with respect to said base unit, a supporting structure between the rear part of said frame and said base unit, said structure including a toothed wheel, a rack mounted upon said base unit for cooperation with said wheel, and flexible drive means for rotating said gear by power derived from said conveyor.

34. In a loading machine, a portable base unit, an elevator mounted upon said base unit and including an elongated frame, an endless conveyor travelling in one direction only over the bottom of said frame, a flexible connection between the forward end of said frame and said base unit admitting of bodily horizontal swinging movement on the part of said frame with respect to said base unit, a supporting structure shiftable in unison with said frame and located between the under part of the latter and said base unit, said structure including a wheel element, a fixed guide mounted upon said base unit for the reception of said element, and means for rotating said element in opposite directions by power derived from said conveyor while the latter is moving in but a single direction.

35. In a loading machine, a portable base unit, a gathering elevator including an elongated frame, a pivotal connection between the rear end of said frame and said base unit admitting of horizontal swinging movement on the part of said frame, and an endless power driven traction belt arranged beneath said frame in advance of said base unit for supporting and swinging said frame.

36. In a loading machine, a portable base unit, a gathering elevator including an elongated frame having the rear end thereof terminated above said base unit and the forward end thereof disposed for engagement with the ground in advance of said base unit, a supporting structure between the rear end of said frame and said base unit, said structure including a vertical axis about which said frame is mounted to swing horizontally, an endless traction belt connected with the under part of said frame and arranged for engagement with the ground in advance of said base unit, said belt being disposed to extend substantially transversely of said frame whereby upon movement of said belt said frame will be swung bodily and horizontally, and a motor for driving said belt.

37. In a loading machine, a travelling base unit, a gathering elevator including an elongated frame, having the rear end thereof disposed above said base unit, a flexible supporting structure between the rear end of said frame and said base unit admitting of bodily horizontal swinging movement on the part of said frame with respect to said base unit, and a pair of endless traction belts depending from the under part of said frame in advance of said base unit and engageable with a floor surface to swing said frame about the vertical axis provided by the supporting structure.

38. In a loading machine, a portable base unit, a gathering elevator including a relatively elevated rear end arranged above said base unit, the forward end of said frame being disposed for engagement with the floor surface over which the frame operates in advance of said base unit, a supporting structure between the rear end of said frame and said base unit, said supporting structure providing a substantially vertical axis about which said frame swings horizontally, endless traction belts carried by and depending from the under part of said frame in advance of said base unit and engageable with the floor surface to support substantially the weight of the front end of said frame, said belts being arranged transversely of said frame on an arc or

radius struck from the vertical axis of said frame, and means for driving said belts in either direction.

39. In a loading machine, a portable base unit, a gathering elevator including a relatively elongated frame having the front end thereof arranged for horizontal sweep movement across a floor surface in advance of said base unit, the rear end of said frame being relatively elevated with respect to said front end and disposed above said base unit, a supporting structure arising from said base unit and serving to pivotally support the rear end of said frame to admit of bodily horizontal swinging movement thereof, a supplemental frame depending from said frame in advance of said base unit, an endless traction belt retained by said supplemental frame and situated transversely of said elevator frame between the front end of the latter and the corresponding end of said base unit, a drive motor for said belt, power transmitting means between said motor and said belt, and a clutch structure interposed in said means for controlling the direction of movement of said belt.

40. In a loading machine, a portable base unit, a gathering elevator including an elongated frame having the rear portion thereof arranged above said base unit, a support between said base unit and the rear end of said frame including a vertical axis admitting of horizontal swinging movement on the part of said frame, the front end of said frame being disposed in advance of said base unit and arranged for horizontal sweep movement across a mine floor to gather material to be loaded onto said elevator, an endless traction belt carried beneath said frame between the front end thereof and the corresponding end of said base unit, said belt being disposed for engagement with the mine floor to effect horizontal sweep movement on the part of the frame, an operating motor for said belt carried by said frame, power transmitting elements including worm gearing between said motor and traction belt, and a clutch structure interposed in the train of said elements for controlling the direction of movement of said belt.

41. In a loading machine, a portable base unit, a gathering elevator including an elongated frame having the rear end thereof disposed above said base unit, a supporting structure between the rear end of said frame and said base unit, a pivotal connection between said frame and said supporting structure admitting of horizontal sweep movement on the part of said frame whereby the front end thereof will swing horizontally in advance of said base unit, an endless gathering conveyer carried by said frame, an endless traction belt arranged transversely beneath said frame between the front end thereof and the corresponding end of said base unit, said belt being disposed for engagement with the floor surface to effect horizontal swinging movement on the part of said frame, and a common motor for actuating the said endless conveyer and traction belt.

42. In a loading machine, a portable base unit, a loading elevator including an elongated frame having the rear end thereof disposed above said base unit, a supporting structure between the rear end of said frame and said base unit, said supporting structure defining a vertical axis about which said frame swings horizontally with the front end thereof in advance of said base unit, a motor driven endless traction belt arranged beneath said frame adjacent to the forward part thereof and engageable with a mine floor to support the weight of the front part of said frame, said belt servign to transmit horizontal movement to said frame, and a hinge connection between the front or nose portion of said frame and the main body portion thereof, the said hinged front end of said frame being disposed in advance of said traction belt.

43. In a loading machine, a portable base unit, a loading elevator including an elongated frame provided with a relatively elevated rear end arranged above said base unit, a supporting structure between said base unit and the rear end of said frame, said structure providing a vertical axis about which said frame swings horizontally with the front end thereof disposed for engagement with the floor of a mine in advance of said base unit, an endless traction belt arranged between the front end of said frame and said base unit and situated beneath said frame for engagement with the mine floor, and pony wheels carried by said frame and serving to maintain said frame in a relatively elevated condition during transportation with said endless traction belt out of engagement with the floor surface.

44. In a loading machine, a portable base unit, a gathering elevator including a frame having an intermediate inclined portion including a depressed nose end arranged for engagement with the floor of a mine and an elevated rear end disposed over said base unit, a supporting structure between said base unit and said frame admitting of vertical tilting movement on the part of said frame, a bolster extending transversely of said frame between the front end of the latter and said base unit, track wheels carried by the outer ends of said bolster, a motor, and drive connections between said motor and bolster for adjusting the latter vertically with respect to said frame, where-

by the wheels thereof may be brought into and out of engagement with the rails of a trackway to raise or lower the front end of said frame into and out of gathering engagement with a mine floor.

45. In a loading machine, a portable base unit, a gathering elevator including an elongated frame having the rear end thereof arranged over said base unit, said frame further including a longitudinally inclined body terminating forwardly in a depressed floor engaging nose, a supporting structure between the rear end of said frame and said base unit admitting of vertical and horizontal swinging movement on the part of said frame, a bolster extending transversely across the under part of said frame between the nose end of the latter and the forward end of said base unit, track engaging pony wheels pivoted to the ends of said bolster about vertical axes, and power actuating means for raising and lowering said bolster to control the engagement of the wheels thereof with the rails of a trackway, whereby the nose end of said frame will be maintained in active or inactive positions.

46. In a loading machine, a portable base unit, a gathering elevator having the rear end thereof pivoted to said base unit, a bolster carried by said frame in advance of said base unit, track wheels rotatably carried by the outer ends of said bolster, a standard arising from the central portion of said bolster, a guideway provided vertically in said frame to slidably receive said standard, and power driven rack and gear mechanism for raising and lowering said standard.

47. In a loading machine, a portable base unit, a gathering elevator including an elongated frame having the rear end thereof pivotally connected to and supported by said base unit, the forward portion of said frame extending in advance of said base unit, a bolster extending transversely of said frame between the forward ground engaging end thereof and said base unit, track engaging wheels carried by the outer ends of said bolster, a standard arising rigidly and centrally from said bolster, a vertical guide formed in said frame to slidably receive said standard, rack teeth provided upon said standard, power driven worm gears situated adjacent to said standard, and pinions rotatable with said gears and in mesh with the rack teeth of said standard to raise and lower the said bolster and retain the latter in any position of adjustment.

48. In a loading machine, a portable base unit, a gathering frame pivotally mounted at its rear end upon said base unit for horizontal and vertical swinging movement, an endless gathering conveyor carried by said frame, a side feed mechanism, a frame raising and lowering mechanism, and a common operating motor for effecting the operation of both of said mechanisms.

49. In a loading machine, the combination with an elevating conveyor comprising a reversible transmission belt, having spaced arm flights, flight run-ways upon which the material is conveyed by the flights, the reversibility of the belt rendering said ways alternately available for conveying the material in a common draft direction, said ways at their discharge ends terminating to provide a non-conveying arm sweep from one way to the second, said conveyor being pivotally mounted at its discharge end for swinging the conveyor horizontally, a plate on the pivotal mounting of said conveyor and disposed beneath said non-conveying arm sweep to maintain the effective area of said sweep constant during the swinging movement of said conveyor, and a receiver disposed beneath the discharge end of said elevating conveyor and said plate, said receiver being provided with upstanding side walls, the forward of which mating with said plate to provide discharge registration between said gathering conveyor and receiver throughout all operating positions of adjustment of said conveyor with respect to said receiver.

In testimony whereof I have signed my name to this specification.

NORTON A. NEWDICK.