

April 19, 1960

W. WHALEY
LOADING MACHINES

2,933,142

Filed Sept. 10, 1956

4 Sheets-Sheet 1

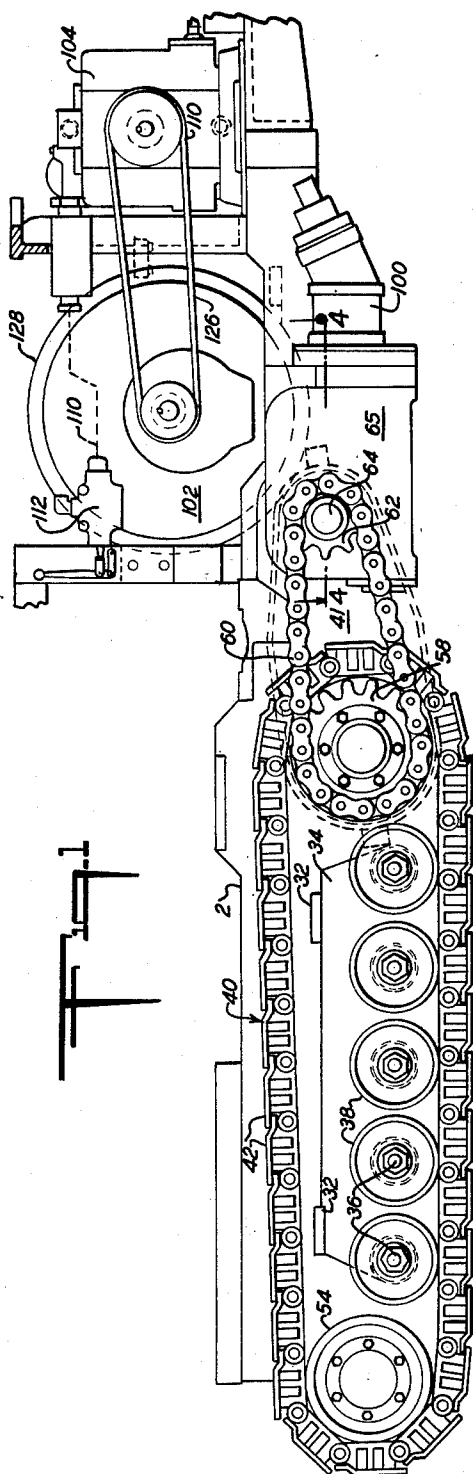
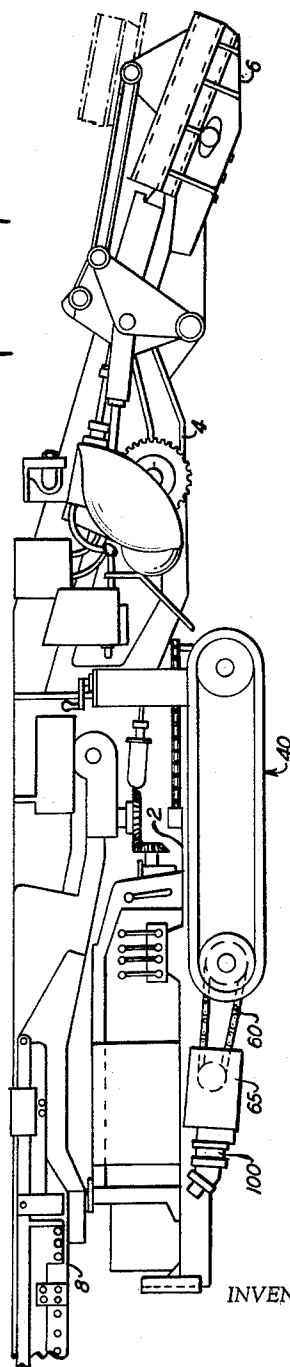


Fig. 2



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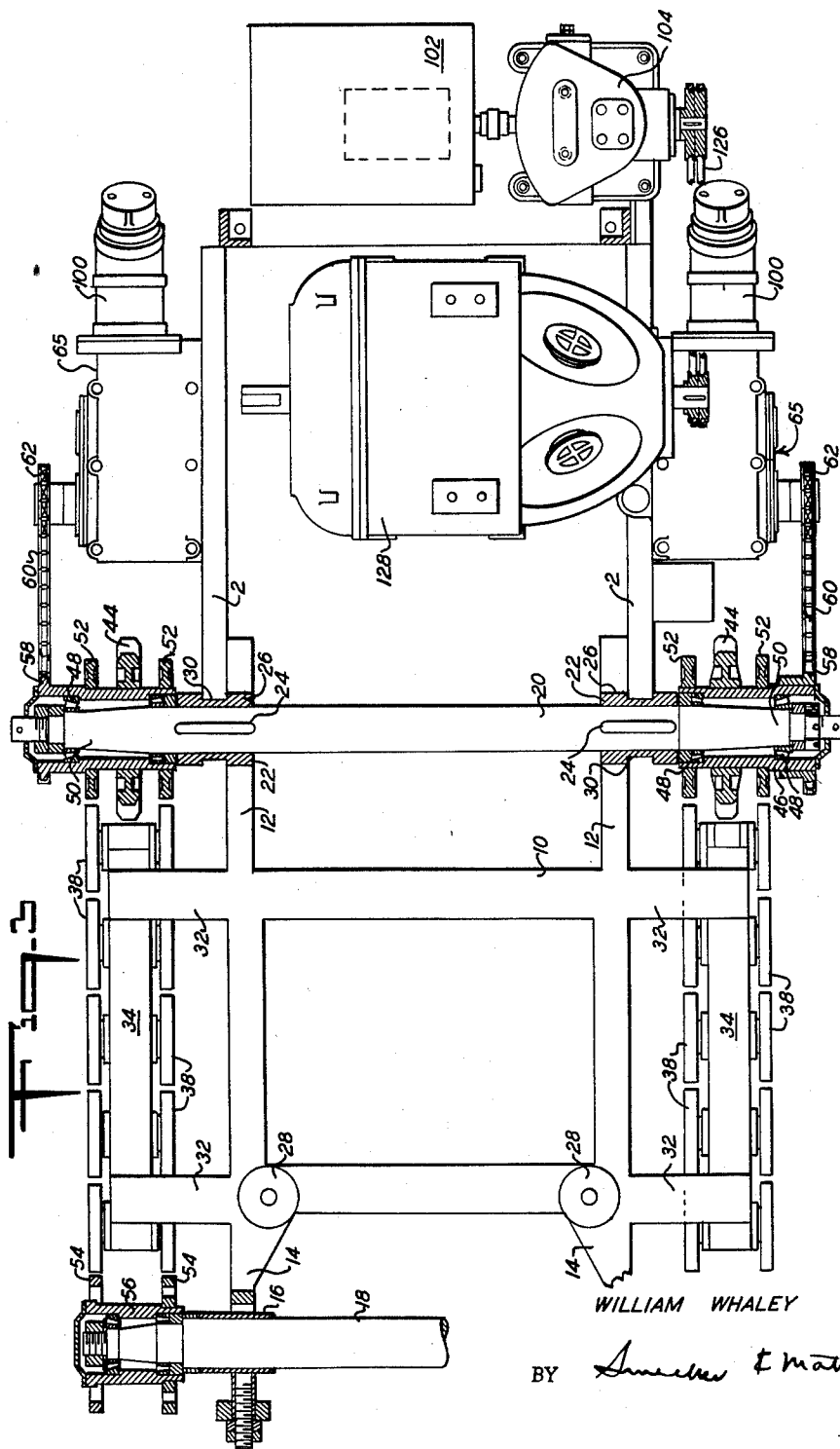
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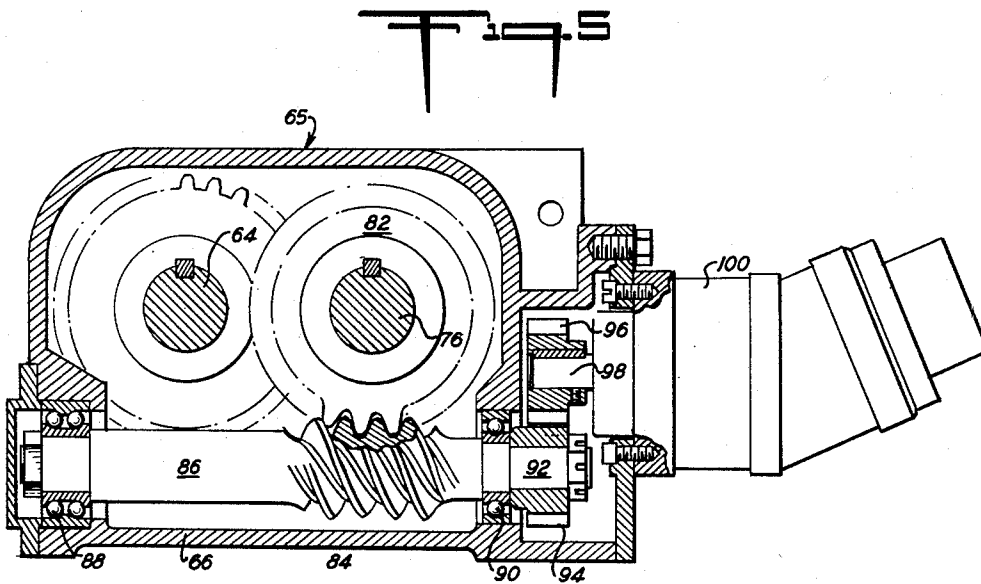
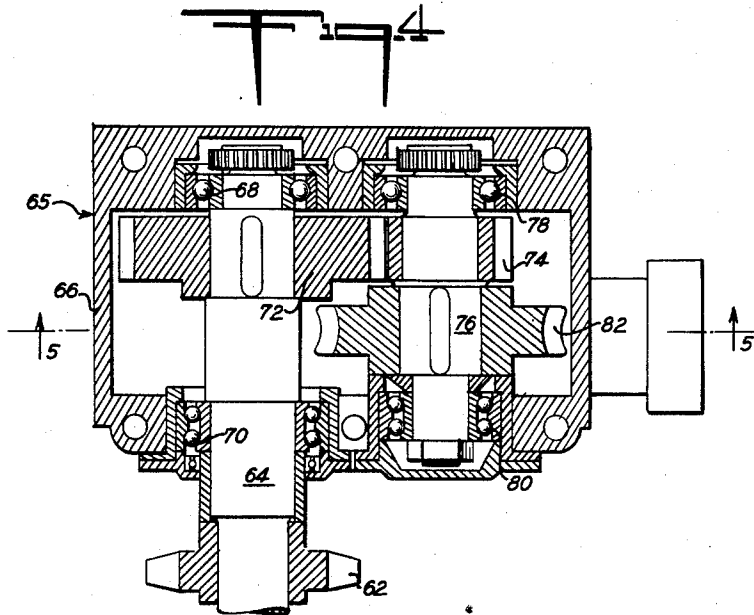
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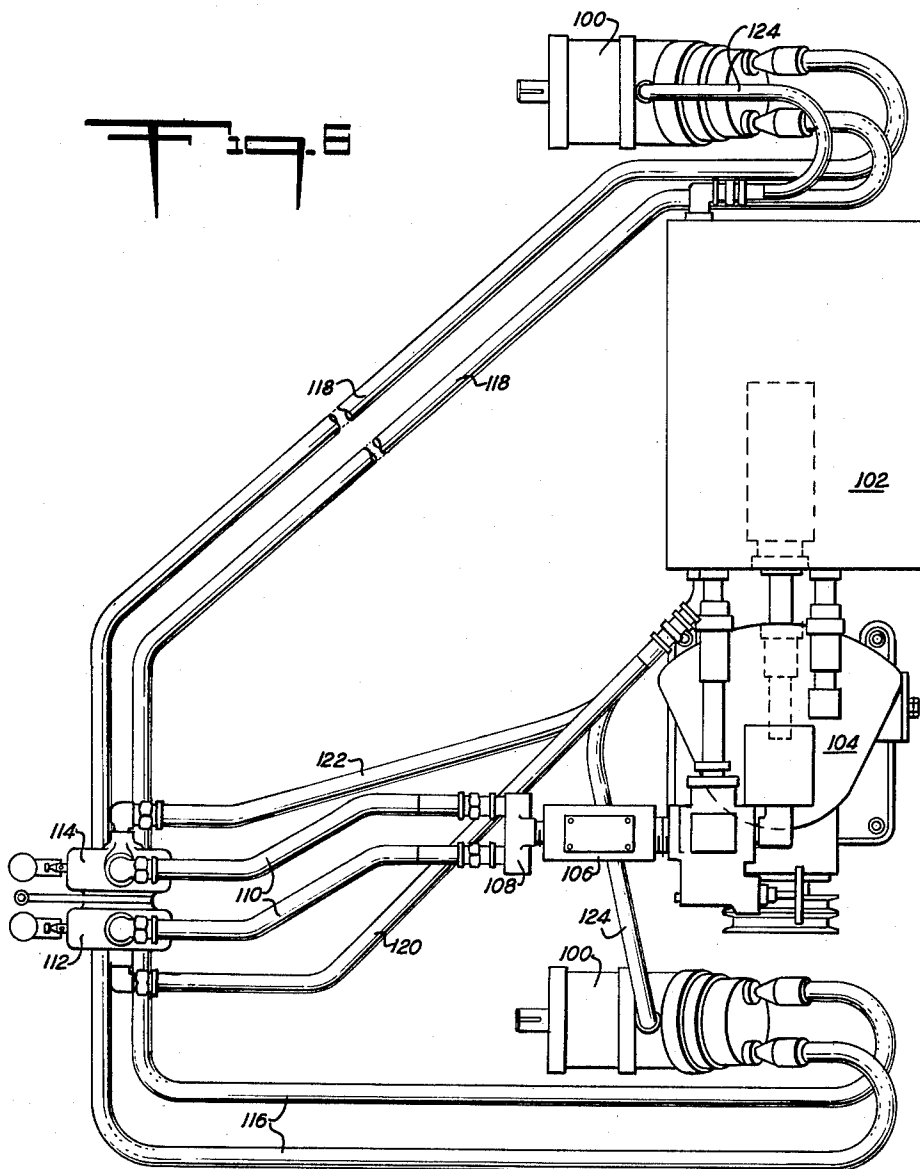
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4 Sheets-Sheet 4



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2,933,142

LOADING MACHINES

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Application September 10, 1956, Serial No. 608,998

8 Claims. (Cl. 180—6.48)

This application is a continuation-in-part of my prior application for Conveyor-Type Loading Machines, Serial No. 267,324, filed January 21, 1952, now Patent No. 2,788,076, granted April 9, 1957.

This invention relates to improvements in loading machines of the type employed in the mining industry for loading onto mine cars and other conveyors coal, loose rock and such lading, for transportation to a remote point for dumping or discharge.

Loading machines of the type generally described have been set forth in my earlier Patents No. 940,999, dated November 23, 1909; No. 1,379,428, dated May 24, 1921; No. 1,814,067, dated July 14, 1931; and No. 2,437,629, dated March 9, 1948.

Loading machines, of the general type described in said prior patents, usually employ a main frame of elongated structure supported upon an undercarriage that includes the traction means for transport of the machine. On the front end of the main frame is mounted the jib which supports the shovel at the forward end thereof and conveyor mechanism which transports the lading from the shovel back to additional conveyor means supported by the main frame adjacent the rear thereof. The latter conveyor structure has provision for discharging the lading into suitable conveying means, such as mine cars, transport vehicles, endless conveyors, and the like.

It has also been provided for bodily swinging movement of the main frame about an axis extending transversely of the propelling mechanism, capable of raising and lowering of parts of the machine with respect thereto. The prior machines have also used crawler structure as the propelling means.

The foregoing mechanism, as set forth and claimed in my prior application, Serial No. 267,324, provided for the use of complex driving and steering means thereon for the crawler structure.

One object of this invention is to simplify and improve the driving and control of the traction means.

Another object of the invention is to provide for direct driving of the respective crawler devices, and the independent control thereof for guiding the machine, without requiring complex operation of a drive shaft, clutch mechanism, brakes, etc., as was necessary heretofore.

These objects may be accomplished according to one embodiment of the invention by mounting the main frame of the loading machine on a carriage structure for bodily tilting movement with respect thereto about a transverse shaft which is connected also with the guide means for the respective crawlers. Power is applied directly to the crawler structures by independent motors on each side of the machine. These motors may be controlled independently for steering and propulsion, thereby simplifying the structure and improving its operation.

This embodiment of the invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevation of a chassis of a loading machine constructed in accordance with this invention;

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Fig. 2 is a side elevation of the loading machine, on a reduced scale and with a part of the conveying means broken away and omitted;

Fig. 3 is a top plan view of the carriage structure, with parts thereof broken away and in section;

Fig. 4 is a cross section through the driving gear box, on the line 4—4 in Fig. 1;

Fig. 5 is a vertical cross section therethrough on the line 5—5 in Fig. 4; and

Fig. 6 is a diagrammatic plan view of the hydraulic drive assembly.

The loading machine, as illustrated in Fig. 2, has a main frame, generally designated by the numeral 2, and which extends lengthwise of the loading machine. The jib section 4 thereon supports the loading means or shovel mechanism, generally indicated at 6, and also conveyor means for moving the lading from the shovel mechanism 6 rearwardly of the machine to discharge conveyor means, generally indicated at 8. The foregoing structure is described more in detail in my prior patents, as aforesaid, to which reference may be had for a more complete understanding thereof.

The chassis structure includes a subframe 10 (Fig. 3), which may be of the character set forth more in detail in my aforesaid patent application, Serial No. 267,324, being of open structure, with opposite side portions 12 at the rear of the machine and forks 14 at the front thereof. Each of the yokes 14 is bifurcated to receive front axle boxes 16 within which a front axle 18 is mounted. The axle boxes 16 are capable of adjustment with respect to the yokes 14 for alignment and positioning of the front axle 18.

The rear side portions 12 of the subframe 10 are mounted on opposite ends of a rear axle or shaft 20 that extends transversely of the carriage, and through axle boxes 22 to which the shaft 20 may be keyed or otherwise fastened, as indicated at 24. The frame portions 12 preferably are journaled on the inner ends of the respective axle boxes 22, as indicated at 26.

The main frame 2 is also mounted on the journal boxes 22 on the cross shaft 20, journaled at 30 thereon for swinging movement about the axis of said shaft 20. A pair of hydraulic cylinders 28 are mounted vertically on the front portions of the frame 10 adjacent opposite sides thereof and extend upwardly therefrom into support relation with the main frame 2. Vertical movement of the pistons of the hydraulic cylinders 28 will cause the main frame 2 to swing about the axis of the shaft 20 for vertical adjustment of the main frame 2. Vertical adjustment of the shovel end of the loader is desirable to compensate for the unevenness of the floor of the mine.

The subframe 10 has lateral projections 32 on each opposite side thereof, spaced lengthwise of the frame, which are seated upon and secured to oppositely disposed crawler frames 34, as shown in Figs. 1 and 3. These crawler frames 34 extend lengthwise of the respective crawler devices and form journal supports for a series of shafts 36 upon which rollers 38 are mounted at opposite ends of the respective shafts.

The crawler structure at each opposite side of the machine includes endless link chains, generally indicated at 40, each comprising a plurality of shoes 42 interconnected with each other for travel in the usual manner, and which endless chains are adapted to be driven to supply traction for the vehicle.

The endless chain 40 extends over a head sprocket 44 mounted on a hub 46 to which the sprocket 44 is rigidly fixed by a key or otherwise (Fig. 3). The hub 46 is mounted on antifriction journal bearings 48 on a projecting portion 50 at each outer end of the rear axle or cross shaft 20.

Also fixed on each hub 46 is a pair of guide wheels

52 on opposite sides of the head sprocket 44, in position to receive opposite ends of the respective shoes 42 as the endless crawler structure 40 passes around the head sprocket 44 in guiding relation therewith.

At its opposite end, each endless crawler chain 40 passes around guide rollers 54 on the front axle 18, being fixed to a hub 56 journaled on the projecting outer end of said front axle, as shown in Fig. 3. The rollers 54 are arranged in longitudinal alignment with the rollers 38 and 52, at the respective opposite sides of each crawler structure, and receive thereover the opposite end portions of the respective crawler shoes 42 during operation of the crawler mechanism.

Each of the crawler devices at opposite sides of the chassis is independently driven by a drive motor connected directly therewith, as shown in Figs. 3 and 6.

The drive illustrated, according to this embodiment of the invention, includes a sprocket 58 fixed on the outer end of each hub 46. A sprocket chain 60 extends over the sprocket 58 and over a sprocket 62 on a shaft 64 (Fig. 1) of a speed reducing device 65, shown more in detail in Figs. 4 and 5.

The shaft 64 extends into a gear box 66 mounted on a side of the main frame 2. Bearings 68 and 70 located in opposite sides of the gear box 66 form journal supports for the shaft 64.

Keyed or otherwise fixed on the shaft 64 is a gear 72 which meshes with a pinion 74 fixed on a stub shaft 76 also journaled in opposite sides of the gear box 66 on antifriction bearings 78 and 80.

The stub shaft 76 carries a worm wheel 82 fixed thereon in mesh with a worm 84 formed on a worm shaft 86 (Fig. 5) that extends transversely of the gear box 66 beneath the shafts 64 and 76. The worm shaft 86 is journaled in bearings 88 and 90 in the gear box, with an end of the shaft 86 projecting through the bearing 90, as indicated at 92. This projecting end portion 92 has fixed thereon a gear 94 in mesh with a gear 96 keyed or otherwise fixed to a drive shaft 98 of a driving motor 100.

The driving motor 100, in the embodiment illustrated, is of the fluid motor-piston type, although it is recognized that any suitable or desirable driving motor may be used for the purpose.

The hydraulic circuit for supplying each motor 100 with operating fluid under pressure is illustrated in detail in Fig. 6. The main fluid supply tank is shown at 102, from which fluid is withdrawn by a pump 104 which discharges the fluid through a filter 106 to a T 108. Flexible hoses 110 extend from the T 108 to four-way valves 112 and 114 that are mounted in suitable positions within convenient reach of the operator on the main frame 2 of the machine. The details of these valves need not be described or illustrated since any suitable valve structure may be used for this purpose.

Hoses 116 extend from the valve 112 to one of the motors 100. Hoses 118 extend from the other valve 114 to the other motor 100 and supply fluid thereto under pressure. The direction of operation of each of the motors 100 depends upon the position of the respective valves 112, 114 for directing fluid under pressure through the corresponding hose 116 or 118 to the motor. Return lines are shown at 120 and 122 from the valves 112 and 114 to the tank 102. A drain line is shown also at 124 extending from each of the motors 100 to the fluid tank 102, for draining surplus oil from the body of the motor.

It will be apparent from the illustration of the hydraulic system in Fig. 6 that either or both of the motors 100 may be operated according to the positions of the valves 112 and 114 that are manually controlled by the operator. Thus, either motor 100 may be power driven to drive the corresponding crawler structure in a forward direction or in reverse, all of which is under the control of the operator by proper manipulation of the valves 112

and 114. Also, the valves may be operated together for forward or backward movement of both motors.

These hydraulic connections are omitted from Fig. 3 to simplify the illustration. However, Fig. 3 shows the manner of operation of the pump 104 which is driven through a belt or chain 126 from an electric motor 128 mounted on the main frame 2 of the machine.

Other details of the machine, not specifically illustrated and described herein, will be apparent from my afore-said patent application, Serial No. 267,324, and from my prior patents hereinbefore identified.

In addition to the adjusting means disclosed in my prior patents and application, the main frame 2 is capable of further adjustment by tilting or pivoting of said main frame on the journals 30 of the axle boxes 22 on the cross shaft 20 which forms the rear axle of the machine. This adjustment may be effected by operation of the hydraulic cylinders 28 to raise or lower the front end portion of the main frame with respect to the subframe 10.

The crawler mechanism is power driven, both to propel the machine and to effect a guiding action thereof. No clutch or brake mechanism is required, but the reversible motors 100 on the respective opposite sides of the machine are connected directly to the crawler mechanism through the speed reducing gearing shown in Figs. 4 and 5 and the sprocket chains 60 that drive directly the head sprockets 44 of the crawler chains 40. Thus, either of the crawler chains can be driven forward and the other in reverse, or may be driven in the same direction at different speeds relative to each other, to effect a steering action, or at the same speed, as desired.

The driving and steering mechanism of the carriage is hereby materially simplified and improved, thus reducing the cost of construction and maintenance of the loading machine, and yet permitting of adjustments of the main frame with respect to the carriage, and independent operation and adjustment of the respective crawlers relative thereto.

While the invention has been illustrated and described in one embodiment, it is recognized that variations and changes may be made therein without departing from the invention as claimed.

I claim:

1. In a loading machine having an elongated main frame with loading means mounted thereon, the combination of a chassis including a subframe, a shaft extending transversely of the subframe and fixed against rotation on the subframe, means mounting the main frame on the shaft for swinging movement relative to the subframe, endless crawler structures supporting the opposite sides of the subframe, a driving member journaled on each opposite end of said shaft and having driving connection with the respective crawler structures, and a separate drive motor for each crawler structure having an operative driving connection with said driving member.

2. In a loading machine having an elongated main frame with loading means mounted thereon, the combination of a chassis including a subframe, journal boxes fixed to the subframe, a shaft extending transversely of the subframe and fixed against rotation in the journal boxes, means mounting the main frame on the journal boxes for swinging movement relative to the subframe, endless crawler structures supporting the opposite sides of the subframe, a driving member journaled on each opposite end of said shaft and having driving connection with the respective crawler structures, and a separate drive motor for each crawler structure having an operative driving connection with said driving member.

3. In a loading machine having an elongated main frame with loading means mounted thereon, the combination of a chassis including a subframe, journal boxes fixed to the subframe, a shaft extending transversely of the subframe and mounted against rotation in the journal boxes, means mounting the main frame on the journal boxes for swinging movement relative to the subframe,

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endless crawler structures supporting the opposite sides of the subframe, a drive sprocket journaled on each outer end of the shaft for rotation relative thereto, said drive sprocket having an operative driving connection with the respective crawler structures, a separate drive motor for each crawler structure having a direct drive connection with the drive sprocket, and a speed reducing gearing intermediate the drive motor and the sprocket.

4. In a loading machine having an elongated main frame with loading means mounted thereon, the combination of a chassis including a subframe, journal boxes fixed to the subframe, a shaft extending transversely of the subframe and mounted against rotation in the journal boxes, means mounting the main frame on the journal boxes for swinging movement relative to the subframe, endless crawler structures supporting the opposite sides of the subframe, a drive sprocket journaled on each outer end of the shaft for rotation relative thereto, said drive sprocket having an operative driving connection with the crawler structure, a separate drive motor for each crawler structure having a direct drive connection with the drive sprocket, said motors being of the fluid operative type, and means for supplying fluid under pressure to the motors.

5. In a loading machine having an elongated main frame with loading means mounted thereon, the combination of a chassis including a subframe, a shaft extending transversely of the subframe and fixed against rotation on the subframe, means mounting the main frame on the shaft for swinging movement relative to the subframe, endless crawler structures supporting the opposite sides of the subframe, a sprocket mounted on each outer end of the shaft and having operative driving connection with the respective crawler structures, a hub fixed to said sprocket, a separate sprocket fixed on the hub, speed reducing gearing having a sprocket driving connection with each second-mentioned sprocket, and a fluid motor having a driving connection directly with said speed reducing gearing and for driving each crawler structure independent of the other.

6. In a loading machine having an elongated main frame with loading means mounted thereon, the combination of a chassis including a subframe, journal boxes fixed to the subframe, a shaft extending transversely of the subframe and mounted against rotation in the journal boxes, means mounting the main frame on the journal boxes for swinging movement relative to the subframe, endless crawler structures supporting the opposite sides of the subframe, said shaft having projecting opposite outer ends, a hub journaled on each projecting outer end of

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the shaft, means mounted on each hub and having driving connection with the respective endless crawler structures, a sprocket mounted on the hub, driving motors mounted on the main frame at opposite sides thereof, means forming flexible driving connections from the motors to the respective sprockets, and power means for operating the motors.

7. In a loading machine having an elongated main frame with loading means mounted thereon, the combination of a chassis including a subframe, a shaft extending transversely of the subframe and fixed against rotation on the subframe, means mounting the main frame on the shaft for swinging movement relative to the subframe, endless crawler structures supporting the opposite sides of the subframe, a driving sprocket journaled on each outer end of the shaft and having a driving connection with the respective crawler structures, a separate drive motor for each crawler structure, and means forming a separate driving connection from each motor to the adjacent sprocket for rotating the sprocket relative to the shaft and to operate the crawler structure.

8. In a loading machine having an elongated main frame with loading means mounted thereon, the combination of a chassis including a subframe, a shaft extending transversely of the subframe and mounted against rotation on the subframe, transversely spaced apart journal boxes between the shaft and the main frame for mounting the main frame on the shaft for swinging movement relative to the subframe, endless crawler structures supporting the opposite sides of the subframe, driving sprockets journaled on the shaft at opposite sides of the subframe coaxial of the swinging mounting means of the main frame, means for driving the respective crawler structures from the driving sprockets, driving motors mounted on the main frame at the respective opposite sides of the subframe, and means forming a direct driving connection from each motor to the adjacent driving sprocket.

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