March 18, 1930. J. L. CLARKSON 1,750,876

LOADING MACHINERY

Filed Jan. 19, 1927 4 Sheets-Sheet 1

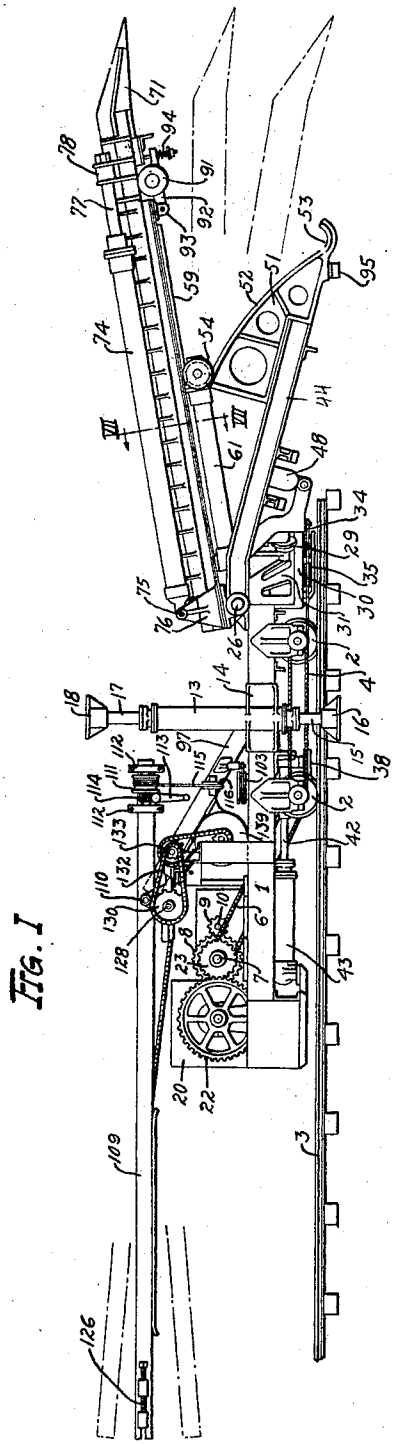


FIG. I

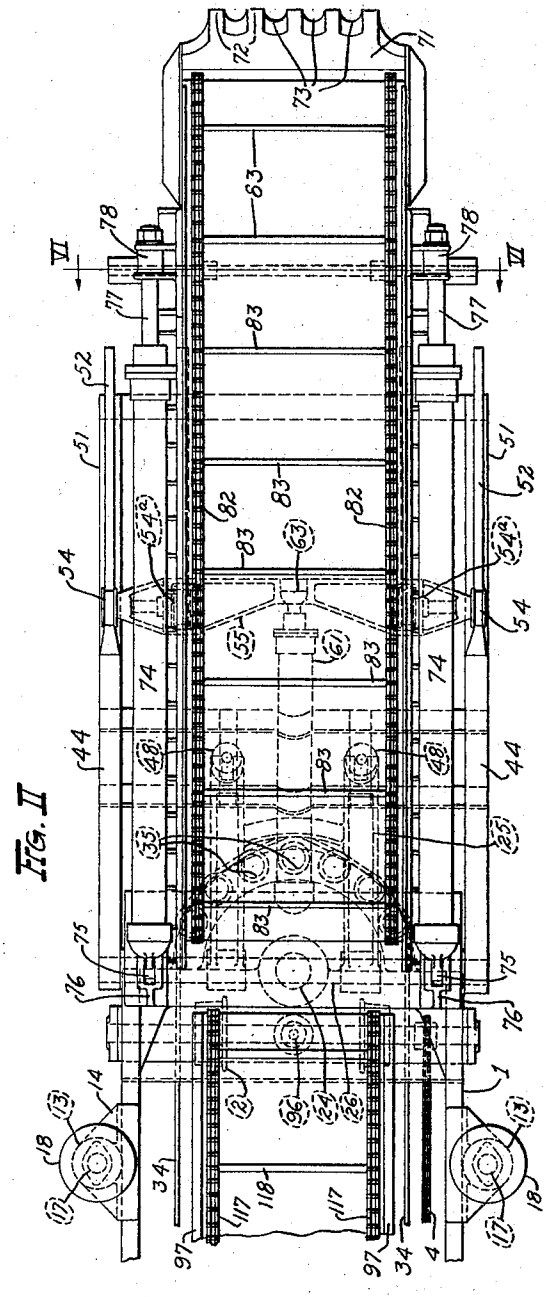


FIG. II

INVENTOR
J. L. CLARKSON
BY J. L. Clarkson
ATTORNEY

March 18, 1930. J. L. CLARKSON 1,750,876

LOADING MACHINERY

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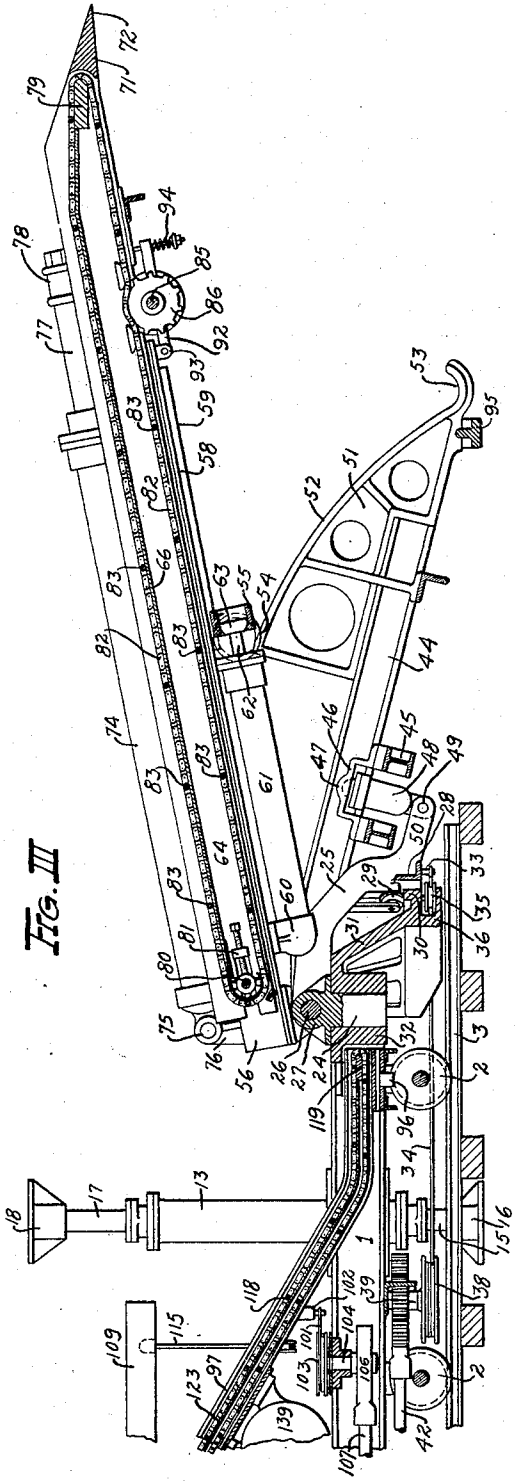


FIG. III

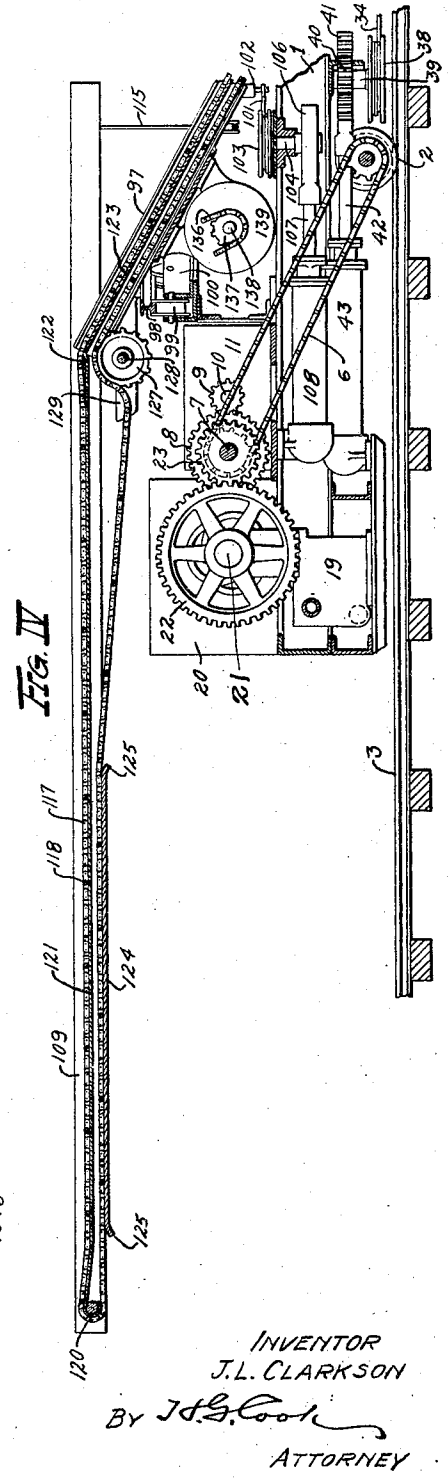


FIG. II

INVENTOR
J. L. CLARKSON
BY J. L. Cook
ATTORNEY

March 18, 1930. J. L. CLARKSON 1,750,876

LOADING MACHINERY

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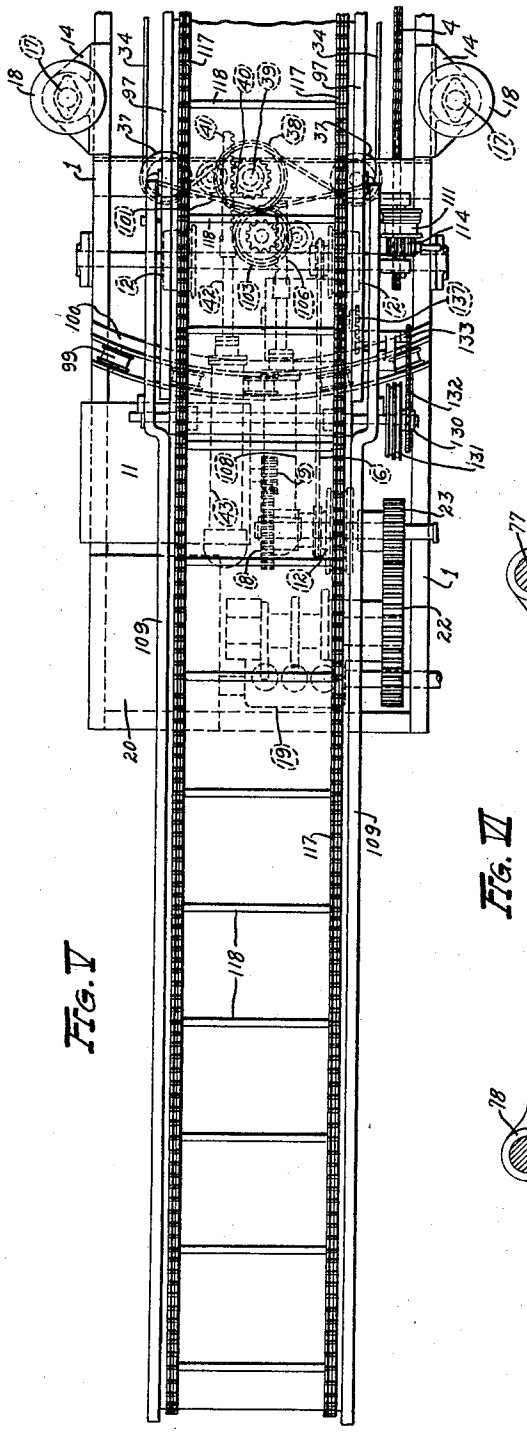


FIG. V

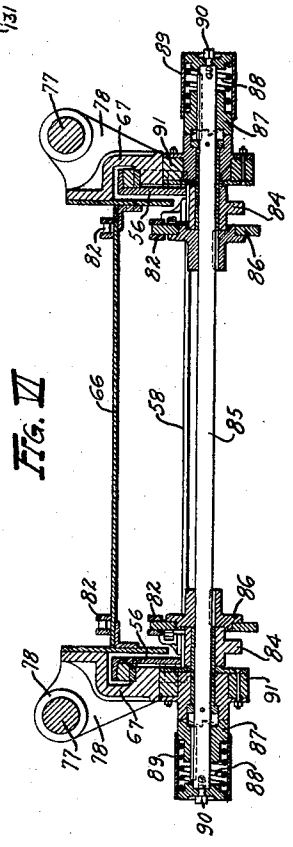


FIG. VI

INVENTOR
J. L. CLARKSON
BY J. L. Clarkson
ATTORNEY

March 18, 1930. J. L. CLARKSON 1,750,876

LOADING MACHINERY

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FIG. VII

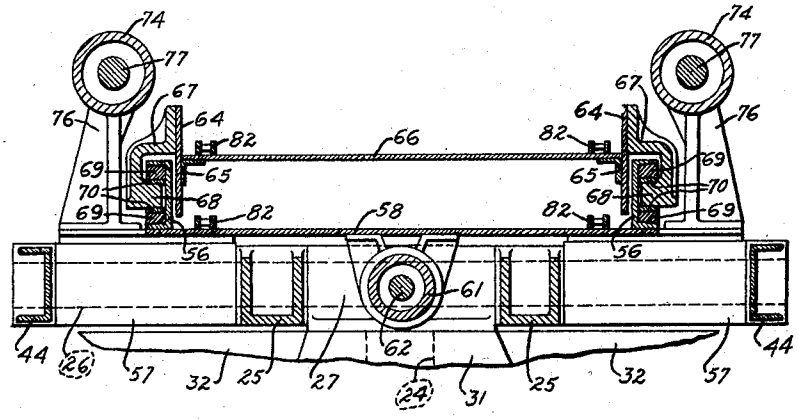
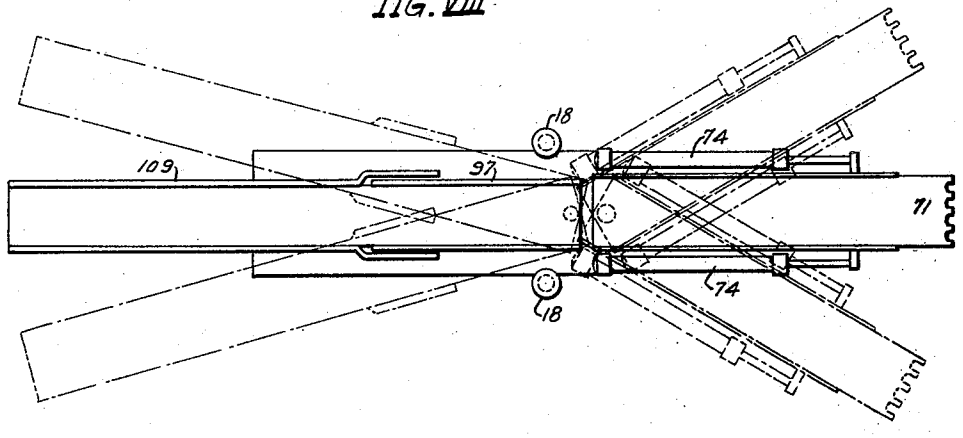


FIG. VIII



INVENTOR
J. L. CLARKSON
BY H. S. Cook
ATTORNEY

Patented Mar. 18, 1930 1,750,876

UNITED STATES PATENT OFFICE

JOHN L. CLARKSON, OF NASHVILLE, ILLINOIS

LOADING MACHINERY

Application filed January 19, 1927. Serial No. 161,984.

This invention relates to loading machinery and, without being absolutely limited thereto, it has more particularly to do with a machine for mining coal and the like. It has for its principal objects to produce a comparatively simple and compact structure possessing the requisite crowding power with a wide digging range both vertically and laterally; to provide for the utilization of the machine on a multiple track system; to provide for convenience in controlling and operating the machine and minimize the amount of physical labor in connection therewith; and to attain certain advantages as will more fully appear in the following description.

The invention consists in the novel construction in its general arrangement and in the parts and combinations and arrangement of parts thereof as hereinafter described, and afterwards pointed out with particularity in the appended claims.

Fig. I is a side elevation of the complete machine.

Fig. II is a top plan view of the forward or digging end portion of the machine.

Fig. III is a vertical longitudinal section through the portion of the machine as shown in Fig. II.

Fig. IV is a vertical longitudinal section of the rear or loading end portion of the machine.

Fig. V is a top plan view of the rear or loading end portion as shown in Fig. IV.

Fig. VI is a cross section on the line VI—VI of Fig. II.

Fig. VII is a cross section on the line VII—VII of Fig. I.

Fig. VIII is a schematic plan view illustrating the relative lateral swing of the forward and rear portions of the machine.

In the drawings, 1 designates generally the carriage frame of the machine which is mounted on a truck having the usual flanged wheels 2, said wheels 2 riding on the rails 3 of a regular trackway. The front and rear axles of the truck are geared together, as by an ordinary sprocket and chain belt drive 4, so that the one is driven by the other. The rear axle is belted, as at 6, to a countershaft 7, which latter is provided with a large gear 8 in mesh with a pinion 9 on the shaft 10 of a motor 11. Obviously, the countershaft 7 may be continuously rotated, and therefore a suitable clutch arrangement is provided under control of the operator for effecting a driving connection between said shaft and the normally loose sprocket thereon which drives the chain 6, it being understood, of course, that this clutch mechanism is provided with a suitable reversing gear arrangement whereby the carriage 1 may be moved in either a forward or rearward direction on the trackway, at will. The details of this mechanism are not illustrated in the drawings, but the approximate location of the same is indicated by the dotted outline, as at 12 (Fig. V).

On opposite sides of the carriage 1 are located hydraulic jacks 13, the same comprising vertically disposed cylinders which are secured to the side frame members of the carriage by bracket members 14. These jacks are of the compensating or equalizing type; that is to say, provision is made therein so that the lower plunger or the piston extension 15, carrying the shoe 16, is first moved, under the application of the pressure in the cylinder, until said shoe 16 bears upon the ground or floor surface, after which the upper plunger 17, carrying the shoe 18, continues its upward movement until said shoe 18 is brought against the roof or other solid abutment provided therefor in the compartment or tunnel in which the machine is operating. By this provision the carriage is firmly held in its operating location.

The pressure for the jacks 13, as well as the several other hydraulic appliances to be hereinafter described, is supplied from a pump 19 (Figs. IV and V) the fluid being supplied from a reserve tank 20. The pump is operated from a cam shaft 21 which has a large gear 22 thereon, the latter being driven by a smaller gear 23 on the countershaft 7 that is driven by the motor 11 as first above-described. In practice, this pump is usually continuously operated in order to maintain the required pressure for the several hydraulic appliances on the machine, and provision is made in the customary manner for relief

valves in the several pressure systems, so that when the predetermined pressure is reached therein the excess fluid is returned to the reserve tank 20. These features are quite obvious, and therefore it is deemed unnecessary to illustrate the same in detail in the drawings.

Swiveled about a vertical axis, on a main pivot 24 at the forward end of the carriage 1 (Figs. II and III), is a laterally swinging carrier frame comprising a pair of forwardly extending arms 25 whose inner end portions are mounted on a horizontal shaft 26 which extends transversely of the carriage through a bearing in the head 27 of the main pivot 24. The forward portions of these arms 25 are rigidly connected by an arcuate cross member 28, thereby constituting a rigid frame, said frame having roller bearings 29 which ride on an arcuate trackway 30 in the lower portion of a forwardly extending bracket frame 31 on the cross support 32 of the carriage 1 in which the main pivot 24 is journaled.

At the middle of the cross member 28 is a depending stud 33 to which the ends of a cable 34 are attached, said cable being passed over a series of grooved pulleys or idlers 35 arranged in a channeled portion 36 of the bracket frame 31 under the arcuate trackway 30 thereof, the intermediate portion of the cable being carried rearward in parallel relation at opposite sides of the carriage 1, thence inward around idlers 37, and having its middle portion looped around a grooved pulley 38 between said two opposed idlers 37.

The pulley 38 is secured on a stub shaft 39 which is mounted on the underside of the carriage 1 and has thereon a pinion 40, with which latter cooperates a toothed rack bar 41 extending from the end of the plunger 42 of a piston working in a hydraulic cylinder 43.

By actuating the piston of the cylinder 43 forward or rearward, as the case may be, the pulley 38 is accordingly rotated and the cable will pull the carrier frame 25 to the right or left on its main pivot 24 at the will of the operator.

Cooperating with the carrier frame 25 is a supplemental supporting frame comprising the forwardly extending parallel side members 44 which are mounted at their inner ends on said cross shaft 26 and being swingable about the axis thereof. These side members 44 are cross connected by parallel yoke members 45, which latter are spanned by overhanging brackets 46 having rounded socket portions 47 to receive counterpart end portions of plunger extensions of pistons which work in hydraulic cylinders 48, hingedly mounted as at 49 on forward extensions 50 of the frame members 25.

Secured on the forward end portions of the side members 44 are upstanding brackets 51 having curved cam portions 52 terminating with hooked end portions 53. Supported and ridable on the cam portions 52 are rollers 54 which are journaled at the ends of a movable cross member or yoke 55, on which latter, inward from the ends thereof, are rollers 54^a which support a carrier frame comprising the parallel side members 56 (Figs. VI and VII). The members 56 are secured to members 57 that are hinged on the cross shaft 26, said members 56 preferably comprising channel iron sections having their flanges outwardly disposed and being cross connected at their undersides by a plate 58 and, from about the location of the cross connecting member or yoke 55 to a point some distance towards the forward end of the frame, said plate 58 is reinforced by track rails 59 (Fig. III) on which the rollers 54^a, shown in Fig. II, ride.

Secured to the underside of the plate 58, as by a combined attaching bracket and cylinder head member 60, is a hydraulic cylinder 61, from whose outer end projects a plunger extension 62 of the piston within the cylinder, which latter is attached as at 63 to the cross member or yoke 55. By this arrangement the inward and outward movement of the piston in the cylinder 61 effects a simultaneous corresponding movement of the cross member or yoke 55, so that the rollers 54 accordingly ride up or down on the cam portions 52 of the frame members 44 while the rollers 54^a ride on the rails 59 of the carrier frame, whereby said frame is raised or lowered, as the case may be.

Slidable endwise on the side frame members 56 is a carriage comprising the side plates 64 on the inner faces of which are longitudinally extending angle reinforcements 65, to which latter are secured the marginal portions of a cross connecting plate 66. On the outer faces of the plates 64 are secured longitudinal carrier members 67 which are substantially Z-shaped in cross section, one flange of the member being riveted or otherwise suitably fastened solidly to the plate 64 and the other flange, which is offset from said plate 64, having an inturned flange portion or longitudinal rib 68 which works in a longitudinal guide groove in the outer side of the side frame member 56, said guide groove being preferably formed by placing filler members 69 against the flanges of said frame member in spaced relation to each other and lining the groove with strips of bronze or other suitable anti-friction bearing metal 70.

Secured to the outer end portions of the plates 64 is a digging and shoveling bit 71 in the form of a heavy casting or forging which is beveled to a sharp cutting edge 72 (Figs. I and III), said cutting edge portion being notched as at 73 (Fig. II).

The carriage just above described is actuated in its endwise movement on the carrier frame members 56 by the power of two

parallel hydraulic cylinders 74 which are secured at their inner ends, as at 75, to the upper end portions of bracket members 76, which latter are firmly secured on the rocking members 57 so as to swing with the carrier frame. The respective pistons in said cylinders 74 have plunger extensions 77 which are securely attached to said carriage members 67 by bracket extensions thereof, as at 78. By this arrangement the two cooperating cylinders 74 may be jointly operated to move the carriage to its forwardly extended position and under sufficient crowding power to cause the bit 71 to dig into the mass of coal or material being mined, and to retract the carriage in the operation of the machine as will presently be more fully described.

Looped around a cross-bar 79 adjacent to the digging and shoveling bit 71 and suitable sprockets 80 adjustably supported at the inner end portions of the side plates 64 of the carriage, as at 81 (Fig. III), is an endless belt conveyor comprising the chains 82 and cross-bars 83. The upper flight of this conveyor rides over the plate 66 of the carriage, while the lower flight thereof rides on the plate 58 of the carrier frame (Figs. VI and VII).

Near the forward end of the carrier frame members 56 are bearings 84 in which a cross shaft 85 is journaled (Fig. VI). On this shaft are keyed two sprocket wheels 86 which project upward through slotted openings in the plate 58 so that the lower flights of the chains 82 can ride thereover. On the outer end portions of this shaft 85 are clutch members 87 which are keyed thereto so as to rotate therewith but are capable of endwise movement thereon, said clutch members 87 being pressed by springs 88 within a cylindrical housing 89 secured removably to the ends of the shaft, as at 90, whereby said clutch members are yieldably held in engagement with friction driving disks 91, which latter are journaled loosely on said shaft 85, and by which arrangement said shaft and friction driving disks are rotatable, the one by the other in one direction, but are independently rotatable in the opposite direction. These friction driving disks 91 are held in contact with the undersides of the carriage members 67 by an arrangement of lever arms 92 which are hinged, as at 93, to the underside of the carrier frame, and spring-pressed as at 94, said lever arms 92 being located so as to bear against the undersides of the journal bearings 84 which are movably mounted in suitable guideways and thereby tending to lift the cross-shaft 85 under the action of said spring 94. Thus, when the carriage is moved endwise in either direction, said friction disks 91 are rotated, and in one direction of movement of said carriage, the forward, said shaft 85 is rotated with said disks owing to the interlocked arrangement of the engaging teeth between the hub portion of said disks and the clutch members 87, while on the return rearward movement of the carriage said disks 91 rotate, but the shaft 85 ceases to rotate as the clutch teeth slip due to the resistance of the conveyor chains on the sprockets 86.

As the carriage moves forward under the power of the hydraulic cylinders 74 the sprockets 86 are rotated with the disks 91 as above described, and, consequently, the conveyor is caused to travel with its upper flight running rearward, whereby any material picked up by the bit at the forward end of the carriage is conveyed rearward therefrom. On the return stroke of the carriage, however, the conveyor ceases to travel and remains idle throughout each return stroke of the carriage.

Connecting the forward end portions of the side members 44 of the supplemental supporting frame is a cross-bar or yoke 95 constituting a shoe adapted to rest on the ground or floor surface of the compartment in which the machine is being operated, whereby to support the frame in its lowered position during the digging and shoveling operation of the machine, to and from which position said frame is moved by the operation of the controlling hydraulic cylinders 48, and from which position said frame has to be lifted prior to the swinging of the frame about the axis of main pivot 24 of the machine, or when it is desired to move the carriage 1 on the trackway 3.

Pivoted on the carriage 1, rearward from the main pivot 24, as at 96, is a conveyor frame 97 having a lower horizontal portion in the region of the pivot 96 and an inclined portion extending upward and rearward therefrom. The inclined portion of the conveyor frame is provided with an arcuate track member 98 which rides on a series of grooved rollers 99 which are journaled in a corresponding arcuate supporting frame 100 (Fig. IV).

In order to effect the swinging of the frame 97 laterally on its axis 96, a cable 101 is secured at its ends to the side members of the frame, as at 102, and its middle portion is looped around a grooved pulley 103 which is mounted on a stub shaft 104 journaled on the underside of the carriage 1. On the shaft 104 is a pinion 105 which is engaged by a rack bar 106 extending from the end of the plunger 107 which projects from the piston in the hydraulic cylinder 108. By this arrangement the conveyor frame is readily swung to the right or the left by moving the rack bar 106 forward or rearward, as the case may be.

Hingedly mounted on the upper end portion of the inclined conveyor frame 97 is a substantially horizontal extension frame 109 which, of course, is swingable laterally with said frame 97 about the pivotal axis 96 there-

of. This extension frame 109, however, is separately tiltable up and down about the horizontal axis of its hinge connection 110 with said frame 97 so as to bring the discharge end of said frame 109 to different elevations for convenience in loading cars of various heights. This tilting adjustment of the extension frame 109 is effected and maintained through the instrumentality of a winch or windlass device comprising a drum 111 journaled in lateral bracket extensions 112 on one of the side members of the frame, said drum being operated by a crank 113 through the intermediary of a suitable worm gearing or spiral gearing 114. A cable 115 is secured at one end to the side member of the frame 109 opposite to that on which the winch is mounted, said cable being carried down and under a pulley 116 on the adjacent side of the inclined conveyor frame 97, thence across and under a like pulley on the opposite side of said inclined conveyor frame, and then up to the drum 111, about which latter its opposite end is wound. By turning the crank 113 the drum 111 is rotated in either direction, at will, thereby winding or unwinding the cable 115 thereon and thereby effecting the raising or lowering of the discharge end of said extension frame 109, in which adjusted position it will remain owing to the arrangement of the worm or spiral gearing 114 which functions as a lock for the drum except when said gearing is actuated by the crank 113.

On the conveyor frame 97 and the extension frame 109 is an endless belt conveyor comprising the parallel side chains 117 and cross-connecting members 118. This conveyor is looped around a cross-bar 119 at the forward end of the lower horizontal portion of the frame 97 and a roller 120 at the discharge end of the frame 109 (Figs. III and IV), the upper flight of the conveyor being supported on the frame 109 by a plate 121 extending lengthwise thereof from the region of the roller 120 to a point near the juncture of said frame 109 with the inclined portion of the frame 97 and being there overlapped, as at 122, by the meeting end portion of a plate 123, which latter follows the contour of said frame 97 and supports the upper flight of the conveyor thereon.

The lower flight of the conveyor is supported on the underside of the extension frame 109 by a plate 124 having the downwardly curved end portions 125 which serve to prevent the conveyor catching thereon, and adjustment for loosening or taking up the slack in the conveyor is effected by the adjusting means 126 as illustrated conventionally in Fig. I.

This conveyor is driven by a gearing comprising sprocket wheels 127 which are fixed on a cross-shaft 128 journaled in the region of the pivotal axis 110 between two frames 97 and 109, and over which sprocket wheels the lower flights of the chains 117 travel and are held in engagement therewith by shoes 129 (Fig. IV). Normally loose on the shaft 128 is a driving sprocket 130 which may be locked to the shaft at the will of the operator, by the provision of a suitable clutch device 131. Said sprocket 130 is belted by a chain 132 to a smaller sprocket 133 on a countershaft 134 which has a larger sprocket 135 thereon that is in turn belted by the chain 136 to a driving sprocket 137 on the shaft 138 of a motor 139.

By the foregoing arrangement it is quite obvious that if the sprocket wheels 127 are rotated under the power of the motor 139 in the direction to carry the lower flight of the conveyor towards the forward end of the carriage 1, the upper flight will travel in the opposite direction or towards the discharge end of the frame 109. Consequently, the material discharged onto the lower forward portion of this conveyor from the conveyor on the digging and shoveling carriage will be carried up to and along the extension frame from which it may be finally discharged into cars, which latter are either brought up to receiving position on the trackway 3, or on a separate trackway on either side thereof, in which latter case said extension frame 109 may be accordingly swung to the right or the left, as the case may be.

In the use of the machine of the present invention, it is readily propelled under its own power to the position on the trackway in working relation to the abutting breast wall from which the coal is to be taken, in which position the carriage 1 is firmly held by the jacks 13.

The carriage 1 being positioned, the pressure in the hydraulic cylinders 48 is relieved so that the supplemental supporting frame 44 is lowered until its shoe member 95 rests on the ground or floor of the compartment in which the machine is operating. The hydraulic cylinder 61 is then operated to raise or lower the carrier frame 56 to bring the bit 71 at the end of the reciprocatory carriage 64 to the elevation where it is desired to cut into the wall of coal or shovel that which is already loosened. The vertical adjustment being effected, the bit may be brought to its working position laterally of the longitudinal axis of the machine by operating the cylinders 48 to raise the shoe portion of the frame 44 off the ground and then operating the cylinder 43 so as to move its rack bar extension 41 accordingly inward or outward and thereby swing the carrier 25 on the trackway 28 and about the axis of the main pivot 24, after which the frame 44 may be lowered to set the shoe portion 95 again on the ground.

The bit 71 being positioned, the carriage 64 is then forced forward under the power of the cylinders 74 so that the bit takes into the mass of coal or material being mined, the

loosened material passing over the bit onto the conveyor plate 66. As the carriage moves forward the conveyor chains 82 are operated, as hereinabove described, so that the upper flights thereof move rearward and the cross-bars 83 move the material accordingly along the plate 66. This movement of the conveyor is, of course, intermittent as it ceases to travel during the rearward movement of the carriage. However, any material which has passed beyond the rear end portion of the carriage is deposited on the plate 58 of the carrier frame 56 and it is pushed therefrom and onto the lower inner end portion of the conveyor frame 97 by said rear end portion of the carriage during each rearward stroke of the carriage.

The endless belt conveyor on the frame 97 carries the loose material deposited thereon up the inclined portion of the frame and along the extension frame 109, which latter, as hereinabove described, is tiltable up and down about the horizontal axis 110 so as to bring the discharge end of the frame 109 into convenient working position according to the height of the cars to be loaded. So, too, as hereinabove described, said extension frame 109 may be swung together with the frame 97 laterally from the axis 96 of the latter, so as to load the material on cars located on a track at either side of the trackway 3.

By the arrangement of the endwise reciprocable and laterally swingable bit 71, it is obvious that, in addition to facilitating the shoveling and gathering of already loosened material, the bit may be used to some advantage in cutting the material loose, as its relatively sharp cutting edge, which is toothed, may be forced endwise into the material by the thrust of the carriage under the power of cylinders 74, and if the material be of considerable hardness in character the cutting may be effected by a series of endwise impacts of the bit thereagainst, coupled with a lateral reciprocation of the bit upon the material, which may be accomplished by the power of the cylinder 43.

Obviously, many changes and alterations may be made in the structure without departing from the principle and scope of the invention as defined by the appended claims. Therefore, it is not limited to the specific construction and arrangement shown in the accompanying drawings.

I claim:

1. In a loading machine, a carriage, a rangeable shoveling element at the forward end thereof, a rangeable loading conveyor extending rearward from said carriage, reciprocable means for thrusting said shoveling element longitudinally forward under power and likewise returning it, an endless conveyor, and means automatically controlled by the direction of movement of said shoveling element for operating said conveyor intermittently and during the forward stroke of said shoveling element for conveying the collected material from said shoveling element to said loading conveyor.

2. In a loading machine, a main body carriage, a supporting frame swingable laterally about a vertical axis from the forward end of said carriage, a supplemental frame liftably supported on said supporting frame, a carrier frame raisable and lowerable on said supplemental frame, a longitudinally movable carriage on said carrier frame, said second-mentioned carriage having a shoveling bit at its outer end, and a conveyor on said carriage for moving the collected material thereon rearward from said shoveling bit.

3. In a loading machine, a main body carriage, a compensating columnar hydraulic jack device for anchoring said carriage to flooring below and heading above, a supporting frame swingable laterally about a vertical axis from the forward end of said carriage, hydraulic controlling and operating means for said supporting frame, a liftable supplemental frame swingable about a horizontal axis on said supporting frame, hydraulic means for raising and lowering said supplemental frame, a carrier frame swingable about the said horizontal axis with said supplemental frame, hydraulic means for raising and lowering said carrier frame on said supplemental frame, a carriage reciprocable endwise on said carrier frame, a shoveling element at the outer end of said carriage, a conveyor on said second-mentioned carriage operable upon the forward stroke of said carriage to convey collected material thereon from said shoveling element rearward, and hydraulic means for moving said carriage forward and for returning it.

4. In a loading machine, a main body carriage, an arcuate trackway at the forward end thereof, a supporting frame pivoted about a vertical axis on said carriage and having anti-friction rollers riding on said arcuate trackway, a supplemental frame extending forward from said carriage and being pivotally supported at its inner end about a horizontal axis substantially in transverse alinement with said above-mentioned vertical axis, a power lifting device for supporting said supplemental frame on said supporting frame, said supplemental frame having an upstanding cam track on the outer end portion thereof, a carrier frame hingedly supported about the same axis with said supplemental frame and having a trackway on its underside in opposed relation to said cam track on said supplemental frame, a cross-member having bearing rollers ridable respectively on said supplemental frame cam track and said carrier frame trackway whereby to support said carrier frame, a power device for moving said cross-member endwise of

said supplemental frame and said carrier frame, both forward and rearward, whereby to raise and lower said carrier frame, a carriage movable endwise on said carrier frame, a shoveling element at the forward end of said second-mentioned carriage, an endless belt conveyor on said carriage, the same extending from the region of said shoveling element to the rear end of the carriage, an automatically releasable clutch device on said carrier frame operable by the movement of said carriage for moving said conveyor intermittently and upon the forward stroke of the carriage only whereby to move the collected material on said carriage rearward from said shoveling element.

In testimony that I claim the foregoing I hereunto affix my signature.

JOHN L. CLARKSON.