

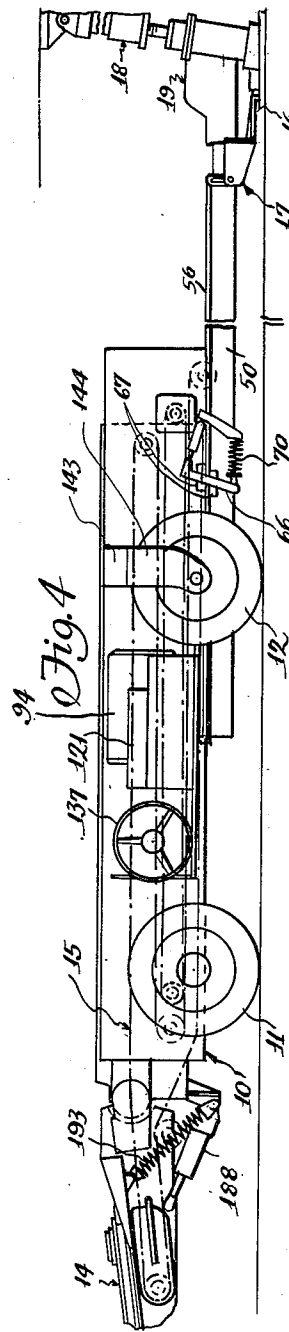
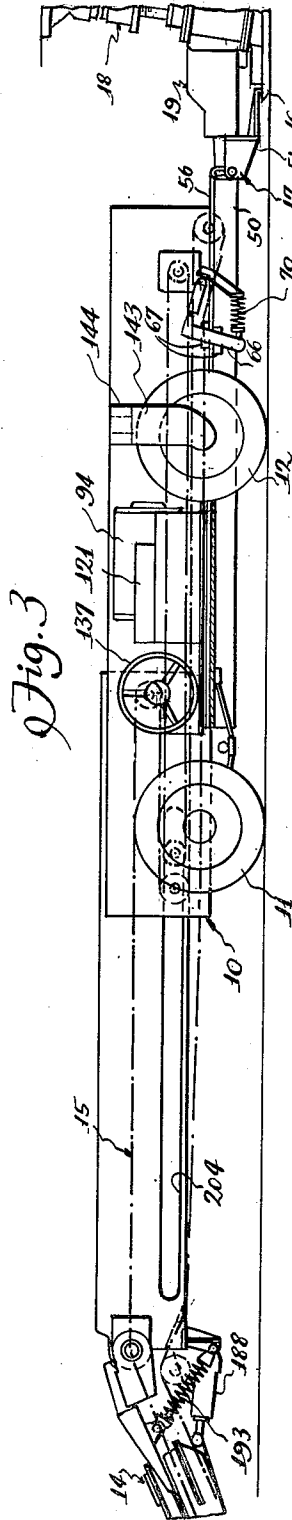
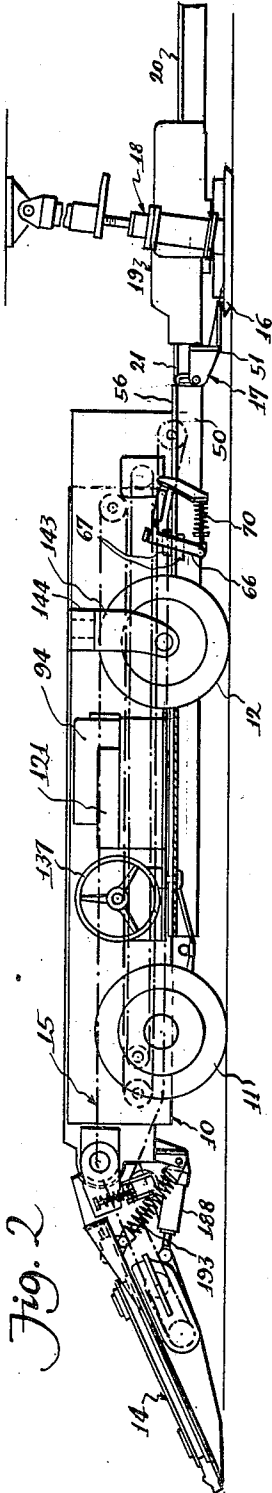
March 10, 1953

R. S. BIGELOW
LOADING MACHINE

2,630,902

Filed Sept. 1, 1944

8 Sheets-Sheet 2



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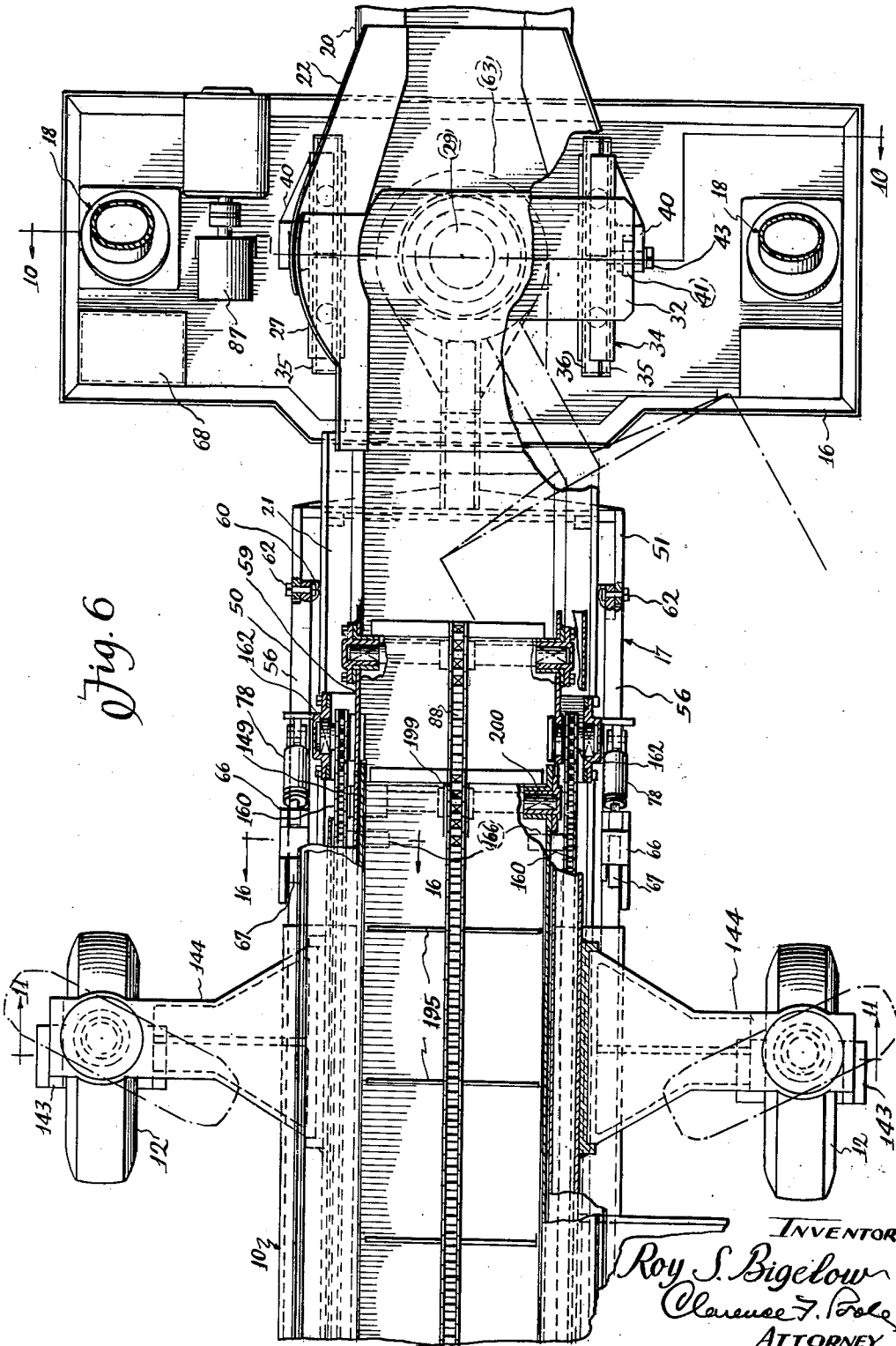
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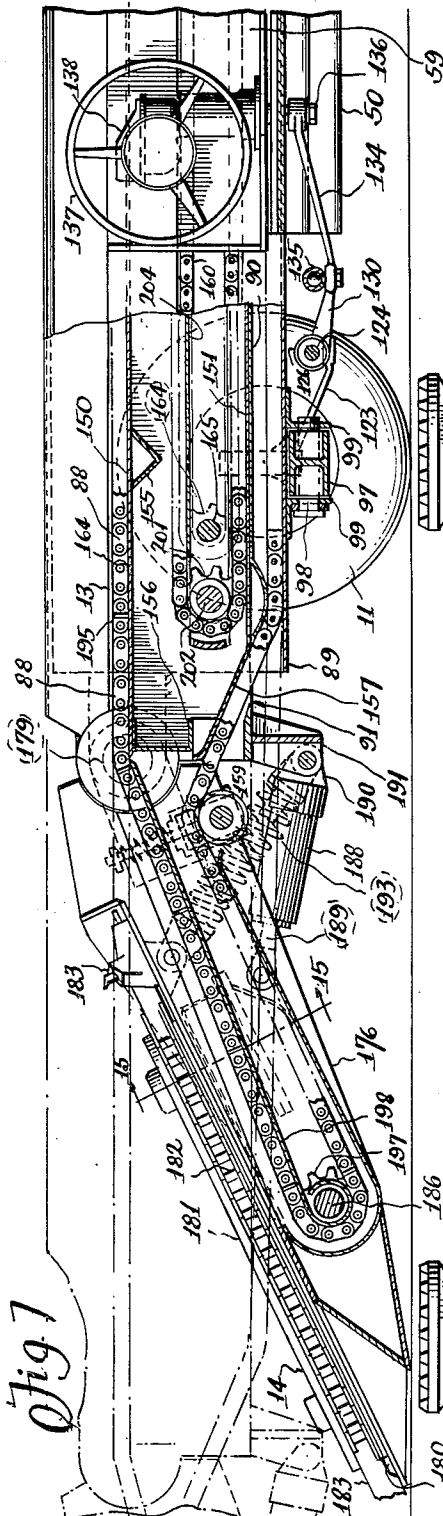


Fig. 15

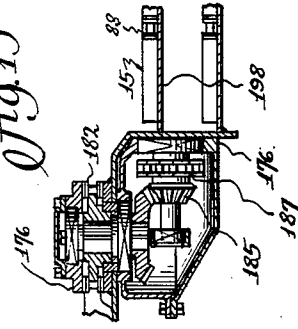
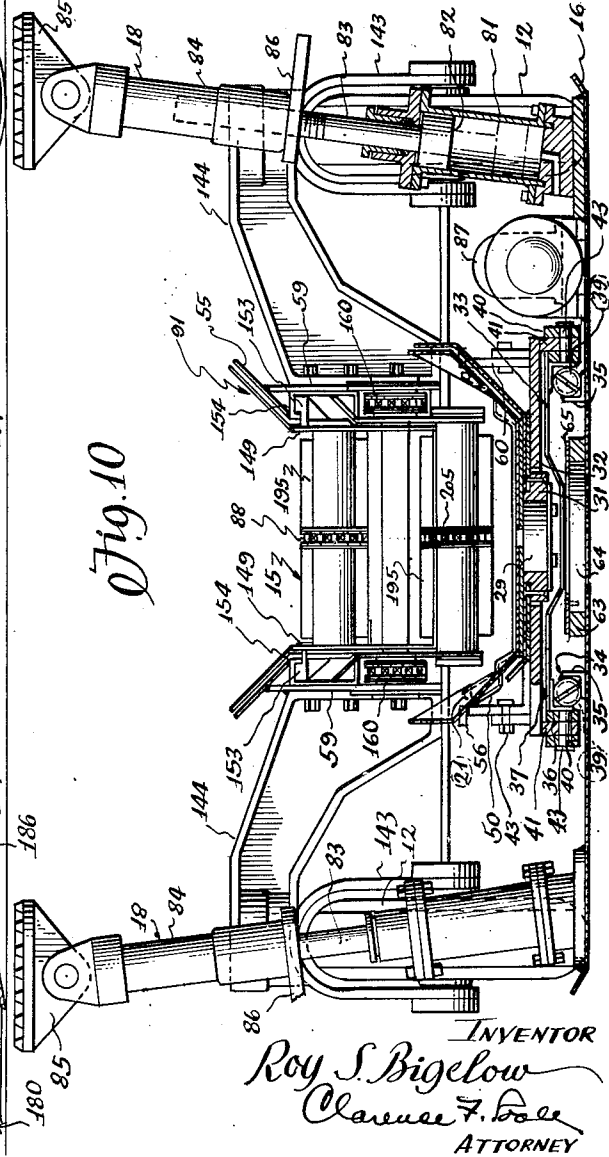


Fig. 10



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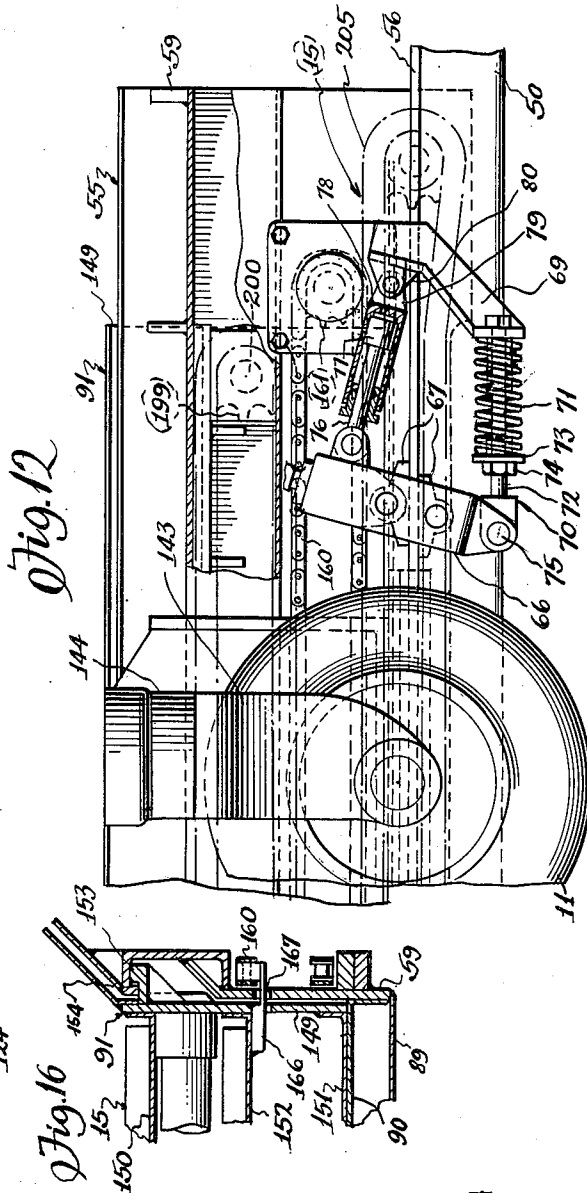
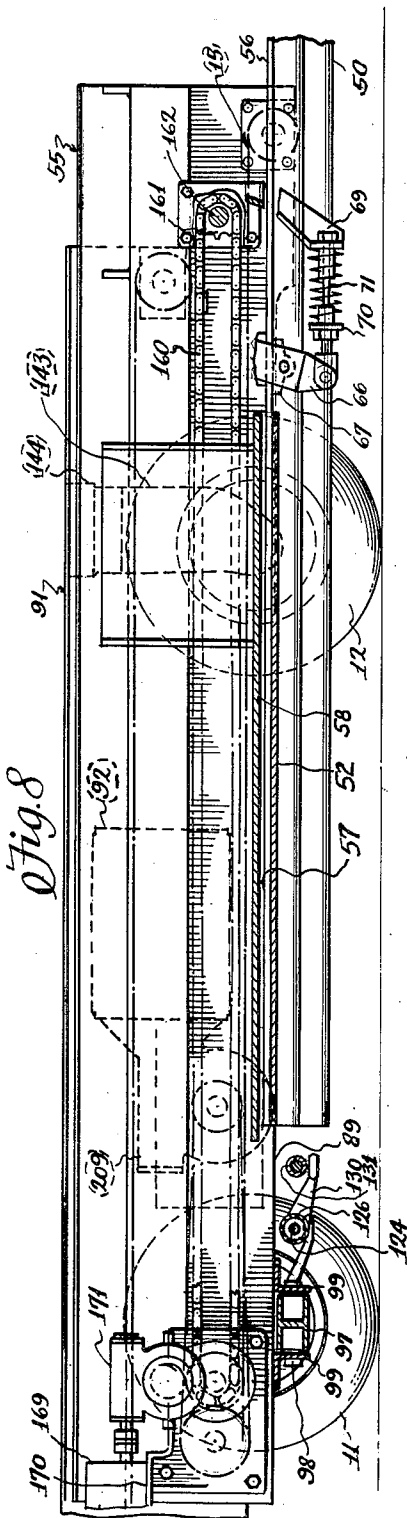
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8 Sheets-Sheet 6



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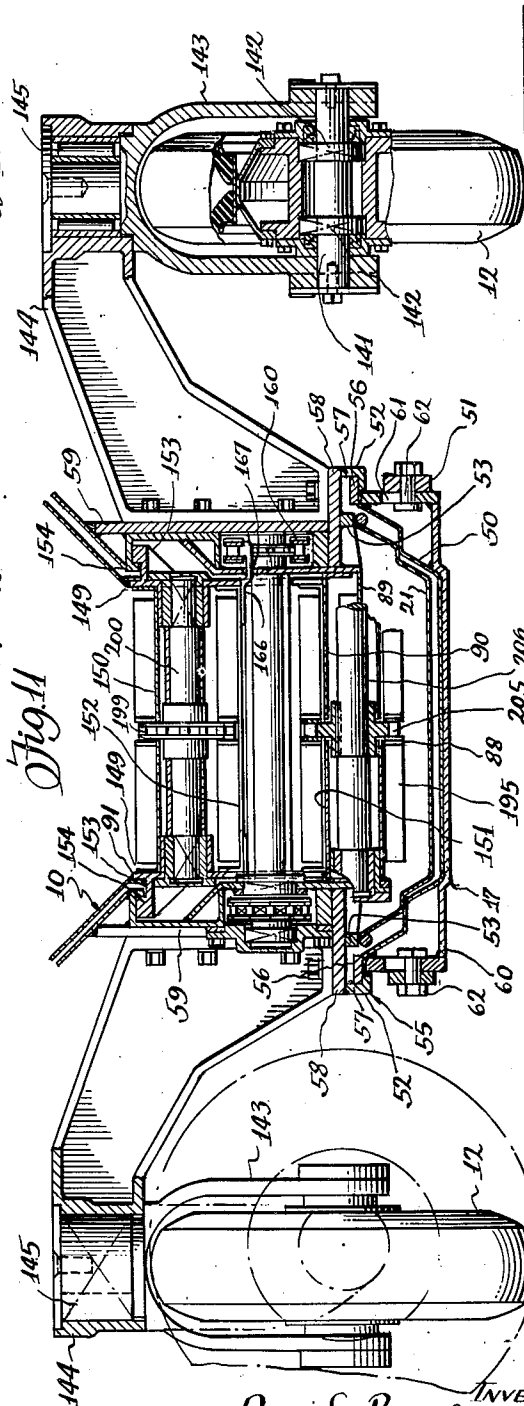
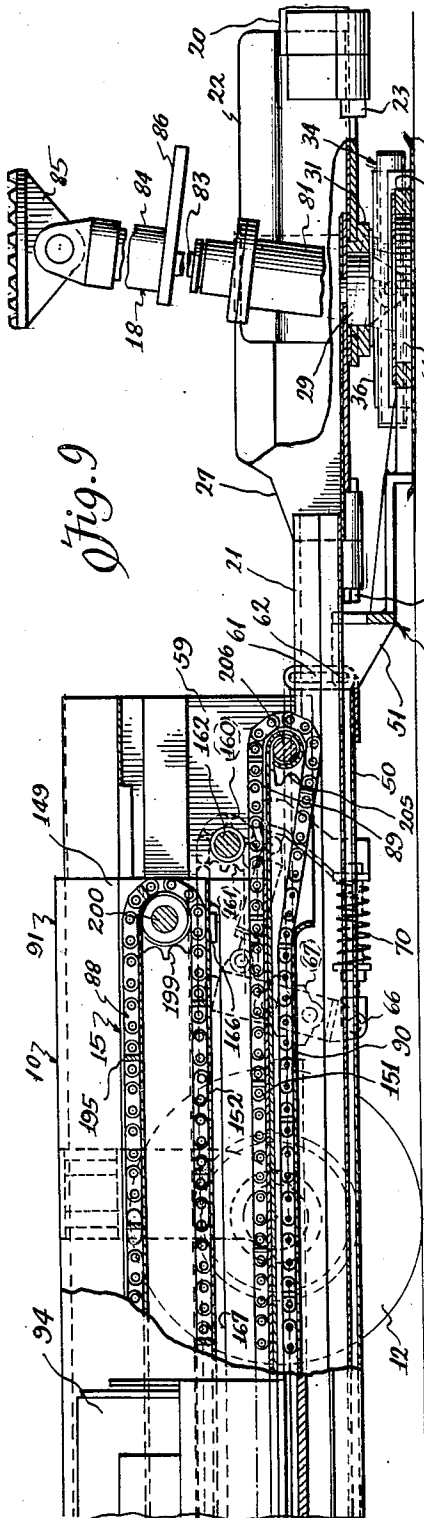
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UNITED STATES PATENT OFFICE

2,630,902

LOADING MACHINE

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Application September 1, 1944, Serial No. 552,243

21 Claims. (Cl. 198—8)

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This invention relates to improvements in loading machines and more particularly to an improved form of loading machine adapted to load coal onto a shaker conveyor trough line in thin seams of coal.

The principal objects of my invention are to provide a loading machine of a low overall height, which is relatively light in proportion to its loading capacity and which is so arranged as to load directly onto the inby end of a shaker conveyor.

A more specific object of my invention is to provide a self-propelled loading machine operating against a fixed reaction member arranged to take the thrusting loads thereof during loading, to enable the weight of the machine to be reduced over former loading machines of the same general type, and having an extensible conveyor with means for extending the conveyor by power against said fixed reaction member, to feed the gathering head into the material it is desired to load.

Another object of my invention is to provide a self-propelled loading machine pivotally connected adjacent its rear end to a stationary base forming a mounting for a swivel connected with the inby end of a shaker conveyor trough line, for holding the loading machine for lateral movement about the axis of the swivel, and forming a reaction means for the loading machine during feeding of the gathering head into the material it is desired to load, which loading machine is so arranged as to have a conveyor trough of the shaker conveyor trough line slidably guided therein, so it may load material directly onto said trough.

A still further object of my invention is to provide a rubber tire mounted loading machine having front steering and propelling wheels and rear caster mounted supporting wheels, for supporting and propelling the machine in a forward or return direction, with means for positioning the steering and propelling wheels to swing the machine laterally, to position the gathering element for picking up material to either side of the center line of the machine.

Other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

Figure 1 is a top plan view of a loading machine constructed in accordance with my invention, showing the machine pivotally connect-

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ed at its rear end to the swivel of a shaker conveyor trough line;

Figure 2 is a view in side elevation of the loading machine shown in Figure 1, drawn to a slightly larger scale than Figure 1 and showing the machine in a retracted position;

Figure 3 is a view drawn to substantially the same scale as Figure 2, but showing the machine in an extended position;

Figure 4 is a view in side elevation of the machine, showing the machine in a retracted position but extended along the means for connecting it to the swivel of the shaker conveyor trough line;

Figure 5 is an enlarged detail fragmentary plan view of the forward portion of the machine shown in Figure 1, with certain parts broken away and certain other parts shown in horizontal section;

Figure 6 is a detail fragmentary plan view of the rear part of the machine, drawn to the same scale as Figure 5, with certain parts broken away and certain other parts shown in horizontal section;

Figure 7 is a detail fragmentary view in side elevation of the forward part of the machine, drawn to the same scale as Figure 5, with certain parts shown in longitudinal section;

Figure 8 is a detail fragmentary view in side elevation of the central part of the machine, with certain parts broken away and certain other parts shown in substantially longitudinal section;

Figure 9 is a detail fragmentary view of the rear part of the machine, with certain parts broken away and certain other parts shown in longitudinal section, showing certain details of the connection of the machine to the conveyor trough line swivel;

Figure 10 is an enlarged sectional view taken substantially along line 10—10 of Figure 6;

Figure 11 is an enlarged fragmentary sectional view taken substantially along line 11—11 of Figure 6;

Figure 12 is an enlarged fragmentary view in side elevation, showing certain details of the friction grip block arrangement for holding the loading machine in fixed relation with respect to the swivel, or for permitting advancing or retractable movement of said loading machine with respect to said swivel;

Figure 13 is an enlarged transverse sectional view taken substantially along line 13—13 of Figure 5;

Figure 14 is a top plan view of one of the propelling and steering wheels, with certain parts shown in horizontal section, showing certain details of the support and the drive therefor;

Figure 15 is a transverse sectional view taken substantially along line 15—15 of Figure 7, showing certain details of the drive to the gathering mechanism;

Figure 16 is an enlarged detail partial fragmentary transverse sectional view taken along line 16—16 of Figure 6, in order to show certain details of construction of the telescoping conveyor framework; and

Figure 17 is an enlarged detail partial transverse sectional view taken along line 17—17 of Figure 5 and showing certain details of construction of the telescoping sections of the conveyor, not shown in Figure 16.

Referring now to Figures 1, 2, 3 and 4 of the drawings, the embodiment of my invention illustrated therein includes generally a face loading machine 10 mounted on front rubber tired steering and propelling wheels 11, 11 and rear supporting caster wheels 12, 12, and including an extensible conveyor 15 with a gathering head 14 at its forward end. Said gathering head may be fed into the material it is desired to load by extensible movement of said conveyor, while the loading machine reacts against a stationary base 16.

The rear end of the loading machine is pivotally connected to the stationary base 16 by means of a link 17, pivotally connected adjacent its rear end to said base, for movement about a vertical axis and adjustably connected with the loading machine, so said loading machine may be extensibly and retractibly moved along said link, and so said link may hold said loading machine from backward movement during the loading operation. Said base is held in position on the ground to form a reaction member for the machine during the loading operation by means of jacks 18, 18 adapted to be interposed between said base and the mine roof. Said base forms a mounting for a swivel 19 of a shaker conveyor trough line 20, and has a reciprocating trough 21 communicating with its receiving end and extending therefrom. Said reciprocating trough is slidably guided in the loading machine frame for reciprocable movement with respect thereto, in receiving relation with respect to the discharge end of the conveyor 15.

The shaker conveyor trough line 20 may be reciprocably driven from a suitable reciprocating drive mechanism at its outby end (not shown), in such a manner as to cause material to flow along said trough line from its inby to its outby end, as is well known to those skilled in the art. Said trough line is connected at its inby end to a connecting trough 22 of the swivel 19 by means of the usual connecting bolts 23, 23 (see Figure 9).

The connecting trough 22 has a widened and curved forward end, which is adapted to have a cured rear end of a swivel trough 27 nested therein. Said swivel trough has a bearing boss 29 secured thereto and depending therefrom, which is journaled in a bearing member 31, secured to the bottom of said connecting trough. Said connecting trough is secured to a bridge member 32 as by rivets. Said bridge member is mounted on an upper frame member 33 of a ball frame 34, for pivotal movement with respect thereto about a transverse axis.

The ball frame 34 is of a well known form and

includes a pair of longitudinally extending, laterally spaced, outwardly facing guides 35, 35 secured to the top of the base 16, and a pair of corresponding guides 36, 36 connected together by a cross frame 37, and facing said first mentioned guides (see Figure 10). Said guides 36, 36, with said guides 35, 35, form guide races for balls 39, 39, which reciprocably support the upper frame 33 of said ball frame on the base plate 16.

The connection between the upper frame of the ball frame 34 and the bridge member 32 includes a pair of laterally spaced forked connecting members 40, 40 one of which is secured to the outer side of each guide 36. Tongues 41, 41 depending from opposite sides of said bridge member are adapted to extend through the furcations of said forked connecting members and to be connected thereto by transverse pivotal pins 43, 43.

The reciprocating trough 21 is secured to the forward end of the swivel trough 27 by means of the usual connecting bolts 46, 46 (see Figure 9). Said reciprocating trough extends forwardly of said swivel trough 27, and is herein shown as being slidably mounted between the wheels of the loading machine on the control link 17.

The control link 17 is herein shown as being in the form of a trough 50, supported to extend beneath the loading machine and pivotally connected to the base 16 by means of a pivoted connecting link 51 (see Figures 8, 9 and 11). Said trough is provided with a pair of flanged bearing members 56, 56 extending along opposite sides thereof, which are adapted to extend within facing channelled guides 57, 57, extending along opposite sides of a main frame 55 of the loading machine and depending therefrom. Said guides, as herein shown, are formed from facing angles 52, 52 secured at the ends of their vertical legs to and depending from horizontal plates 58, 58, which are secured to the bottoms of and extend along side frame members 59, 59 of the frame 55.

The reciprocating trough is nested within and reciprocably supported on the shouldered portions of the sides of the trough 50 of the control link 17. The upper ends of the sides of said trough are adapted to abut bearing strips 53, 53, which are mounted on the bottoms of the plates 58, 58 and extend therealong, to retain said reciprocating trough 21 within said trough 50, especially when the loading machine is in an extended position with respect to said trough 21.

The trough 50 of the link 17 has a cross frame 60 secured to its rear end, which extends across the bottom thereof and upwardly along opposite sides thereof to a position just beneath the flanged bearing members 56, 56. The outer sides of said cross frame are provided with vertically extending slotted portions 61, 61 adapted to receive pivot pins 62, 62 connected to opposite laterally spaced sides of the connecting link 51, for connecting said link to the rear end of said trough, for a limited amount of free pivotal and vertical movement of said trough with respect to said link.

The connecting link 51 extends rearwardly from its point of pivotal and vertical slidable connection to the rear end of the trough 50 and has a rear annular portion 63 journaled on a bearing boss 64 extending upwardly from the bottom of the base 16, coaxial with the pivotal axis of the swivel trough 27, when said trough is at the central portion of its stroke. A retaining ring 65, secured to the upper side of said bearing boss and abutting the top of said annular portion 63, is provided to retain said link on said

bearing boss and to permit said link to pivot about the vertical axis of said boss.

A means is provided to connect the trough 50 with the frame 55, which is selectively operable to permit the loading machine to be extended along said trough or to hold said frame and loading machine in fixed relation with respect to said trough, so the base 16 may form a fixed reaction member for the loading machine when extending the gathering head 14 into the material it is desired to load. Said means, as herein shown, includes a carrier member 66 extending along each side of the frame 55 (see Figure 12). Each of said carrier members has a pair of friction grip blocks 67, 67 pivotally mounted therein and adapted to have gripping engagement with the upper and lower sides of the bearing plates 55, 56.

The lower end of the carrier member 66 is connected to a depending arm 69 of the frame 55 by means of a yieldable link 70. Said yieldable link includes a spring 71 encircling a rod 72 slidably mounted in said depending arm. One end of said spring abuts said depending arm while the opposite end of said spring abuts the flange of a flanged sleeve 73, mounted on said rod. A nut 74 threaded on said rod is provided to hold said sleeve from forward movement with respect to said rod and to preload said spring. The forward end of said rod is of a forked construction pivotally connected to the lower end of said carrier member by means of a pivotal pin 75. The spring 71 is so loaded that the yieldable link 70 is normally a solid member and will only yield upon overload conditions of the grip blocks 67, 67, to release said grip blocks and to permit the loading machine to move rearwardly along the trough 50 when the gathering head 14 engages a solid construction on the ground.

The upper end of each carrier member 66 is pivotally connected to the free end of a piston rod 76 extending from a piston 77, movable within a cylinder 78. Said cylinder has an ear 79 extending rearwardly from its rear end, which is interleaved by spaced lugs 80, 80 projecting forwardly from the upper end of the depending arm 69, and which is pivotally connected thereto. The admission of fluid under pressure to the piston rod ends of said cylinders will thus move the carrier members 66, 66 into position to positively engage the grip blocks 67, 67 with the bearing members 55, 56, to cause the control link 17 to form a fixed reaction member for the loading machine, releasable upon overload conditions by the yieldable link 70. The admission of fluid under pressure to the opposite ends of said cylinders will release said grip blocks and permit the loading machine to be moved along said link and the reciprocating trough 21.

The jacks 18, 18 for holding the base 16 in a stationary position on the ground during the loading operation are herein shown as being hydraulic jacks, each including a cylinder 81 mounted on the base 16 at its head end and so arranged that fluid under pressure may enter the head end thereof (see Figure 10). A piston 82 movable within said cylinder has a piston rod 83 extensible from the piston rod end of said cylinder through suitable packing. The upper portion of said piston rod is threaded, and has a cylindrical member 84 threaded thereon for adjustment therealong. Said member has a roof-engaging shoe 85 transversely pivoted to its upper end. A handle 86 is operatively connected with the member 84, for turning said member along

said piston rod to bring the roof-engaging shoe 85 into proximity with the mine roof. Fluid under pressure is then admitted to the head end of said cylinder 81 to engage said shoe with the mine roof and to hold said shoe in engagement therewith.

Fluid under pressure is supplied to the cylinders 81, 81 by means of a motor driven fluid pump 87 mounted on the base 16 and obtaining fluid from a fluid storage tank 68, which is also mounted on said base. Suitable control valves (not shown) are provided to control the admission and release of fluid to said cylinders, and to hold fluid under pressure in said cylinders.

Thus when the jacks 18, 18 are engaged with the mine roof, to hold the base 16 in a stationary position on the mine bottom, said base, besides forming a support for the swivel 19, may also form a reaction means for the loading machine, to take the rearward thrusts of the machine thereon through the link 17, to permit the gathering head 14 to be readily fed into the material it is desired to load, and to permit the front traction and steering wheels 11, 11 to swing the loading machine laterally about the axis of pivotal connection of said link to said base.

The frame 55 includes the parallel spaced side frame members 59, 59 which are connected together at their lower ends by a bottom plate 89, forming a support for the lower run of an endless chain 88 for the conveyer. Said side frame members are also connected together by a bottom plate 90 spaced upwardly from said last mentioned bottom plate and forming a bottom for the conveyer at its discharge end. Said frame forms a supporting guide frame for an extensible frame 91 extensibly mounted within said frame 55, for extending said conveyer and the gathering head 14 into the material it is desired to load. Said extensible frame rests on the bottom plate 90 for slidable movement therealong. Said frame 55 also forms a support for a motor 92 on its right-hand side when looking towards the forward end thereof. Said motor is supported on a bracket 93 secured to and extending laterally from the right-hand plate 58 and serves to drive the conveyer 15 (see Figure 5). A motor 94 is also mounted on said main frame on a lateral extension 95 of the left-hand plate 58. Said motor is provided to drive a fluid pump 96, for supplying fluid under pressure to apply the friction grip blocks 67, 67, to extend the conveyer 15 and to drive and steer the front traction and steering wheels 11, 11 (see Figures 1 and 13).

The front traction and steering wheels 11, 11 are mounted on the frame 55 on a transverse dead axle 97, which is mounted on the bottom of the bottom plate 89 of said frame on a longitudinally extending pivot pin 98, mounted at its ends in angle brackets 99, 99, secured to and depending from said bottom plate (see Figure 8). Said angle brackets extend entirely across said bottom plate and form a transversely extending slidable guide for said axle (see Figure 13). Said wheels are mounted on opposite ends of said axle for steering on the usual Lemoine pivots having swiveling axles 103, 103 extending from swivel brackets 104, 104, which extend along the upper and lower sides of and are pivotally mounted on upright standards 105, 105 at the ends of said dead axle. Said wheels may be of any suitable heavy duty construction including hubs 106, 106 journaled on said swiveling axles and having rims 107, 107 detachably mounted thereon (see Figures 13 and 14).

A ring gear 109 having an inwardly extending flanged portion 110 is secured to an inner flange 111 of each hub to provide a means for driving said hub and wheel. Said ring gear is herein shown as being meshed with a spur pinion 112 on the outer end of a transverse shaft 113. Said shaft is journaled in a worm and worm gear housing 114, which is suitably mounted on a plate 115 projecting inwardly from the swivel bracket 104 of the Lemoine pivot, and mounted thereon. Said shaft and pinions are driven from a worm gear 117 on said shaft, which meshes with a worm 118 (see Figure 13). A fluid motor 119 mounted on said plate is provided to drive said worm through a flexible drive connection 120.

A fluid storage tank 121 is provided on the machine frame to store fluid so it may be supplied under pressure to the motor 119 by means of the pump 96. Suitable valves (not shown) also are provided to control the passage of fluid to said motor and back to the return. Said control valves are not herein shown or described since they form no part of my present invention.

Turning of the wheels about the axes of the Lemoine pivots, for steering, is effected by means of a pair of projecting lever arms 123, 123 secured to and extending angularly inwardly and rearwardly from the swivel brackets 104, 104, and having transversely extending rods 124, 124, pivotally connected to their rear ends by the usual ball and socket connections (see Figures 5 and 13). Said rods have pistons 125, 125 connected to their inner ends, which are mounted in a cylinder 126. Fluid passageways 127, 127 are provided in opposite ends of said cylinder to admit fluid under pressure therein, to cause the pistons 125, 125 to move to the extreme inner positions in said cylinder shown in Figure 5. Movement of said pistons inwardly along said cylinder is limited by shouldered portions 129, 129 thereof. When the pistons are in this position, fluid under pressure may be held in opposite ends of said cylinder, to cause said rods and cylinder to act as a unitary tie rod, for turning the wheels for steering when transversely moved in one direction or another. An arm 130 projects rearwardly from the central portion of said cylinder and has a drag link 131 pivotally connected thereto by a usual ball and socket connection. The opposite end of said drag link is pivotally connected to a rocking arm 134 by means of a similar ball and socket connection. Said rocking arm is mounted on the lower end of a vertical shaft 136 and is rocked back and forth, to effect steering, by means of a hand wheel 137 through a usual worm and worm gear steering connection (not shown), mounted in a housing 138, secured to a bracket 139, extending outwardly from the outer side of the left-hand side frame member 59.

The cylinder 126 also has a fluid passageway 140 midway between its ends, to admit fluid under pressure to the head ends of the pistons 125, 125, to cause said pistons to move to the extreme outer ends of said cylinder, and to be held in such a position by fluid pressure within said cylinder, to pivot the wheels 11, 11 outwardly at substantially right angles to the longitudinal axis of the machine, so said wheels may propel the loading machine and gathering element laterally about the bearing boss 64 on the base 16, to position the gathering head 14 to one side or the other of the center of the conveyer trough line, so as to pick up loose material from the

entire working place. Said wheels may be locked in any desired position by the admission of fluid under pressure to opposite ends of said cylinder and through the port 140 intermediate the ends thereof. It should here be noted that when the wheels 11, 11 are swung to extreme positions, to propel the machine laterally about the swivel 19, that one of the fluid motors must be reversed so the two wheels will be driven in the proper direction. The reversal of said motors is controlled by suitable valve mechanism, which is not herein shown or described since it is no part of my present invention.

The rear caster supporting wheels 12, 12, which support the rear end of the machine, are each journaled on a horizontal dead axle 141 on ball bearings 142, 142 (see Figure 11). Said axle is mounted at its ends in a fork 143 journaled at its upper end in the outer end of a laterally extending bracket 144, on a roller bearing 145. Said bracket is secured to the outer side of the side frame member 59 and extends laterally and upwardly therefrom, to form a vertical pivotal support for said wheel, to permit said wheel to turn about a vertical axis, to conform to the path of travel of the machine, when said machine is moving in a longitudinal or a lateral direction.

The extensible frame 91 includes a pair of parallel spaced side frame members 149, 149 having outwardly flared upper sides forming a flared trough for the conveyer and connected together adjacent their upper ends by a plate 150 which forms a bottom plate for the upper run of the extensible conveyer 15. Said side frame members are connected together adjacent their lower ends by a plate 151 which forms a bottom plate for the upper run of the lower portion of the conveyer and which slidably rests on the bottom plate 90 (see Figures 10 and 13). An intermediate plate 152 is also connected between said side frame members and forms a support plate for the return run of the upper part of the extensible conveyer. The side frame members 149, 149 each has a channelled guide portion 153 extending outwardly from the upper end thereof, which is adapted to be engaged by a gibbed guide 154 extending inwardly from the side frame member 59, to slidably guide said extensible frame in said side frame member.

The forward ends of the side frame members 149, 149 are connected together by cross braces 155, 156 and by an angular guide shoe 157 forming a continuation of the plate 151 and adapted to be engaged by the upper side of the lower run of the conveyer chain, to guide said chain around a tension idler roller 159 mounted on the gathering head 14 (see Figure 7).

A pair of endless chains 160, 160 extending along and mounted on the outer sides of the side frame members 59, 59 and operatively connected with the extensible frame 91, are provided to extensibly or retractibly move said extensible frame 91 with respect to said frame 55. Said chains are trained around idler sprockets 161, 161 mounted adjacent the rear ends of said side frame members, on transverse stub shafts 162, 162, mounted on the outer sides of the side frame members 59, 59 and extending outwardly therefrom (see Figure 6). Said endless chains are trained, at their opposite ends, around drive sprockets 164, 164 on a transverse shaft 165 journaled at its ends in the side frame members 59, 59 of the frame 55.

The connection between the extensible frame

91 and the endless chains 160, 160 includes a pair of connecting members 165, 166 secured to the intermediate plate 152 and extending laterally therefrom through the side frame members 149 and through longitudinal slots 167, 167 formed in the side frame members 59, 59 (see Figures 9, 11 and 16). Said connecting members are suitably connected to links of the endless chains 160, 160, so said chains will move said extensible frame along the main frame 55, upon movement of said endless chains.

The endless chains 160, 160 are driven from a fluid motor 169 mounted on a platform 170, projecting outwardly from the left-hand forward end of the frame 55. Said fluid motor has connection with and forms a means for driving a worm and worm gear reduction 171, which in turn has driving connection with the transverse shaft 165 by means of a spur gear reduction 174. The fluid motor 169 is a reversible motor so that when fluid under pressure is admitted to drive said motor in one direction, the frame 91 will be extended along the frame 55 to feed the gathering element 14 into the material it is desired to load, and when fluid under pressure is admitted to drive said motor in a reverse direction, said extensible frame will be retractably moved with respect to said frame 55, to withdraw said gathering element from the loose material. Fluid is supplied to said fluid motor through the pump 38. The connection from said pump to said motor and the fluid control valves for controlling the admission and release of fluid under pressure to said fluid motor, are not herein shown or described, since the hydraulic system is no part of my present invention.

The gathering head 14 is mounted on the forward end of a longitudinally extending inclined frame 176, which is transversely pivoted to the forward end of the extensible frame 91 (see Figures 5 and 7). The upper portion of said inclined frame forms an inclined trough for the inclined elevating portion of the conveyer 15. Said frame is provided with a pair of rearwardly extending trunnion brackets 177, 177 trunnioned on trunnion shafts 179, 179, secured to and projecting laterally from the outer sides of the extensible frame 91.

The gathering head 14, herein shown, is of a well known form of endless chain gathering head and includes an inclined apron 180 mounted on the forward end of the inclined frame 176 and extending across the front end of the conveyer 15 to the ground. A pair of chain guiding members 181, 181 having endless chains 182, 182 guided for orbital movement thereabout are mounted on the top side of said apron, as usual, so as to extend along opposite sides of and forwardly of said conveyer. A plurality of gathering arms 183, 183 are carried by said endless chains for picking up material from the ground and moving it along the forward portion of said apron onto the conveyer.

The endless chains 182, 182 and gathering arms 183, 183 are orbitally driven about the chain guiding members 181, 181 by means of bevel gear reductions 185, 185 driven from opposite ends of a forward idler shaft 186 of the conveyer 15, through chain and sprocket drives 187, 187 (see Figures 5 and 15).

The gathering head 14 and inclined frame 176 are elevated or lowered about the trunnion shafts 179, 179, by means of a pair of double-acting fluid pressure cylinders 188, 188 having piston rods 189, 189 extensible therefrom. Each of said cylinders is provided with a rearwardly projecting

ear 190 pivotally connected to a connecting member 191, depending from the forward end of the extensible frame 91. The free end of said piston rod is pivotally connected to a connecting bracket 192, extending outwardly from the outer side of the frame 176, so that when fluid under pressure is admitted to the head ends of said cylinders, the gathering element will be positively raised by power, and when fluid under pressure is admitted to the piston rod ends of said cylinders, said gathering element will be lowered by power.

A pair of compression springs 193, 193 are connected between the depending connecting member 191 and the underside of the apron 180 adjacent the upper end thereof, to cushion the fall of said gathering head, in cases where pressure might be suddenly relieved from the cylinders 188, 188, and to support the forward end of said gathering head in floating engagement with the ground.

The conveyer 15 is herein shown as being a single center strand conveyer having a plurality of parallel longitudinally spaced flights 195, 195 extending laterally from the endless chain 88. Said chain and flights are trained from an idler sprocket 197 on the transverse shaft 186, upwardly along an inclined plate 198, extending between the side walls of the inclined frame 176. At the upper end of said last mentioned plate, said chain extends along the plate 150, connecting the side frame members 149, 149 of the extensible frame 91 together, to an idler sprocket 199 on a transverse shaft 200, journaled at the rear end of said frame 91 (see Figures 6, 9 and 11). From said idler sprocket said conveyer extends towards the forward end of the machine, along the top of the intermediate plate 152, to and around a drive sprocket 201 on a transverse drive shaft 202, journaled adjacent its ends in opposite side frame members 59, 59 of the main frame 55.

The side frame members 149, 149 of the extensible frame 91 are provided with longitudinal slots 204, 204 extending therealong to permit movement of said extensible frame with respect to said drive shaft (see Figures 3, 5, 7 and 13). From said drive shaft said chain extends forwardly along the bottom plate 151 of the extensible frame 91, towards the rear end of the machine and along a bottom plate 90 of the frame 55, to and around an idler sprocket 205 on a shaft 206, journaled at the rear end of the main frame 55 in the side frame members 59, 59. From thence said chain extends in an upwardly inclined direction, to and along the top of the bottom plate 89 of said main frame, to the forward end of said frame and upwardly beneath the inclined shoe 157, over the tension idler 159, and in a downwardly inclined direction, to and around the idler sprocket 197 on the transverse shaft 186.

The drive shaft 202 and sprocket 201 are driven from the motor 92 through a worm and worm gear speed reducer 203 mounted in a casing 209 secured to the end of the shell of said motor. A chain and sprocket drive indicated generally by reference character 210 and driven from said speed reducer, has drive connection with the outer right-hand end of said shaft (see Figures 5 and 13).

Thus the conveyer 15 may be positively extended to extend the gathering head 14 for loading by movement of the chains 160, 160, and may be driven in all of its extended positions to convey material along the machine frame and discharge it into the reciprocating trough 21 from a low point on the loading machine. Since the upper

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portion of the extensible conveyer 15 extends along the upper portion of the extensible frame 91 and discharges onto the lower portion of said conveyer, which extends along the lower portion of the stationary frame 55, and discharges into the reciprocating trough 21, the dropping of the coal onto the pan line from a high point on the machine is avoided, which reduces strains on the pan line and reduces breakage of the coal during loading.

In operation the loading machine is moved into the working place by means of its steering and propelling wheels 11, 11 in position so the reciprocating trough 21 of the trough line 20 can be extended beneath said loading machine in receiving relation with respect to the conveyer 15, and supported and guided in the trough 50 of the control link 17 and so said control link 17 can be pivotally connected at its rear end to the base 16 for the swivel 19. When said reciprocating trough has been extended beneath said loading machine, and said control link has been pivotally connected to said base, the jacks 18, 18 are set so as to firmly hold said trough in position on the ground. When initially starting the loading operation, the entire loading machine is usually in a retracted position with respect to the reciprocating trough 21 and the grip blocks 67, 67 may be engaged with the bearing members 56, 56 of the trough 50, to hold the loading machine from movement along said control link 17. At this time the forward end of the gathering head 14 should be adjacent the broken down coal so it can readily pick it up. Said gathering head may then be fed into the broken down coal by extending the extensible conveyer 15 until all of the coal in front of said gathering head has been loaded out. Said gathering head may then be retractibly moved by retracting the conveyer 15. At the same time the steering and propelling wheels may be turned at substantially right angles to the machine frame, to feed the loading machine and gathering head laterally to one side or the other, so as to load out the entire working place, it being understood that during this loading operation the conveyer 15 is continually extensibly and retractibly moved with respect to the frame 55, to extend the gathering head 14 into and to withdraw it from the broken down coal.

After the first place has been loaded out and the working face has been undercut and broken down, the grip blocks 67, 67 may be released from the bearing plates 56, 56 and the loading machine may be extended along the reciprocating trough 50, as shown in Figure 4, so as to load out another working place without advancing the swivel 19 and base 16. When the loading machine has reached the end of the trough 50, the swivel 19 may be advanced by inserting another trough in the trough line, or another trough may be connected to the trough 50, to further extend the range of advance of the machine, it being understood that if the trough 50 is extended by the insertion of another similar trough, that the trough 21 must likewise be extended.

While I have herein shown and described one form in which my invention may be embodied, it will be understood that the construction thereof and the arrangement of the various parts may be altered without departing from the spirit and scope thereof. Furthermore, I do not wish to be construed as limiting my invention to the specific embodiment illustrated, excepting as it may be limited in the appended claims.

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I claim as my invention:

1. In a face loading machine of the class described, a main frame, wheels for supporting and propelling said main frame in a forward or a lateral direction, an extensible conveyer extending along said frame beyond the forward end thereof, and having gathering devices at its forward end, means for extending said conveyer for feeding said gathering devices into the material it is desired to load, and means connected with and forming a reaction means for said loading machine for holding said loading machine from backward movement during extension of said conveyer and gathering devices into the material it is desired to load and for controlling lateral movement of said loading machine including a base, means for holding said base in a fixed position on the ground, a link, a vertical pivotal connection between said link and said base, and an extensible connection between said link and said loading machine, permitting said loading machine to be extensibly or retractibly moved along said link.

2. In a face loading machine of the class described, a main frame, wheels for supporting and propelling said main frame in a forward or a lateral direction, an extensible conveyer extending along said frame beyond the forward end thereof and having gathering devices at its forward end, means for extending said conveyer for feeding said gathering devices into the material it is desired to load, and means connected with and forming a reaction means for said loading machine for holding said loading machine from backward movement during extension of said conveyer and gathering devices into the material it is desired to load and for controlling lateral movement of said loading machine including a base, means for holding said base in a fixed position on the ground, a link, a vertical pivotal connection between said link and said base, and means connecting said link with said loading machine, for holding said loading machine in fixed relation with respect to said link, or for permitting said loading machine to be extensibly or retractibly moved with respect to said link.

3. In a face loading machine of the class described, a main frame, wheels for supporting and propelling said main frame in a forward or a lateral direction, an extensible conveyer extending along said frame beyond the forward end thereof and having gathering devices at its forward end, means for extending said conveyer for feeding said gathering devices into the material it is desired to load, and means connected with and forming a reaction means for said loading machine for holding said loading machine from backward movement during extension of said conveyer and gathering devices into the material it is desired to load and for controlling lateral movement of said loading machine including a base, means for holding said base in a fixed position on the ground, a link, a vertical pivotal connection between said link and said base, and means connecting said link with said loading machine, for holding said loading machine in fixed relation with respect to said link, or for permitting said loading machine to be extensibly or retractibly moved with respect to said link, said means including a pair of friction grip blocks and means selectively operable to hold said friction grip blocks in a gripping or released position.

4. In a face loading machine of the class described, a main frame, wheels for supporting and propelling said main frame in a forward or

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a lateral direction, an extensible endless conveyor extending along said frame beyond the forward end thereof and having gathering devices at its forward end, a conveyor extending into the working place and mounted in material receiving relation with respect to said first conveyor, means for extending said first conveyor for feeding said gathering devices into the material it is desired to load, and means connected with and forming a reaction means for said loading machine, for holding said loading machine from backward movement during extension of said first conveyor and gathering devices into said material and for controlling lateral movement of said loading machine, said means also forming a slidable guide means for said second conveyor, for holding said second mentioned conveyor in receiving relation with respect to the discharge end of said first conveyor in all positions of said loading machine with respect to the working place.

5. In a face loading machine of the class described, a main frame, wheels for supporting and propelling said main frame in a forward or a lateral direction, an extensible endless conveyor extending along said frame beyond the forward end thereof and having gathering devices at the forward end thereof, a conveyor extending into the working place and mounted in material receiving relation with respect to said first conveyor, means for extending said first conveyor for feeding said gathering devices into the material it is desired to load, and means connected with and forming a reaction means for said loading machine for holding said loading machine from backward movement during extension of said first conveyor and gathering devices into said material and for controlling lateral movement of said loading machine including a base, means for holding said base in a fixed position on the ground, a link connected with said loading machine, a vertical pivotal connection between said link and said base, said link also forming a slidable support and guiding means for said second conveyor, for holding said second mentioned conveyor in receiving relation with respect to said first conveyor in all positions of said loading machine with respect to the working place.

6. In a face loading machine of the class described, a main frame, wheels for supporting and propelling said main frame in a forward or a lateral direction, an extensible endless conveyor extending along said frame beyond the forward end thereof, and having gathering devices at its forward end, a conveyor extending into the working place and mounted in material receiving relation with respect to said first conveyor, means for extending said first conveyor for feeding said gathering devices into the material it is desired to load, and means connected with and forming a reaction means for said loading machine for holding said loading machine from backward movement during extension of said first conveyor and gathering devices into said material and for controlling lateral movement of said loading machine including a base, means for holding said base in a fixed position on the ground, a link connected with said loading machine, a vertical pivotal connection between said link and said base, said link also forming a slidable support and guiding means for said second conveyor, for holding said second mentioned conveyor in receiving relation with respect to said first conveyor in all positions of

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said loading machine with respect to the working place, and the connection between said loading machine and said link being extensible and being operable to permit said loading machine to be extended along said link, or to hold said loading machine in fixed relation with respect to said link.

7. In a face loading machine of the class described, a main frame, wheels for supporting and propelling said main frame in a forward or a lateral direction, an extensible endless conveyor extending along said frame beyond the forward end thereof and having gathering devices at its forward end, a conveyor extending into the working place and mounted in material receiving relation with respect to said first conveyor, means for extending said first conveyor for feeding said gathering devices into the material it is desired to load, and means connected with and forming a reaction means for said loading machine for holding said loading machine from backward movement during extension of said first conveyor and gathering devices into said material and for controlling lateral movement of said loading machine including a base, means for holding said base in a fixed position on the ground, a link connected with said loading machine, a vertical pivotal connection between said link and said base, said link also forming a slidable support and guiding means for said second conveyor, for holding said second mentioned conveyor in receiving relation with respect to said first conveyor in all positions of said first conveyor with respect to the working place, and the connection between said loading machine and said link being extensible and being operable to permit said loading machine to be extended along said link, or to hold said loading machine in fixed relation with respect to said link, and including a pair of friction grip blocks manually controllable to hold said loading machine in fixed relation with respect to said link, or to release said loading machine for movement along said link.

8. In a face loading machine of the class described, a main frame, front steering wheels for propelling said main frame in a longitudinal or lateral direction, rear idler wheels for said main frame, said rear idler wheels being mounted for free movement about vertical axes to conform to the paths of said steering wheels during movement of the machine in a longitudinal or a lateral direction, and means for turning said front wheels for steering, said means being operable to turn said front wheels in opposite directions to positions to propel said main frame laterally and to hold said front wheels in such positions, and including a lever arm connected with each of said front wheels, and an extensible tie rod connected between said lever arms, said tie rod including a laterally movable fluid pressure cylinder, a rod extensible from each end of said cylinder, said rods having operative connection with said lever arms, and fluid pressure means for extending said rods with respect to said cylinder for turning said front wheels in opposite directions to laterally extended positions and holding said wheels in such positions, and for retracting said rods within said cylinder and positively holding said rods in such positions to move with said cylinder upon lateral movement thereof, for steering the machine.

9. In a face loading machine of the class described, a main frame, front steering wheels for propelling said main frame in a longitudinal or

a lateral direction, rear idler wheels for said main frame, said rear idler wheels being mounted for free movement about vertical axes, to conform to the paths of said steering wheels during movement of the machine in a longitudinal or a lateral direction, and means for turning said front wheels for steering, said means being operable to turn said front wheels in opposite directions to positions to propel said main frame laterally and to hold said front wheels in such positions, and including a lever arm connected with each of said front wheels for turning said wheels, a separate rod connected with each of said lever arms, a cylinder having said rods guided therein for extensible movement with respect thereto, a drag link for moving said cylinder laterally, fluid pressure means for positively holding said rods in a retracted position with respect to said cylinder to steer the machine when said cylinder is moved laterally by said drag link and for extending said rods from said cylinder and holding said rods in extended positions with respect to said cylinder, for moving said front wheels into and for holding said wheels in a laterally extended position with respect to said main frame.

10. In a face loading machine of the class described, a main frame, front steering wheels for propelling said main frame in a longitudinal or a lateral direction, rear idler wheels for said main frame, said rear idler wheels being mounted for free movement about vertical axes to conform to the paths of said steering wheels during movement of the machine in a longitudinal or a lateral direction, and means for turning said front wheels for steering, said means being operable to turn said front wheels to a position to propel said main frame laterally and to hold said front wheels in such a position, and including a lever arm connected with each of said front wheels for turning said wheels, an extensible tie rod connected between said lever arms, for turning said front wheels to extend laterally of the machine by extension of said tie rod, said tie rod including a fluid pressure cylinder disposed intermediate said lever arms, a piston rod connected with each of said lever arms, said piston rods extending within opposite ends of said cylinder and having connection with separate pistons therein, and a port entering said cylinder intermediate the ends thereof, for admitting fluid under pressure to an intermediate portion thereof, to extend said piston rods from opposite ends thereof, and to hold said piston rods in an extended position with respect to said cylinder.

11. In a face loading machine of the class described, a main frame, front steering wheels for propelling said main frame in a longitudinal or a lateral direction, rear idler wheels for said main frame, said rear idler wheels being mounted for free movement about vertical axes to conform to the paths of said steering wheels during movement of the machine in a longitudinal or a lateral direction, and means for turning said front wheels for steering, said means being operable to turn said front wheels to a position to propel said main frame laterally and to hold said front wheels in such a position, and including a lever arm connected with each of said front wheels for turning said wheels, an extensible tie rod connected between said lever arms, for turning said front wheels to extend laterally of the machine by extension of said tie rod, said tie rod including a fluid pressure cylinder disposed intermediate said lever arms, a piston rod connected

with each of said lever arms, said piston rods extending within opposite ends of said cylinder and having connection with separate pistons therein, a port in said cylinder, for admitting fluid under pressure to an intermediate portion thereof to extend said piston rods from opposite ends thereof, and to hold said piston rods in an extended position with respect to said cylinder, ports in opposite ends of said cylinders to admit fluid under pressure therein to retract said piston rods within said cylinders and to hold said piston rods in a retracted position, and means for moving said cylinder laterally to effect steering through said piston rods.

12. In a face loading apparatus particularly adapted to load loose material onto a shaker conveyer trough line and in combination with a swivel connected with the inby end of a shaker conveyer trough line and having a reciprocating trough communicating therewith and mounted for lateral swinging movement with respect to said trough line, a stationary base, a wheel mounted face loading apparatus mounted for movement along the ground and including a frame with wheels for supporting said frame, said frame having said reciprocating trough slidably mounted thereon to extend between the rear supporting wheels for said frame, and means pivotally connecting said loading apparatus with said base, to cause said base to form a reaction means for said loading apparatus and to control lateral movement of said loading apparatus.

13. In a face loading apparatus particularly adapted to load loose material onto a shaker conveyer trough line and in combination with a swivel connected with the inby end of a shaker conveyer trough line, a stationary base for said swivel, a reciprocating trough communicating with and connected to said swivel for lateral movement with respect to said trough line, a face loading apparatus mounted for longitudinal movement and for lateral swinging movement with respect to said base and including a longitudinally extending conveyer having gathering devices at its receiving end, and having said reciprocating trough slidably mounted beneath said conveyer in material receiving relation with respect thereto, means pivotally connecting said loading apparatus to said base for movement with respect thereto about a vertical axis for causing said loading apparatus to move laterally in a controlled path, and means permitting said loading apparatus to be extensibly or retractibly moved along said connecting means and reciprocating trough, and for holding said loading apparatus in fixed relation with respect to said swivel during loading, said means forming a guide means for holding said trough in material receiving relation with respect to said conveyer in all positions of movement of said loading apparatus with respect to said base.

14. In a loading apparatus particularly adapted to load loose material onto a shaker conveyer trough line having a swivel at its inby end, a stationary base for said swivel, a reciprocating trough extending from said swivel and connected therewith for lateral movement with respect to said trough line, a face loading apparatus adapted to move longitudinally and laterally with respect to said swivel and including a main frame, wheels for supporting said frame, a longitudinally extensible endless conveyer extending along said main frame, gathering devices at the receiving end of said conveyer, for picking up material from the ground and loading it onto said conveyer, said

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reciprocating trough being slidably guided in said main frame, between the wheels thereof, and means extensibly connected with said loading apparatus and pivotally connected with said base for controlling lateral swinging movement of said loading apparatus and for permitting said loading apparatus to be extensibly or retractibly moved with respect to said reciprocating trough, said means forming a longitudinal guide means for said reciprocating trough.

15. In a loading apparatus particularly adapted to load loose material onto a shaker conveyor trough line having a swivel at its inby end, a stationary base for said swivel, a reciprocating trough extending from said swivel and connected therewith for lateral movement with respect to said trough line, a wheel mounted face loading apparatus including a main frame, front traction and steering wheels for moving said loading apparatus in a longitudinal or a lateral direction with respect to a working place, a longitudinally extensible conveyor extending along said main frame, gathering devices for picking up material from the ground and loading it onto the receiving end of said conveyor, means for mounting said reciprocating trough on said main frame, for slidable movement beneath the discharge end of said conveyor and for holding said reciprocating trough in receiving relation with respect to said conveyor in all positions of said loading apparatus with respect to said swivel, said means forming a reaction means for said loading apparatus during the loading operation to permit said conveyor to feed said gathering devices into the material it is desired to load by extension thereof, while said main frame remains stationary, and having pivotal connection with said base, for controlling lateral swinging movement of said loading apparatus, and a connection from said means to said loading apparatus, permitting said loading apparatus to be extensibly or retractibly moved with respect to said reciprocating trough.

16. In a loading apparatus particularly adapted to load loose material onto a shaker conveyor trough line having a swivel at its inby end, a stationary base for said swivel, a reciprocating trough connected therewith for lateral movement with respect to said trough line, a wheel mounted face loading apparatus including a main frame, front traction and steering wheels for moving said loading apparatus and main frame in a longitudinal or a lateral direction with respect to a working place, and a longitudinally extensible conveyor extending along said main frame, gathering devices at the receiving end of said conveyor for picking up material from the ground and loading it onto said conveyor, means for positively extending said conveyor by power to feed said gathering devices into the material it is desired to load, means for mounting said reciprocating trough for slidable movement beneath the discharge end of said conveyor and for supporting said reciprocating trough in receiving relation with respect to said conveyor in all positions of said loading apparatus with respect to said swivel, said means extending along said reciprocating trough and having vertical pivotal connection with said base, for controlling lateral movement of said loading apparatus, said means also forming a reaction means for said loading apparatus for holding said loading apparatus from backward movement during extension of said conveyor and

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gathering devices into the material it is desired to load.

17. In a loading apparatus particularly adapted to load loose material onto a shaker conveyor trough line having a swivel at its inby end, a stationary base for said swivel, a reciprocating trough extending from said swivel and connected therewith for lateral movement with respect to said trough line about the axis of said swivel, a wheel mounted face loading apparatus including a main frame, front traction and steering wheels for moving said loading apparatus and main frame in a longitudinal or a lateral direction with respect to a working place, and a longitudinally extensible conveyor extending along said main frame, gathering devices at the receiving end of said conveyor for picking up material from the ground and loading it onto said conveyor, means for positively extending said conveyor by power to feed said gathering devices into the material it is desired to load, means for mounting said reciprocating trough for slidable movement beneath the discharge end of said conveyor and for supporting said reciprocating trough in receiving relation with respect to said conveyor in all positions of said loading apparatus with respect to said swivel, said means extending along said reciprocating trough and having vertical pivotal connection with said base for controlling lateral movement of said loading apparatus, said means also forming a reaction means for said loading apparatus for holding said loading apparatus from backward movement during extension of said conveyor and gathering devices into the material it is desired to load, and means controllable at the will of the operator for holding said loading apparatus in fixed relation with respect to said means or for permitting said loading apparatus to extensibly move along said means.

18. In a face loading machine of the class described, a main frame, at least one pair of dirigible driving wheels for propelling said main frame in a forward or a lateral direction and for steering said main frame, an extensible endless conveyor extending along said main frame beyond the forward end thereof, gathering devices at the forward end of said conveyor for picking up loose material from the ground and moving it onto said conveyor, power means for extending said conveyor for feeding said gathering devices into the material it is desired to load, a base plate spaced rearwardly of said main frame and adapted to be anchored to the ground and held from movement with respect thereto, said wheels having lever arms interconnected by tie rod means which is bodily shiftable transversely of the machine, steering means operatively connected with the wheels and tie rod assembly for swinging the wheels concurrently in the same direction, means for varying the length of said tie rod means between a first length to dispose the wheels substantially parallel to one another for steering during tramping and a second length to dispose said wheels for rotation about axes extending in the direction of said base plate, means pivotally connecting said base plate with said main frame for holding said loading machine from backward movement during extension of said conveyor and gathering devices into the material it is desired to load and forming a means for controlling movement of said loading machine when propelled in a lateral direction about said base plate by said wheels.

19. In a face loading apparatus of the class de-

scribed, a conveyer adapted to extend into the working place of a mine, a stationary base, a wheel mounted face loading apparatus mounted for lateral movement with respect to said base and including a frame with wheels for supporting and propelling said frame in a forward or a lateral direction, a longitudinally extending endless conveyer having gathering devices at its receiving end, a slidable connection between said first conveyer and said frame, slidably connecting said first conveyer to said frame in material receiving relation with respect to said second conveyer, and a pivotal connection between said frame and said base adapted to hold said loading apparatus for lateral movement about said base in a controlled path, and forming a reaction means for said loading apparatus, during crowding of said gathering devices into the material it is desired to load, by extension of said second conveyer.

20. In a face loading apparatus of the class described, a conveyer adapted to extend into the working place of a mine and having a laterally movable receiving end, a stationary base, a face loading apparatus straddling said laterally movable receiving end of said conveyer and including a frame with wheels for supporting and steering said frame, a longitudinally extensible conveyer extending along said frame beyond the forward end thereof and having gathering devices at its receiving end, a slidable connection between said frame and the receiving end of said first conveyer, slidably guiding said first conveyer in material receiving relation with respect to said second conveyer, and said slidable connection between said frame and said first conveyer including a link vertically pivoted to said base and adapted to hold said loading apparatus for lateral movement about said base in a controlled path, and with said base forming a reaction means for said loading apparatus during crowding of said gathering devices into the material it is desired to load, by extension of said second conveyer.

21. In a face loading apparatus of the class described, a conveyer adapted to extend into the working place of a mine and having a laterally movable receiving end, a stationary base, a face loading apparatus straddling said laterally movable receiving end of said conveyer and including a frame with wheels for supporting and steering said frame, a longitudinally extensible conveyer extending along said frame beyond the forward end thereof and having gathering devices at

its receiving end, a slidable connection between said frame and the receiving end of said first conveyer, slidably guiding said first conveyer in material receiving relation with respect to said second conveyer, said slidable connection between said frame and said first conveyer including a link vertically pivoted to said base and adapted to hold said loading apparatus for lateral movement about said base in a controlled path, and an extensible connection between said loading apparatus and said frame, permitting movement of said loading apparatus along said frame and said first conveyer, said extensible connection including yieldable connective means adapted to hold said loading apparatus to said frame during normal gathering operation of said apparatus, whereby said frame, link and base form reaction means for said loading apparatus during crowding of said gathering devices into the material it is desired to load, by extension of said second conveyer.

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