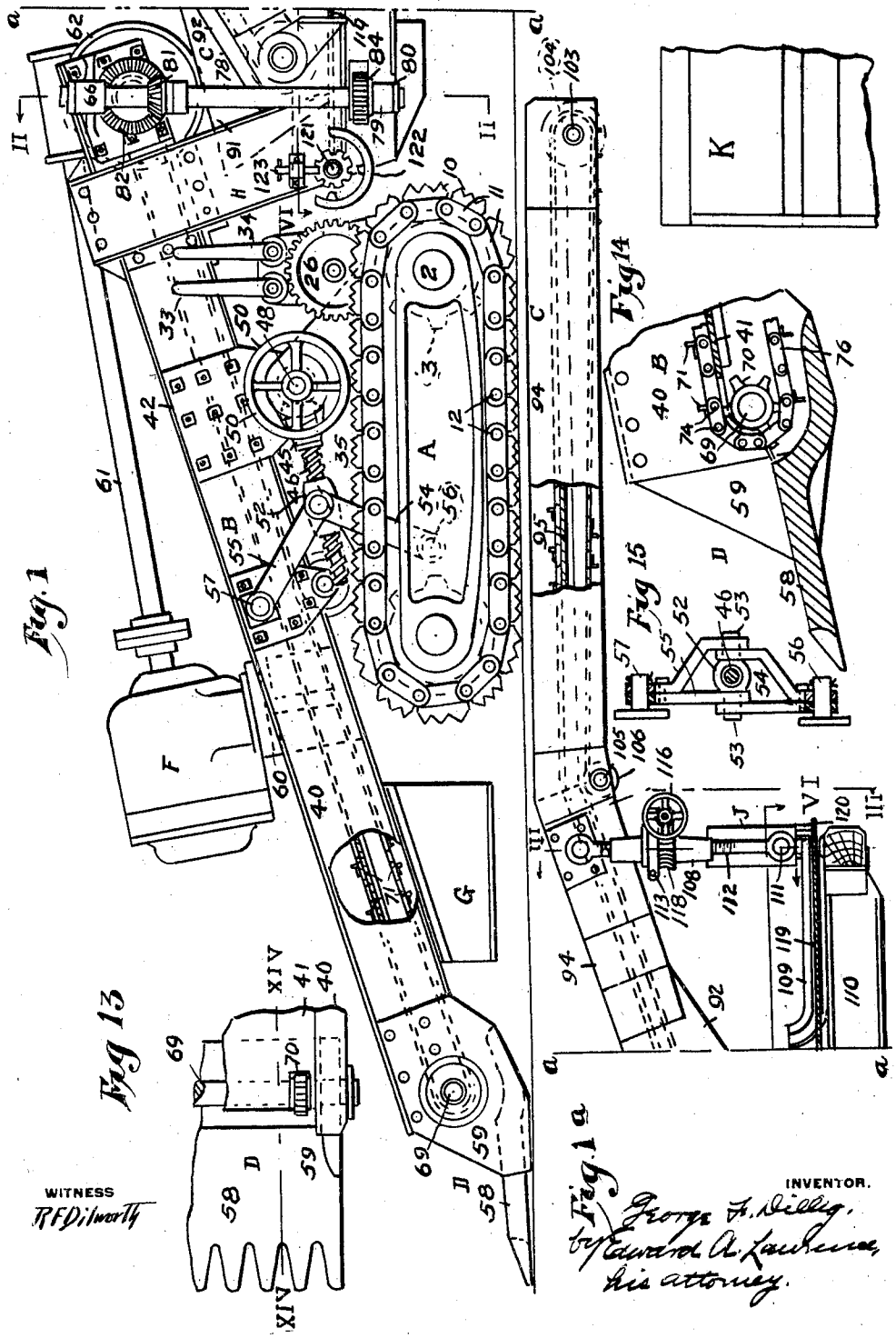
Nov. 25, 1924. 1,516,633

G. F. DILLIG

LOADING MECHANISM

Original Filed Feb. 17, 1919 4 Sheets-Sheet 1



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G. F. DILLIG

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Fig. 2

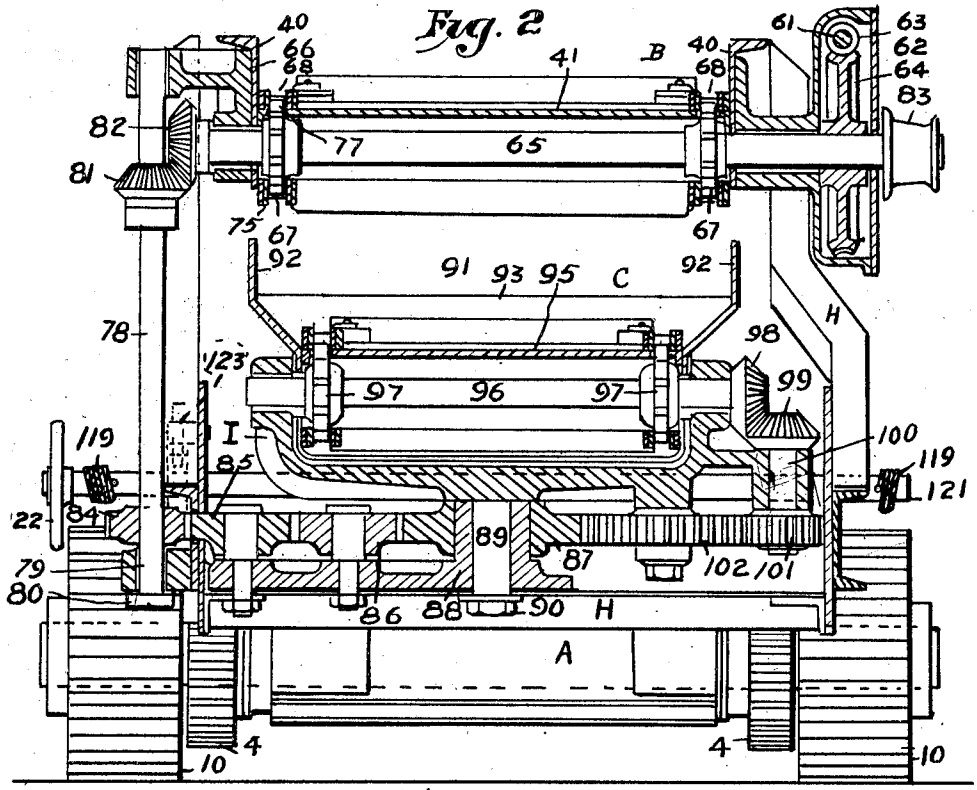


Fig. 3

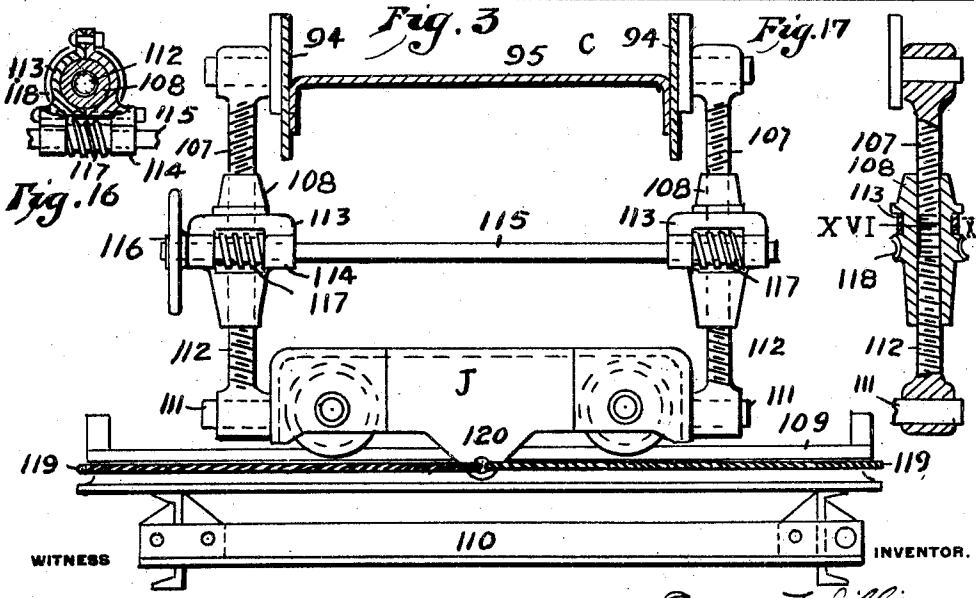


Fig. 17

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Fig. 4

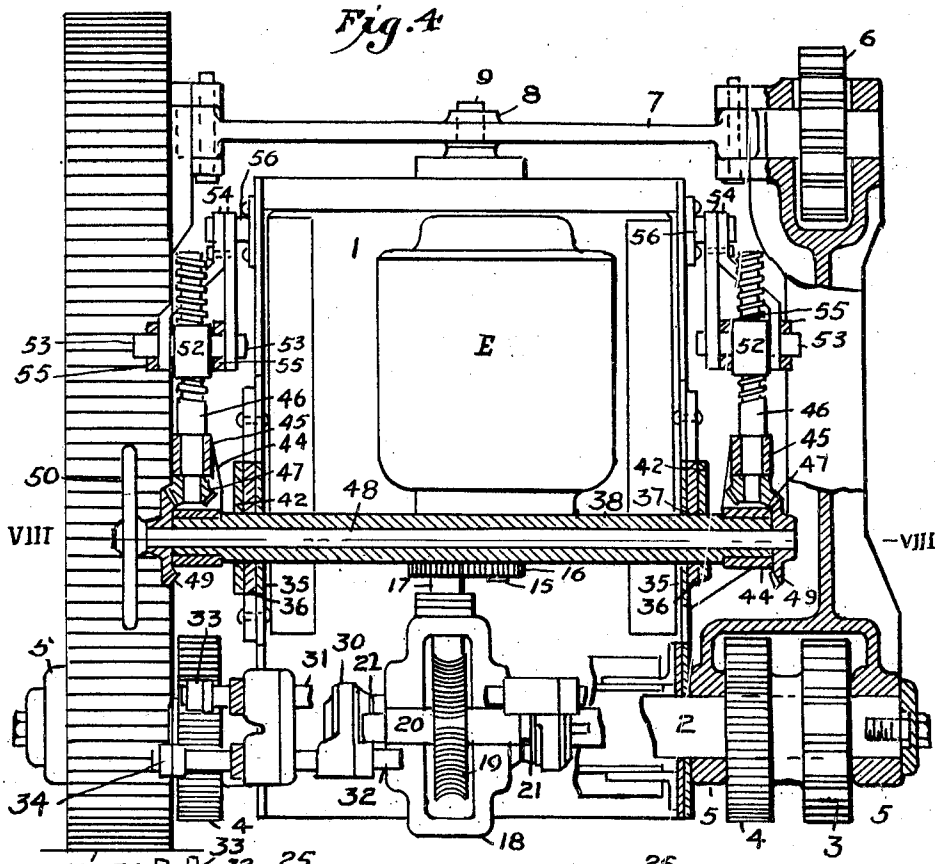


Fig. 5

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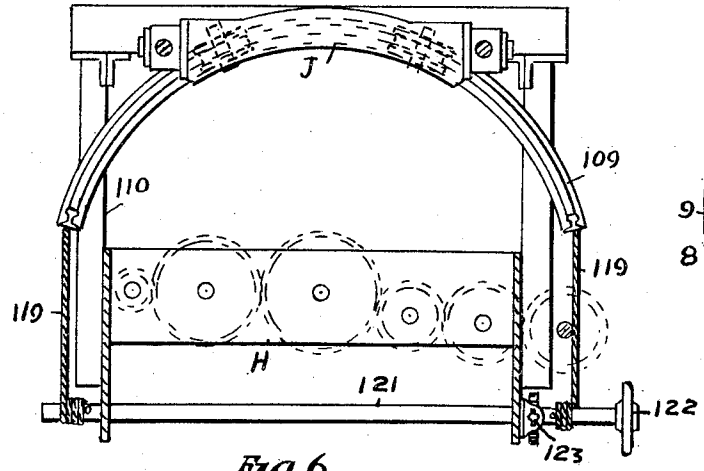


Fig. 6

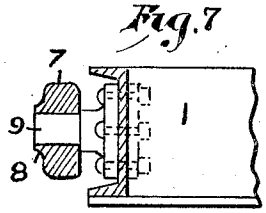


Fig. 7

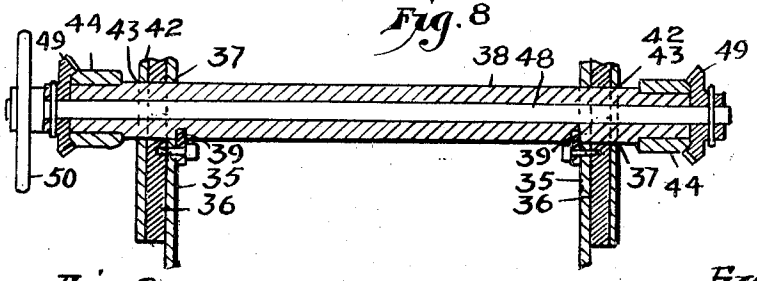


Fig. 8

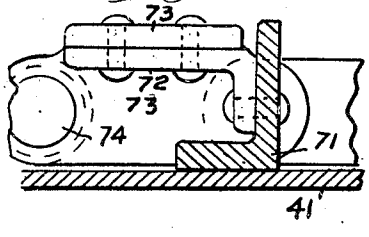


Fig. 9

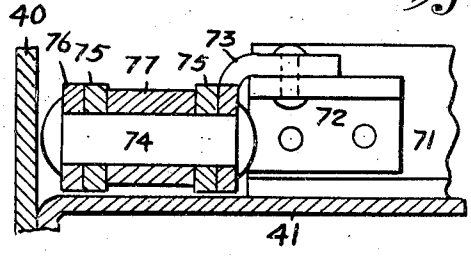


Fig. 10

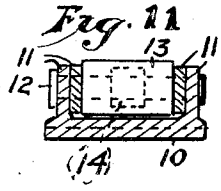


Fig. 11

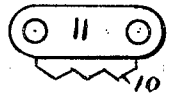


Fig. 12

WITNESS

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Patented Nov. 25, 1924. 1,516,633

UNITED STATES PATENT OFFICE.

GEORGE F. DILLIG, OF PITTSBURGH, PENNSYLVANIA.

LOADING MECHANISM.

Application filed February 17, 1919, Serial No. 277,409. Renewed May 8, 1923.

To all whom it may concern:

Be it known that I, GEORGE F. DILLIG, a citizen of the United States, and residing in the city of Pittsburgh, in the county of Allegheny and State of Pensylvania, have invented or discovered new and useful Improvements in Loading Mechanism, of which the following is a specification.

My invention consists in a new and improved machine for loading coal and other material in bulk.

The practice in coal mines is to "shoot" the coal in large quantities onto the floor of the mine, and then load it into mine cars. The loading is usually done by hand shovellers, although various types of mechanical loaders have been employed experimentally with but indifferent success.

A practical loader must possess a number of cardinal qualifications, among which may be mentioned the following.

Thus the machine must be low enough in height to be used in relatively thin veins of coal; it must be compact for passage through narrow entries, and must be flexible enough to turn short corners and to deliver the coal from all parts of the rooms to the mine cars on the track. The machine must also be simple in construction, strong and substantial to avoid undue repairs, and easy to operate and keep in repair.

All of the above mentioned requirements are fully met in my improved machine.

Generally speaking, my machine is of the following character.

The travelling base of the machine is in the form of a tractor, preferably a caterpillar tractor having independently driven treads, so that the machine can be conveniently driven in either direction or turned in a small space. The treads are flexibly mounted on the frame, so that irregularities of the mine floor or other surface over which the machine is travelling will not impair the efficiency of the machine or subject any of its parts to undue strain. The tractor is detachable from the remainder of the machine and may be used for general traction purposes.

A main conveyer is mounted on the tractor, being pivoted for adjustment in a vertical plane, and the forward end of said main conveyer is provided with a shovel member which is inserted under the material to be taken up by the main conveyer, thus bringing the same into reach of the conveyer. The shovel may also be used to ram or knock down material, such as coal which has not been properly broken down on to the floor of the mine, or where the loader is used as an excavator in light soil.

An auxiliary conveyer receives the material from the main conveyer and discharges the same into the mine cars or other depository. The auxiliary conveyer is mounted in such a manner that it may be swung in relation to the main conveyer in both a horizontal and a vertical plane, thus greatly increasing the usefulness and convenience of the machine.

Many other novel features of construction and arrangement of parts will appear from the following description.

In the accompanying drawings, which are merely intended to illustrate a practical embodiment of the principles of my invention without limiting the scope of the latter to the construction shown, Figs. 1 and 1ª combined form a side elevation of a machine embodying the principles of my invention; Fig. 2 is an enlarged vertical section taken along the line II—II in Fig. 1; Fig. 3 is an end view partially in section along the line III—III in Fig. 1ª, showing the method of adjusting the auxiliary conveyer in a vertical plane; Fig. 4 is a plan view of the tractor, one of the tread chains being omitted to show one of the tread arms, and the main conveyer adjusting mechanism being broken away in horizontal section for the sake of clearness; Fig. 5 is a rear end view of the tractor, one of the treads being partially broken away to more clearly show the construction; Fig. 6 is a horizontal section along the line VI—VI in Figs. 1 and 1ª, showing the method of moving the auxiliary conveyer in a horizontal plane, Fig. 7 is a detail showing the flexible support of the front end of the tractor frame; Fig. 8 is a section along the line VIII—VIII in Fig. 4, showing the shaft by means of which the main conveyer is adjusted; Fig. 9 is a broken longitudinal section showing the construction of the main conveyer; Fig. 10 is a broken cross section of the same; Fig. 11 is a cross section of one of the tractor tread chains; Fig. 12 is an end view of one of the tread plates or members; Fig. 13 is a broken plan view of the front end of the main conveyer and the shovel member mounted on the same; Fig. 14 is a section along the line XIV—XIV in Fig. 13; Fig. 15 is a

detail view of one side of the toggle mechanism by means of which the main conveyer is adjusted; Fig. 16 is a cross section along the line XVI—XVI in Fig. 17, and Fig. 17 is a vertical section through one side of the opposed screw shaft and turnbuckle mechanisms by means of which the auxiliary conveyer is adjusted in a vertical plane.

The following is a detailed description of the drawings.

The machine is composed of four main coacting elements; the tractor A; the main conveyer B; the auxiliary conveyer C, and the shovel member D.

I will first describe the tractor.

1 is the frame, preferably rectangular in shape and formed of structural steel. E is an electric motor, of the reversible type, mounted on the frame and connected to a suitable source of current, such as the mains running along the mine entries 2 is a shaft mounted transversely in the rear end of the frame with protruding ends. At either end said shaft is provided with a loose sprocket 3 having integral therewith or coupled thereto a gear 4. 5 represents a tread arm, one of which is located on either side of the frame 1. The rear ends of said arms are bifurcated, as shown in Fig. 4, so as to be journaled on the end of the shaft 2 on both sides of the sprockets 3 and gears 4, and the front ends of said arms, which extend beyond the front end of the frame 1, are also bifurcated to receive and journal the front sprockets 6 which are alined, respectively, with the rear sprockets 3. 7 is a cross brace or bar whose ends are pivotally attached to the front ends of the tread arms 5, thereby permitting said treads to move freely and independently in vertical planes but preventing their lateral spreading. At its center said bar 7 is provided with a horizontal bearing 8 in which is journaled the trunnion 9 projecting from the front center of the frame 1. Thus the front of the frame is flexibly suspended from the tread arms 5 so that no strain is placed upon the tractor frame and the mechanism carried thereby by the independent movement of the tread arms.

The tractor is provided with a pair of chain treads mounted respectively on the pairs of sprockets 3—6, and said treads are preferably of the following construction. 10 represents the tread plates, preferably with transversely serrated contact surfaces and provided at either end with transverse, inwardly projecting flanges 11 whose protruding ends are rounded and provided with holes. The flanges of adjacent plates are offset or staggered so as to overlap when the plates are assembled, and the plates are flexibly connected together by pivot pins 12 which are passed through the registering holes in the ends of the plate flanges 11. 13 represents rollers mounted on the pins 12 between the pairs of plate flanges 11 at either end, which rollers engage the teeth of the sprockets while the flanges 11 of the tread plates pass along on either side of the sprocket teeth. The centers of the bores of the rollers are enlarged, as at 14, to provide lubricant pockets, so that the rollers will at all times rotate freely.

15 is the driving shaft of the motor E which is connected by reducing pinions 16 with a worm shaft 17, journaled in the worm gear box 18 mounted on the frame 1. The top of the box is shown removed in Fig. 4. 19 is a worm gear mounted in said box and having its axle 20 protruding from either side thereof and provided with clutch members 21 and 22 at either end. 23 and 24 are a pair of shafts alined with the axle 20 at either side and journaled in housings 25 extending up from the frame 1. The outer ends of said axles are provided with pinions 26 meshing with the gears 4, respectively while the inner ends of the shafts 23 and 24 are provided, respectively, with sliding clutch members 27 and 28, adapted to engage the clutch members 21 and 22, respectively, and thus drive the sprockets 3. The clutch members 27 and 28 are controlled, respectively, by fingers 29 and 30, mounted on sliding shaft 31 and 32, carried by the housings 25 and operated individually by hand levers 33 and 34, respectively, whereby the operator may cause either or both of the tread chains to be driven, as the operation of the tractor may require.

I will now describe the main conveyer B and its mounting on the tractor A.

The side members of the tractor frame extend upwardly in triangular form, as shown at 35 in Figs. 1 and 8, and are reinforced by plates 36. The sides and plates are pierced by registering horizontal holes 37, and 38 is a hollow cylindrical shaft spanning the tractor frame and having its ends protruding through said holes. The shaft is held against rotation and longitudinal movement by means of small lock plates 39 bolted to the frame and engaging transverse slots or seats cut in the shaft. The removal of such plates permits the longitudinal dismounting of the shaft 38.

The main conveyor frame is formed of side beams 40 connected together by the floor plate or plates 41. 42 represents brackets depending from said side beams and overlapping the plates 36 on the outside. Said brackets are provided with holes 43 which register with the holes 37 and are engaged by the shaft 38, thus pivoting the main conveyer in a vertical plane upon the tractor. The ends of the shaft 38 are reduced to receive the cylindrical hubs of the brackets 44

which are provided with collar bearings 45 in which are journaled the plain portions of the screw shafts 46 having threads of opposite pitch. The inner ends of said screw shafts are provided with bevelled gears 47. 48 is a small shaft journaled in the bore of the pivot shaft 38 with its ends protruding and provided with pinned on bevelled gears 49 in mesh with the bevelled gears 47. 50 is a hand wheel on one end of the shaft 48. 52 represents screw collars on the shafts 46 and provided with diametrically opposed trunnions 53 upon which are pivotally mounted the ends of the double toggle levers 54 and 55. The other ends of the levers 54 are pivoted on the studs 56 extending from the tractor frame, while the other ends of the levers 55 are similarly pivoted on studs 57 extending laterally from the main conveyer frame.

It is evident that by rotating the hand wheel 50 in the proper direction, the conveyer may be swung in a vertical plane on the shaft 38, thus permitting the shovel member D to be adjusted at the desired elevation.

By removing the lock plates 39, the hand wheel 50, the bevelled gears 49 and the brackets 44, and disconnecting the levers 54 and 55 from the studs 56 and 57, respectively, the shaft 38 may be withdrawn and the conveyer dismounted from the tractor.

The shovel member D is preferably a casting provided with a forwardly projecting and preferably serrated bottom portion 58 and upwardly extending sides 59 which are bolted to the outer faces of the front ends of the side beams 40, the bottom of the shovel extending rearwardly under the front end of the conveyer floor 41, and being preferably downwardly curved, as shown in Fig. 14, to clear the conveyer.

F is an electric motor, suitably connected to the electric mains of the mine, and mounted on a bracket platform 60 attached to one side of the conveyer frame. The driving shaft 61 of said motor extends to the rear end of the conveyer and is journaled in a worm gear box 62 mounted on the side of the conveyer frame. The end of the shaft is provided with a worm 63 which meshes with a worm wheel 64 mounted within said gear box upon the end of a shaft 65. The shaft 65 is journaled at one end in the box 62 through which it protrudes and at the other end it is journaled in and protrudes through a bracket 66 mounted on the side of the conveyer frame. The shaft 65 extends across the conveyer frame just under the turned down rear end of the floor 41, and is provided with the conveyer sprockets 67 which extend through slots 68 in the end of the floor. The front end of the conveyer frame is provided with a similar transverse shaft 69 carrying the idle sprockets 70, the front end of the floor being also curved down over the shaft 69 and the sprockets extending through slots in the end of the floor.

The conveyer is preferably of the scraper type working over the continuous floor 41, and formed by pivotally connecting together in an endless series the angle shape scraper plates 71 whose bottoms slide over the floor 41 and whose flanges extend upwardly therefrom to engage and carry along the material. The flanges of the scraper plates have attached to their ends the small angles 72 to which are riveted the brackets 73 whose outwardly depending flanges are laterally extended to either side of the scraper plates and are provided at their ends with holes to receive the pivot pins 74, two of said pins being provided at each end of each scraper plate 71. Adjacent scraper plates are flexibly connected together by pairs of links 75 which couple together the pivot pins 74 of adjacent scraper plates, while the pivot pins on the same end of a scraper plate are preferably connected together at their outer ends by links 76. Upon the intermediate portions of the pins are mounted the rollers 77 which engage the teeth of the sprockets 67 and 70, whereby the endless series or chain of scraper plates is caused to move rearwardly over the floor 41 and forwardly beneath the same, the floor 58 of the shovel D extending beneath the forward end of the conveyer at a level to just clear the scraper plates.

G is a shelf depending from the frame of the main conveyer adjacent to the shovel end upon which weights may be placed to counterbalance the load carried by the rear end of the main conveyer.

H is a saddle of substantially rectangular construction depending rigidly from the side beams 40 of the main conveyer frame near its rear end. 78 is a vertical shaft whose upper end is journaled in a bearing in the bracket 66 and its lower end in the bearing 79 on the saddle H, the lower end of said shaft being provided with a collar 80 to prevent its moving up out of the bearing 79. 81 is a bevelled gear on the upper end of the shaft 78 meshing with a similar gear 82 on the end of the sprocket shaft 65.

83 is a nigger head or steel pulley mounted on the other end of the shaft 65 by means of which a belt or cable can be used to shift cars in relation to the loader and for other purposes.

The lower end of the shaft 78 is provided with a pinion 84 meshing with a larger pinion 85 journaled on the saddle H and in turn meshing with a second pinion 86 also journaled on the saddle. The pinion 86 meshes with a large gear 87 which is journaled on the central cylindrical stud 88 of the saddle H.

I is a yoke, preferably a casting, pro-

vided with a central depending trunnion 89 which is journaled in the bore of the stud 88, thus enabling the yoke to freely pivot in a horizontal plane. A nut 90 is screwed on the lower end of the trunnion 89 to prevent displacement of the yoke from its mounting on the saddle.

91 is a hopper mounted on the yoke I and having flaring sides 92 and a front end wall 93. The rear ends of the side walls of the hopper are spliced onto the front ends of the side beams 94 of the frame of the auxiliary conveyer C, which frame extends upwardly at an angle and then rearwardly in an approximately horizontal plane. The hopper and conveyer frame are provided with a continuous floor 95, which however stops short of the front wall of the hopper to provide clearance for the end loop of the conveyer.

96 is a shaft journaled beneath the front end of the floor 94 in the yoke H, and provided with sprockets 97 which protrude through slots in the front end of the floor. One end of the shaft 96 protrudes and is provided with a bevelled gear 98 which meshes with a similar gear 99 on the upper end of a shaft 100 journaled vertically in the yoke I, and having its lower end provided with a gear 101 meshing with a gear 102 journaled on the yoke I and meshing with the large, central gear 87. Thus the sprocket shaft 96 is power driven from the motor F and the swing of the yoke I does not affect the same owing to the freedom of travel between the gears 102 and 87.

The rear end of the auxiliary conveyer frame is provided with a sprocket shaft 103, having mounted thereon idle sprockets 104. The conveyer which is mounted on the sprockets 97 and 104 is preferably of the scraper type, similar to the main conveyer, passing rearwardly over the floor 95 and forwardly underneath the same, the lower section of the conveyer being held up to the contour of the frame by means of the transverse shaft 105 journaled in the frame beneath the floor and provided with idlers 106 engaging the conveyer rollers from beneath.

107 represents a pair of screw shafts whose upper ends are pivotally attached to the side beams of the auxiliary conveyer frame while their lower ends are screwed into turn buckles 108. J is a wheeled buggy running on a curved or semi-circular track 109 which is supported by a horizontal frame 110 extending rearwardly from the saddle H. The ends of said buggy are provided with alined trunnions 111 on which are pivotally mounted the lower ends of a pair of screw shafts 112, oppositely threaded to the shafts 107, and screwed into the lower ends of the turnbuckles 108.

113 represents brackets loosely mounted on the turnbuckles 108 so as not to retard the rotation of the latter. Thus said brackets may be split and coupled together about the turnbuckles by bolts, as shown in Fig. 16. Said brackets are provided with yoke or bifurcated bearings 114 in which is journaled a horizontal shaft 115, one of whose ends is provided with a hand wheel 116. Said shaft is provided with worms 117 which mesh with annular series of worm teeth 118 cut on the perimeter of the turnbuckles, so that the rotation of the shaft 115 rotates the turnbuckles and thus forces the pairs of screw shafts 107—112 either together or apart, thus providing for the adjustment of the auxiliary conveyer in a vertical plane.

The auxiliary conveyer is swung or adjusted in a horizontal plane by means of cables 119 attached to a central projection 120 on the buggy and moving in the guide grooves formed by the outer surface of the track rail. The ends of said cables are oppositely wound on the shaft 121 journaled in the saddle H. 122 is a hand wheel on the end of said shaft and 123 is a ratchet lock by means of which the shaft can be locked at any position. Thus by rotating the shaft 121 in the proper direction, the auxiliary conveyer can be swung horizontally into the desired position.

The operation of my improved loader is as follows: The machine is transported by the tractor element into the necessary position, for instance, a coal mine room. Where the coal has been properly shot down onto the floor of the room, the shovel is inserted under the coal by advancing the tractor, thus bringing the coal within reach of the main conveyer which delivers it to the hopper of the auxiliary conveyer which latter in turn delivers the coal to the mine car or other depository. The ability to adjust the auxiliary conveyer both vertically and horizontally enables the machine to deliver to the mine car from all parts of the room. In Fig. 1[a] the two conveyers are shown alined, the auxiliary conveyer delivering to the mine car K, but it will be readily understood that while the loader must be moved frequently to pick up the coal, the position of the mine car is dictated by the location of the track.

Where the coal has been only partially knocked down by the shots or is in too large lumps to be conveniently handled by the conveyers, the shovel may be raised to the proper level and used as a ram to knock and batter the coal by the advance and retreat of the tractor. In such cases the shovel is raised during the transportation of the loader from place to place, the auxiliary conveyer is raised to clear the ground. The ability of the auxiliary conveyer to be swung laterally is of great advantage in

turning short corners or angles in the mine. By dismounting the conveyers, the tractor can be arranged for general tractor purposes, such as hauling the cars in the mine, etc. If desired, the auxiliary conveyer may be removed and the main conveyer used to deposit material into the mine car or other depository, but in such case the flexibility of the machine is greatly reduced.

Although, for the sake of clearness, I have minutely described the embodiment of my invention illustrated in the accompanying drawings, I do not wish to limit myself thereby, but claim broadly:

1. In a loading machine, a tractor base, a main conveyer pivoted intermediate of the length on said base to swing in a vertical plane, a shovel rigidly attached to the front end of said main conveyer, a saddle depending from the rear end of said main conveyer and in the rear of said tractor base, a yoke member pivotally mounted on said saddle to swing in a horizontal plane, and a second conveyer pivotally mounted on said yoke member to swing in a vertical plane.

2. In a loading machine, a tractor base, a main conveyer pivoted intermediate of the length on said base to swing in a vertical plane, a shovel rigidly attached to the front end of said main conveyer, a saddle depending from the rear end of said main conveyer and in the rear of said tractor base, a yoke member pivotally mounted on said saddle to swing in a horizontal plane, a second conveyer pivotally mounted on said yoke member to swing in a vertical plane, and a support for the free end of said second conveyer.

3. In a loading machine, a tractor base, a main conveyer pivoted intermediate of its length on said base to swing in a vertical plane, a shovel rigidly attached to the front end of said main conveyer, a saddle depending from the rear end of said main conveyer, and in the rear of said tractor base, a yoke member pivotally mounted on said saddle to swing in a horizontal plane, a second conveyer pivotally mounted on said yoke member to swing in a vertical plane, and an adjustable support for the free end of said second conveyer.

4. A loading machine comprising a base, a conveyer pivotally mounted on said base to swing in a vertical plane, a second conveyer mounted on the rear end of said first conveyer and free to swing in a horizontal plane, a horizontal track supported from above by the rear end of said first conveyer, and a wheeled member moving on said track and supporting said second conveyer.

5. A loading machine comprising a base, a conveyer pivotally mounted on said base to swing in a vertical plane, a second conveyer mounted on the rear end of said first conveyer and free to swing in a horizontal plane, a horizontal track supported from above by the rear end of said first conveyer, a wheeled member moving on said track and supporting said second conveyer, and means for propelling said wheeled member in either direction along said track.

6. A loading machine comprising a base, a conveyer mounted on said base, a second conveyer mounted on the rear end of the first conveyer and free to swing in both a horizontal and a vertical plane, a horizontal track carried by said first conveyer, a wheeled member running on said track, and an extensible support interposed between said wheeled member and said second conveyer to adjust the elevation of the latter.

7. A loading machine comprising a base, a conveyer mounted on said base, a second conveyer mounted on the rear end of the first conveyer and free to swing in both a horizontal and a vertical plane, a horizontal track carried by said first conveyer, a wheeled member moving on said track, means for propelling said wheeled member in either direction along said track, and an extensible support interposed between said wheeled member and said second conveyer, to adjust the elevation of the latter.

8. A loading machine comprising a base, a conveyer mounted on said base and adapted to receive the material to be loaded, a second conveyer mounted on the rear end of said first conveyer and free to swing in both a horizontal and a vertical plane, a horizontal track carried by said first conveyer, a wheeled member running on said track, and turn buckle mechanism interposed between said wheeled member and said second conveyer to adjust the elevation of the latter.

9. A loading machine comprising a base, a conveyer mounted on said base and adapted to receive the material to be loaded, a second conveyer mounted on the rear end of said first conveyer and free to swing in both a horizontal and a vertical plane, a horizontal track carried by said first conveyer, a wheeled member running on said track, means for propelling said wheeled member in either direction along said track, and turn buckle mechanism interposed between said wheeled member and said second conveyer to adjust the elevation of the latter.

Signed at Pittsburgh, Pa., this 15th day of February, 1919.

GEORGE F. DILLIG.