W. H. SCHACHT.

DIGGING AND LOADING MACHINE.

APPLICATION FILED MAY 29, 1920.

1,431,491.

Patented Oct. 10, 1922.

5 SHEETS—SHEET 1.

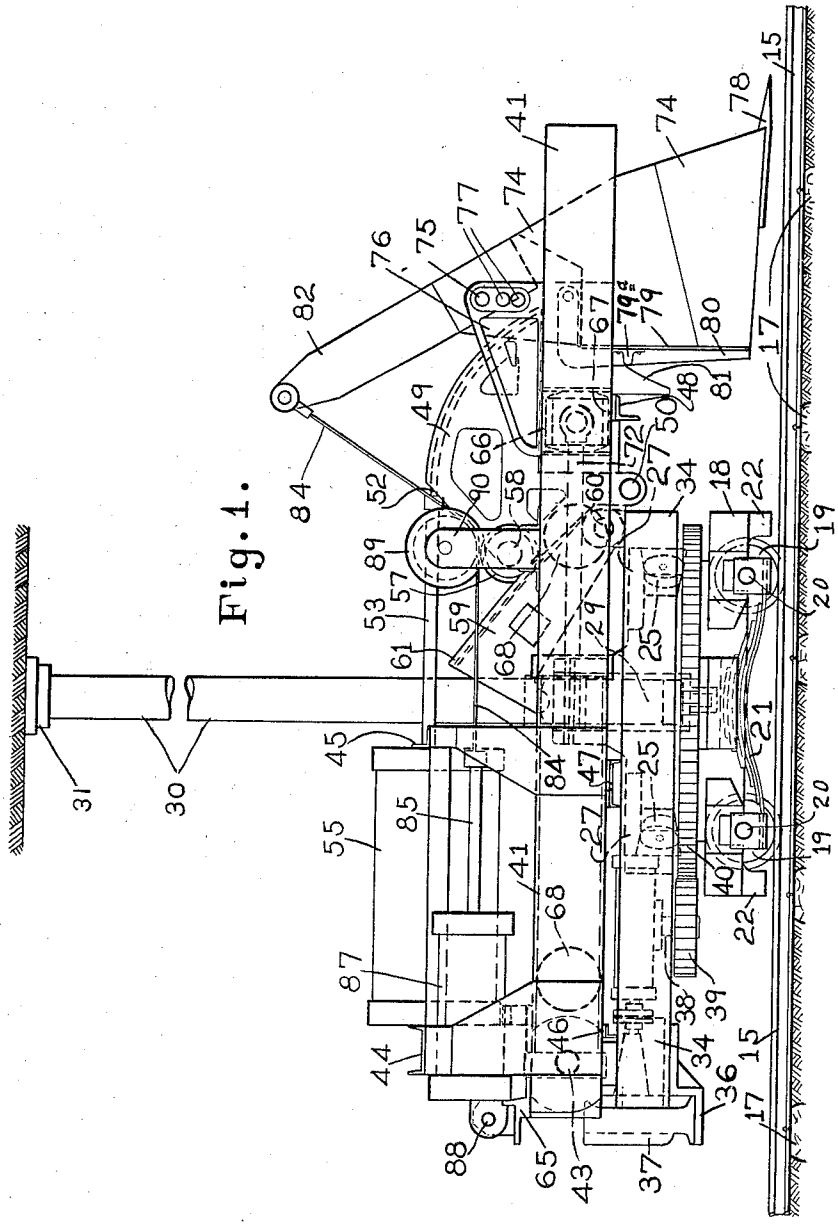


Fig. 1.

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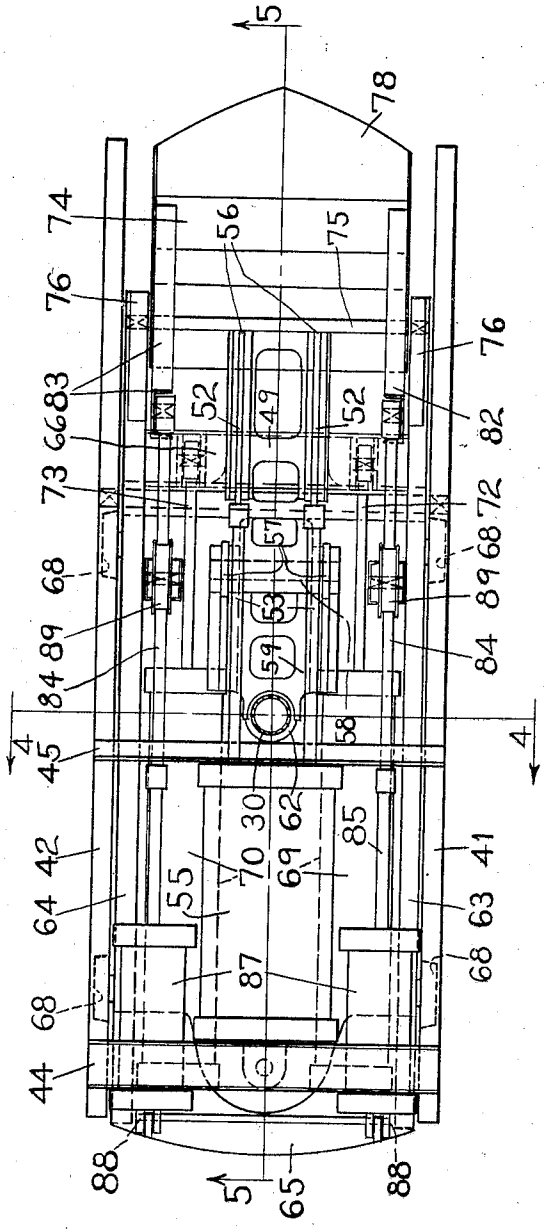
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5 SHEETS—SHEET 2.

Fig. 2.



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5 SHEETS—SHEET 3.

Fig. 3.

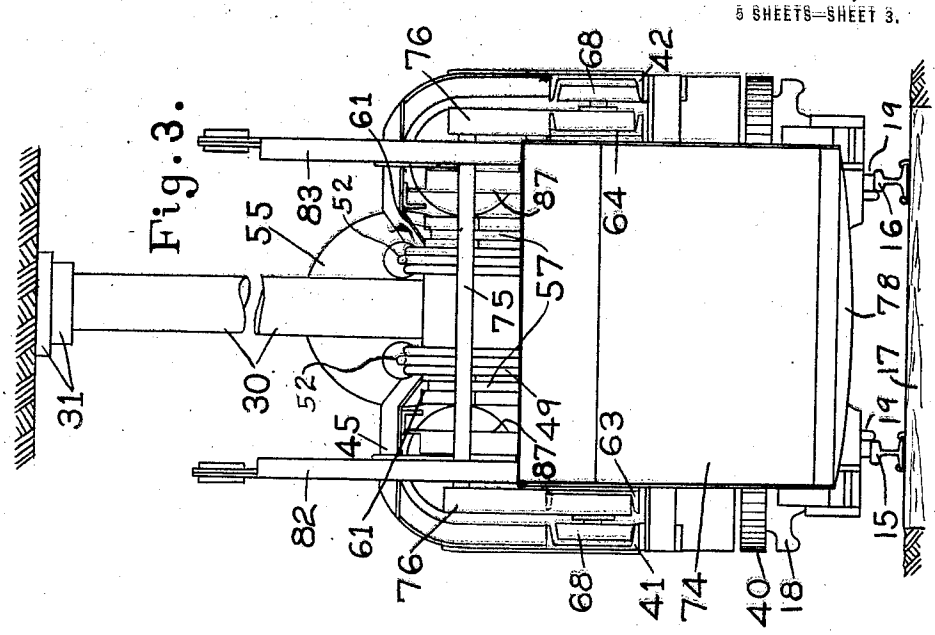
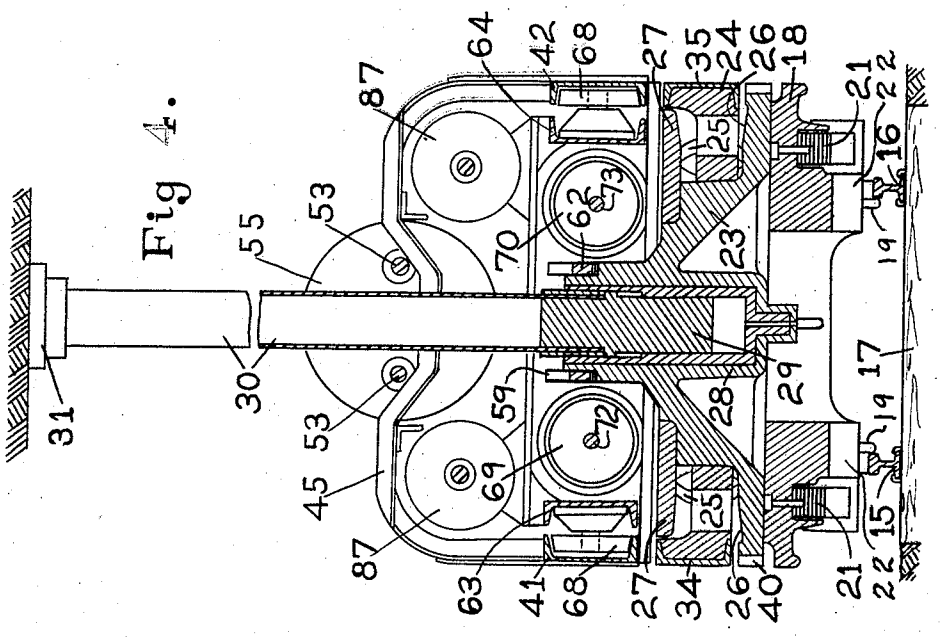


Fig. 4.



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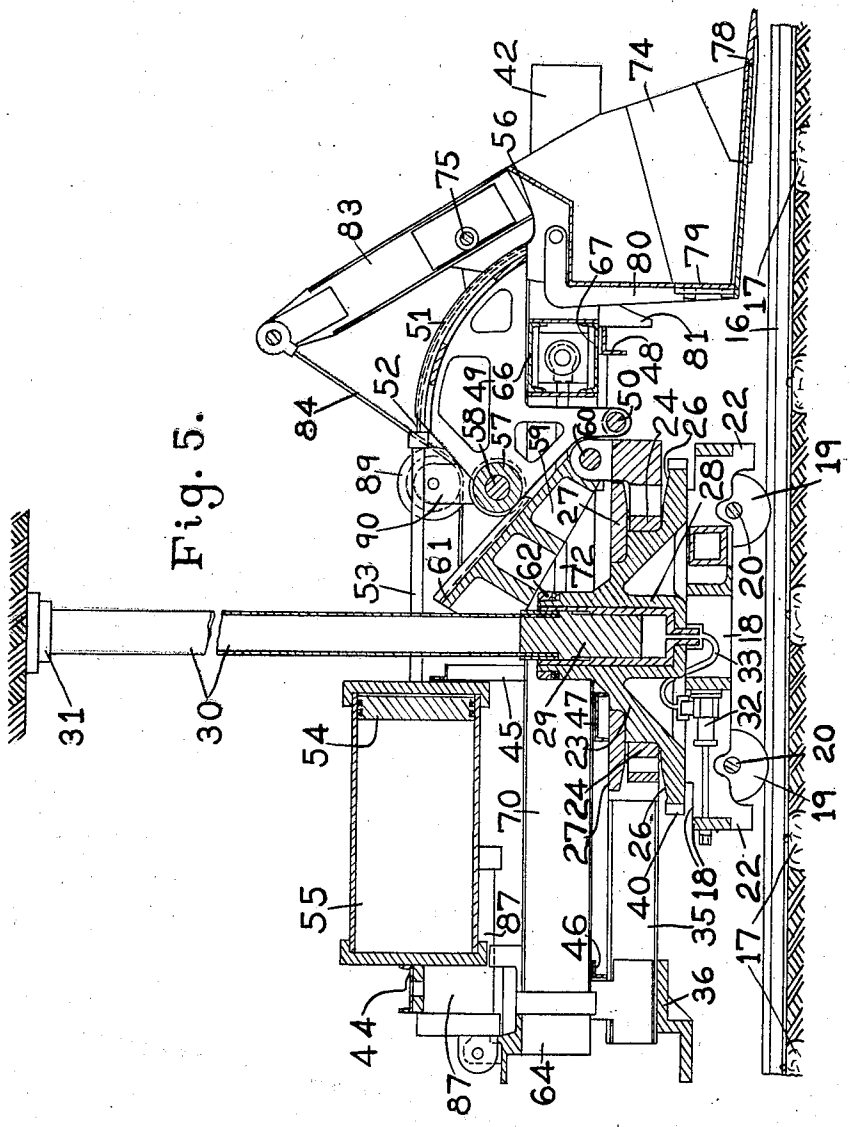
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5 SHEETS—SHEET 4.

Fig. 5.



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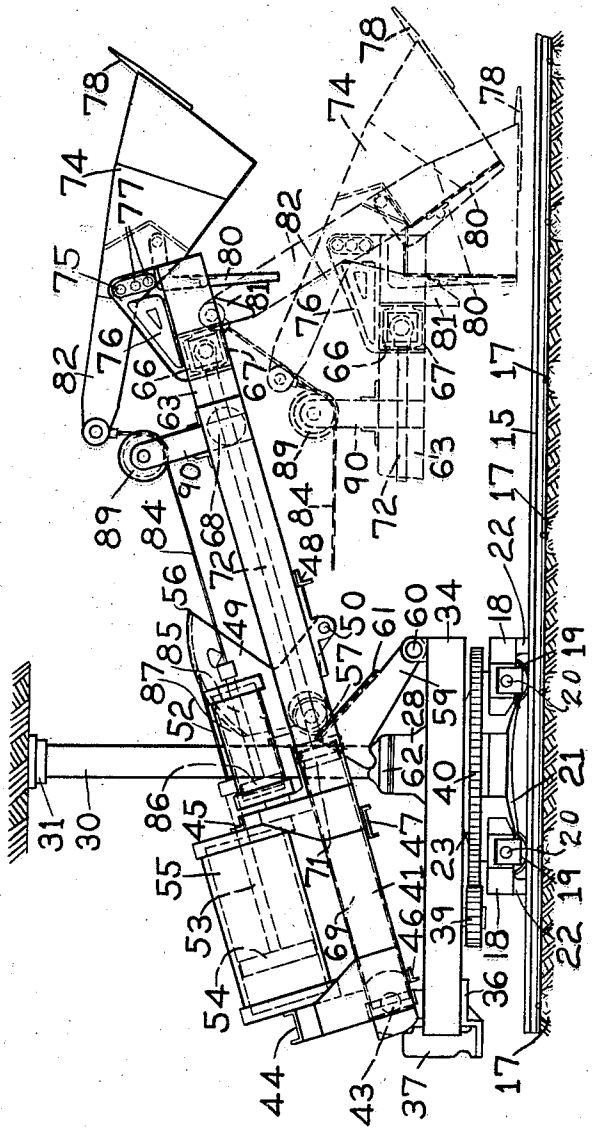
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5 SHEETS—SHEET 5.

Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM H. SCHACHT, OF PAINESDALE, MICHIGAN.

DIGGING AND LOADING MACHINE.

Application filed May 29, 1920. Serial No. 385,294.

To all whom it may concern:

Be it known that I, WILLIAM H. SCHACHT, a citizen of the United States, and a resident of Painesdale, in the county of Houghton and State of Michigan, have invented certain new and useful Improvements in Digging and Loading Machines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to digging and loading machines of the type designed for use in a mine for loading broken and loosened material, such as coal or ore, into cars located near by. It is the object of my invention to provide an improved loading machine which may be readily and quickly shifted from one point to another and made ready for use and by reason of which the effective range of operation of the machine shall be made as great as possible without unduly increasing the weight of the machine as a whole. The preferred means by which I have accomplished my object are illustrated in the drawings and are hereinafter specifically described. That which I believe to be new is set forth in the claims.

In the drawings,—

Fig. 1 is a side view of my improved machine in position for operation but with the securing means only partially applied for holding the machine against movement;

Fig. 2 is a top plan view of my improved machine, certain parts being omitted for clearness of illustration;

Fig. 3 is an end view of my machine as seen from the right in Figs. 1 and 2;

Fig. 4 is a transverse vertical section taken on line 4—4 of Fig. 2;

Fig. 5 is a longitudinal central section taken on line 5—5 of Fig. 2; and

Fig. 6 is a side view of my improved machine rigidly secured in position showing one phase of the operation of the machine, changed positions of certain operative parts being indicated by dotted lines.

Referring to the several figures of the drawings in which corresponding parts are indicated by the same reference characters, 15 and 16 indicate the rails of a track held in position upon suitable cross-ties 17. A truck frame 18 is supported upon the track by means of wheels 19 mounted upon axles 20, springs 21 being interposed between the axles and the frame 18, said springs being adapted normally to hold downwardly-projecting lugs 22 a short distance above the rails. When sufficient downward pressure is brought to bear upon the truck frame 18, the frame is adapted to descend with respect to the axles so as to bring the lugs 22 into contact with the rails, as is shown in Fig. 6.

Rigidly mounted upon the truck 18 is a base 23 in the form of a heavy casting. This base 23 provides a support for a turn table 24 which is revolubly mounted thereon, and supported by rollers 25 (see Fig. 1) which bear upon a circular track portion 26. A circular plate 27 secured upon the base 23 above the rollers 25 serves to provide an upper bearing for the rollers 25 whereby the turn table is held against tipping with respect to the base 23. The circular plate 27 is held rigidly in position by any suitable means. The base 23 comprises also a cylinder 28 which in the construction shown is cast integrally therewith in concentric position with respect to the axis about which the turn table 24 rotates. Slidably mounted within the cylinder 28 is a plunger 29 which is provided at its upper end with a column or standard 30 equipped with a bearing shoe 31 of any suitable type at its upper end. This construction includes a fluid-operated jack which is adapted to be equipped in any approved manner for attaining the desired operation, the equipment illustrated in the drawings comprising a pump 32 connected to the cylinder by a pipe 33.

The turn table 24 has fixedly secured thereto at its sides longitudinally-extending channel irons 34 and 35 (see Fig. 4). These channel irons 34 and 35 comprise the side bars of the main supporting frame of my improved mechanism. A cross-bar 36 serves to connect these bars at their rear ends, an engine 37 of any suitable type (see Fig. 1) being mounted upon the cross-bar 36. The engine 37 is connected by any suitable train of mechanism with a vertically-disposed shaft 38 which is provided at its lower end with a pinion 39 which meshes with the teeth of a large gear 40 formed on the outer edge of the base 23. As will be readily understood, by the application of power to the pinion 39, such pinion is caused to revolve about the gear 40, serving to swing the main frame horizontally with respect to the base 23 and the truck 18.

41 and 42 indicate channel irons comprising the side bars of an elevating frame which is pivotally mounted at its rear end

so as to swing vertically about a transverse shaft 43, suitably supported upon the main frame (see Fig. 6). The side bars 41 and 42 of the elevating frame are connected together at their rear ends by an arch 44 in the form of a channel as is shown in Figs. 1 and 5, and they are connected at their intermediate point by a transverse arch 45 in the form of an angle iron. The bars 41 and 42 are further connected together by transverse bars 46, 47 and 48, whereby a rigid structure is formed.

For raising the elevating frame with respect to the main frame about the shaft 43, I have provided a combination of lever and cam means adapted to be operated by suitable mechanism mounted on the elevating frame. This mechanism comprises a heavy lever 49 pivotally mounted upon a transversely-extending shaft 50 carried by the elevating frame. The end of the lever 49 is in the form of an arc of a circle about the shaft 50, the curved end being provided with suitable grooves 51 at its opposite sides which are adapted to receive cables 52 secured to the front ends of piston rods 53 secured to the piston 54 of a cylinder 55 securely mounted in position between the arches 44 and 45. The lever 49 is so arranged that the piston rods 53 are arranged tangentially with respect to the arc-shaped portions of the lever, with the result that when the piston 54 is moved toward the left in Fig. 5 as hereinafter described for drawing the lever 49 also toward the left about the axis 50, the piston rods 53 retain the desired effective position with respect to the cables 52 and the lever 49, the cables 52 being connected to the lever 49 at 56 at the extreme right-hand end of the lever as shown in said Fig. 5. As is best shown in Fig. 5 the lever 49 is provided at its rear edge portion with supporting rollers 57 rotatably mounted thereon through the medium of a shaft 58. The rollers 57 carried by the lever 49 stand in contact with a diagonally-disposed supporting bar 59 which is pivotally mounted upon the main frame by means of a horizontally-disposed shaft 60, the bar 59 being in the form of a heavy casting comprising grooved rail sections 61 within which the rollers 57 bear. The rear end of the diagonally-disposed support 59 bears upon a collar 62 rotatably and loosely mounted upon the upper end of the cylinder 28 of the base 23, a bearing for the supporting bar 59 being provided by the collar 62 at both sides of the column 30 of the jack. By the use of the grooved track construction, the elevating frame is braced laterally to take care of the tendency of the frame to move sidewise during the swinging of the turntable.

By the application of power to the cables 52 to draw them toward the left in Fig. 5, the lever 49 will be turned in counterclockwise direction as viewed in said figure, thus compelling the roller 57 to move up the diagonally-disposed support 59, thereby causing the shaft 50 and the elevating frame upon which the shaft 50 is mounted to move upward about the shaft 43 which connects the elevating frame with the main frame, an elevated position of the elevating frame being illustrated in Fig. 6.

63 and 64 indicate channel irons forming the side bars of an operating frame which is movable longitudinally with respect to the elevating frame. The side bars 63 and 64 are rigidly joined together at their rear ends by a cross-bar 65 and are rigidly connected at their front end portions by a heavy cross-bar comprising channel irons 66 and 67 as is best shown in Fig. 5. The side bars 63 and 64 of the operating frame are provided with supporting wheels 68 rotatably mounted thereon as is shown in Fig. 4, the supporting wheels 68 being adapted to engage the flanges of the channel irons 41 and 42 so as to act as anti-friction supports for the operating frame for its movement longitudinally of the elevating frame. 69 and 70 indicate cylinders fixedly secured upon the elevating frame at its opposite sides having pistons 71 therein (see Fig. 6) which are connected by means of piston rods 72 and 73 respectively with the cross-bar comprising the channel irons 66 and 67 of the operating frame. By the application of power to the piston rods 72 and 73 for moving them toward the right in Fig. 1, the operating frame comprising the side bars 63 and 64 is moved longitudinally of the elevating frame comprising the side bars 41 and 42.

74 indicates a heavy scoop of any approved construction pivotally mounted by means of a shaft 75 upon brackets 76 fixedly secured upon the forward end of the operating frame. As is best shown in Fig. 1, each bracket 76 is provided with a plurality of openings 77 in any one of which the shaft 75 may be mounted for varying the position of the scoop 74 with respect to the end portion of the operating frame. The scoop 74 is provided with a reinforced edge portion 78 which is adapted to be brought into close proximity to the rails 15 and 16 when the scoop is in position to pick up a load as hereinafter described. The rear face 79 of the scoop 74 is hingedly mounted by means of bars 80 upon the body of the scoop so as to be capable of displacement for dumping the contents. Lugs 79[a] are mounted upon the face 79 of the scoop at its side edges and are adapted to engage backing blocks 81 to limit the backward swinging of the scoop. The blocks 81 are mounted upon the operating frame at its opposite sides, being secured in position by any suit-

able means. These blocks have diagonally-disposed bearing faces adapted to be engaged by the lugs 79ª at different points therealong as the scoop is lowered on the operating frame by the shifting of the shaft 75 as above described. As will be readily understood, when the scoop is so lowered on the operating frame it is capable of swinging backward farther than when in the position illustrated in the drawings. In this way, the operative edge 78 is capable of being lowered to a greater degree to stand at an angle to cut in to better advantage for digging. The scoop 74 is provided at its upper end with operating arms 82 and 83 which in the construction shown are in the form of channel irons as is best shown in Fig. 2. The upper ends of the arms 82 and 83 are connected by means of cables 84 with piston rods 85 which are connected with pistons 86 in cylinders 87 mounted on the operating frame at its rear end portion. In the construction shown the cylinders 87 are fixedly mounted upon the transversely-extending bar 65 of the operating frame, such connection being effected through the use of horizontally-disposed pins 88 as is best shown in Figs. 1 and 2. The cables 84 extend underneath idler pulleys 89 which are rotatably mounted at the upper ends of standards 90 rising from the operating frame a short distance in rear of the cross-bar to which the piston rods 72 and 73 are connected. As will be readily understood, upon the application of power to the cables 84 for moving them toward the rear, the scoop 74 is given a rotary movement about the shaft 75 in counterclockwise direction as seen in Fig. 6. The scoop 74 may be of any approved construction by which it is adapted to operate as hereinafter described.

With my improved mechanism in position on a track as shown in Fig. 1 but with the column 30 and the shoe 31 in lowered position so as to be out of contact with the roof or back of the mine, the truck is adapted to be run along a track into close proximity to a pile of broken rock or coal which it is desired to have loaded into cars standing upon the same track or upon another track near by. When the machine has been moved to the desired position, the shoe 31 is adapted to be forced quickly into contact with the roof of the drift, serving to force the lugs 22 of the truck frame into contact with the rails for holding the machine as a whole very firmly in position without danger of the machine being displaced longitudinally of the track or of being tipped out of normal position with respect to the track. When the machine has been secured firmly in position, by the admission of fluid under pressure to the rear end portions of the cylinders 69 and 70 the operating frame is pushed forward through the medium of the piston rods 72 and 73, serving to advance the operative edge of the scoop 74 under a pile of loose material that is to be removed. When the scoop 74 has been advanced in this manner to the desired point, the movement is stopped and the scoop is tipped about the shaft 75 into the position shown in solid lines in Fig. 6 with respect to the operating frame, this result being attained by the admission of fluid under pressure to the forward ends of the cylinders 87 for applying a backward pull upon the cables 84 as above described. Thereupon by the admission of fluid under pressure to the forward end of the cylinder 55, the lever 49 is given an operative stroke in counterclockwise direction in Fig. 1 which causes the roller 57 to ride up the diagonally-disposed support 59 for raising the elevating frame as above described. When the scoop 74 has thus been raised into position to clear the top of the car into which the rock is to be dumped, the engine 37 is thrown into operation for driving the pinion 39 and for turning the machine as a whole about the base gear 40 so as to bring the scoop into position above the car. For accomplishing this purpose, the machine as a whole is adapted to be given if necessary a complete rotation about the column 30 of the securing jack. If necessary for the dumping operation, the operating frame may be retracted or extended by the use of the cylinders 69 and 70 as will be readily understood. When the scoop 74 has been brought to the desired position above a car, the material is dumped from the scoop by the manipulation of the controlling means in the ordinary manner, whereupon the scoop is adapted to be brought back into its operative position as shown in Fig. 1 for receiving another load.

On account of the backing lugs 79ª in the rear of the movable face 79 of the scoop having direct contact at variable points with the blocks 81 a very effective construction is provided adapted to withstand the hard usage to which such face is subjected.

By the use of the jack construction by which downward pressure is applied to the truck from the roof or back of the drift in which the work is being carried on, I have found that it is unnecessary to make the parts of any greater weight than that necessary for providing the required strength. In this way a very much lighter construction than that ordinarily used is attained, whereby the machine is much more easily and quickly transported from one point to another. Moreover, by the application of force directly from the roof of the mine, the truck is held much more securely against tipping than can possibly be the case where the weight of the machine is relied upon for attaining this end. As a result of my being

able in this manner to secure the machine as a whole so firmly in position, I am enabled to operate at a very much greater distance from the car than could be done before. By the use of my construction I am enabled to operate as easily and efficiently at the side of the car as I am at a point directly over the track, since I do not in any way rely upon the stiffness or strength of the track for holding my machine rigidly in position. It will be appreciated also that I have accomplished the desired result of holding the machine as a whole very securely in position without sacrificing the portability of the machine, since the machine can be released from one position and secured in the next desired operative position in substantially as short a time as that required for a shifting movement of the very much heavier machines in use heretofore. This is particularly true with respect to those machines of the prior art which are adapted to be clamped to the track.

It will be understood that any suitable means may be employed for controlling the admission of fluid under pressure from any suitable source to the several cylinders above referred to on either side of the piston, and I have accordingly not illustrated nor described such means herein since it forms by itself no part of my present invention.

By the use of my improvements, a very effective construction is attained which is capable of use to very good advantage at a distance from the track. As will be understood from an examination of the structure, the scoop 74 is adapted to be lowered as far as may be desired below the level of the rails, either at the side of the track or at a point beyond the rails when the machine is positioned at the end of the track. The machine is thus available for cutting out the material in advance for laying the ties and the rails of the track, if desired.

What I claim as my invention and desire to secure by Letters Patent is,—

1. An underground loading machine comprising a base, a turn table mounted on said base and adapted to rotate thereabout, and a jack extending upward from said base through said turn table adapted to apply pressure from the roof to said base for holding the base in position.

2. An underground loading machine comprising a base, a turn table mounted on said base and adapted to rotate thereabout, said turn table having an opening therethrough about the axis upon which it is rotatably mounted, and a jack projecting upward through said opening adapted to apply pressure from the roof to said base for holding the base in position.

3. An underground loading machine comprising a wheeled truck, a turn table mounted on said truck and adapted to rotate about a vertical axis thereon, said turn table having an opening therethrough about the axis upon which it is rotatably mounted, and a jack projecting upward through said opening adapted to apply pressure from the roof to said truck for holding the truck securely in position.

4. An underground loading machine comprising a truck frame, wheels for supporting said truck frame upon a track, yielding means interposed between said truck frame and said supporting wheels, and a jack adapted to apply pressure from the roof to said truck frame for bringing said frame into contact with the track against the action of said yielding means for holding said frame securely in position.

5. An underground loading machine comprising a truck frame, wheels supporting said truck frame upon a track, yielding means interposed between said truck frame and said supporting wheels, a jack adapted to apply pressure from the roof to said truck frame and to bring said frame into contact with the track against the action of said yielding means for holding said frame securely in position, and a turn table mounted on said truck frame and adapted to rotate about said jack.

6. An underground loading machine comprising a truck frame, wheels for supporting said truck frame upon a track, lugs on said frame overlying the rails of said track, springs interposed between said supporting wheels and said truck frame adapted normally to support said lugs a short distance above said rails, a jack adapted to apply pressure from the roof to said truck frame for bringing said lugs into contact with the rails for holding the truck frame securely in position, and a turn table mounted on said truck frame and adapted to rotate about said jack.

7. An underground loading machine comprising a truck frame, wheels for supporting said truck frame upon a track, lugs on said frame overlying the rails of said track, springs interposed between said supporting wheels and said truck frame adapted normally to support said lugs a short distance above said rails, a turn table mounted on said truck frame and adapted to rotate about a vertical axis thereon, said turn table having an opening therethrough about the axis upon which it is rotatably mounted, and a jack adapted to apply pressure from the roof to said truck frame for bringing said lugs into contact with the rails for holding the truck frame securely in position.

8. An underground loading machine comprising a truck frame, wheels for supporting said truck frame upon a track, lugs on said frame overlying the rails of said track, springs interposed between said supporting wheels and said truck frame adapted nor-

mally to support said lugs a short distance above said rails, a turn table mounted on said truck frame and adapted to rotate about a vertical axis thereon, said turn table having an opening therethrough about the axis upon which it is rotatably mounted, power-operated scooping means mounted on said turn table and adapted to work at a considerable distance therefrom, and a jack adapted to apply pressure from the roof to said truck frame for bringing said lugs into contact with the rails for holding the truck frame securely in position.

9. An underground loading machine comprising a base, a main frame mounted on said base and adapted to rotate about a vertical axis thereon, an elevating frame pivotally mounted on a horizontal axis on said main frame, power-operated scooping means supported by said elevating frame, and a jack extending upward through both of said frames adapted to apply pressure from the roof to said base for holding the base securely in position.

10. An underground loading machine comprising a base, a main frame mounted on said base and adapted to rotate about a vertical axis thereon, an elevating frame pivotally mounted on a horizontal axis on said main frame, power-operated scooping means supported by said elevating frame, both of said frames having openings therethrough about the axis upon which said main frame is rotatably mounted, and a jack projecting upward through said openings adapted to apply pressure from the roof to said base for holding said base securely in position.

11. An underground loading machine comprising a base, a main frame mounted on said base and adapted to rotate about a vertical axis thereon, an operating frame movable longitudinally with respect to said main frame, power-operated scooping means supported by said operating frame, and a jack extending upward through both of said frames adapted to apply pressure from the roof to said base for holding said base securely in position.

12. An underground loading machine comprising a base, a main frame mounted on said base and adapted to rotate about a vertical axis thereon, an operating frame movable longitudinally with respect to said main frame and also adapted to swing about a horizontal axis with respect thereto, power-operated scooping means supported by said operating frame, and a jack extending upward through both of said frames adapted to apply pressure from the roof to said base for holding said base securely in position without interfering with the operative movements of said frames.

13. An underground loading machine comprising a base, a main frame mounted on said base and adapted to rotate about a vertical axis thereon, an operating frame movable longitudinally with respect to said main frame, said operating frame being provided with a longitudinally-extending opening therethrough, power-operated scooping means supported by said operating frame, and a jack extending upward through said main frame and through said longitudinally-extending opening in said operating frame adapted to apply pressure from the roof to said base for holding said base securely in position.

14. An underground loading machine comprising a base, a main frame mounted on said base and adapted to rotate about a vertical axis thereon, an elevating frame pivotally mounted upon a horizontal axis on said main frame, an operating frame movable longitudinally with respect to said elevating frame, power-operated scooping means supported by said operating frame, and a jack extending upward through all three of said frames adapted to apply pressure from the roof to said base for holding said base securely in position without interfering with the operative movements of said frames.

15. An underground loading machine comprising a base, a main frame mounted on said base and adapted to rotate about a vertical axis thereon, an elevating frame pivotally mounted upon a horizontal axis on said main frame, an operating frame movable longitudinally with respect to said elevating frame, power-operated scooping means supported by said operating frame, each of said frames having an opening therethrough about the axis about which said main frame rotates, the opening through said operating frame being elongated longitudinally thereof, and a jack extending upward through the openings in said frames adapted to apply pressure from the roof to said base for holding said base securely in position without interfering with the operative movements of said frames.

16. An underground loading machine comprising a base, a main frame mounted on said base and adapted to rotate about a vertical axis thereon, an elevating frame pivotally mounted on a horizontal axis on said main frame, power-operated scooping means supported by said elevating frame, a jack extending upward through both of said frames adapted to apply pressure from the roof to said base for holding the base securely in position, and means carried by said frames for swinging the elevating frame upward with respect to said main frame.

17. An underground loading machine comprising a base, a main frame mounted on said base and adapted to rotate about a vertical axis thereon, an elevating frame pivotally mounted on a horizontal axis on said

main frame, power-operated scooping means supported by said elevating frame, a jack extending upward through both of said frames adapted to apply pressure from the roof to said base for holding the base securely in position, a lever carried by one of said frames, and means for swinging said lever into contact with a suitable portion of the other of said frames for causing said elevating frame to swing upwardly with respect to said main frame.

18. An underground loading machine comprising a base, a main frame mounted on said base and adapted to rotate about a vertical axis thereon, an elevating frame pivotally mounted on a horizontal axis on said main frame, power-operated scooping means supported by said elevating frame, a jack extending upward through both of said frames adapted to apply pressure from the roof to said base for holding the base securely in position, a lever carried by one of the said frames, a roller carried by said lever, and means for swinging said lever for bringing the roller into contact with a suitable portion of the other of said frames for causing said elevating frame to swing upwardly with respect to said main frame.

19. An underground loading machine comprising a main frame, an elevating frame pivotally mounted on a horizontal axis on said main frame, power-operated scooping means supported by said elevating frame, a lever pivotally mounted on one of said frames, a diagonally-disposed member mounted on the other of said frames, and means for swinging said lever into operative contact with said diagonally-disposed member for causing said elevating frame to swing upwardly with respect to said main frame.

20. An underground loading machine comprising a main frame, an elevating frame pivotally mounted on a horizontal axis on said main frame, power-operated scooping means supported by said elevating frame, a lever pivotally mounted on one of said frames, a roller rotatably mounted on said lever, an inclined support mounted on the other of said frames, and means for swinging said lever for causing said roller to ride up said inclined support for swinging the elevating frame upwardly with respect to said main frame.

21. An underground loading machine comprising a main frame, an elevating frame pivotally mounted on a horizontal axis on said main frame, power-operated scooping means supported by said elevating frame, a lever pivotally mounted on said elevating frame, the end of said lever being in the form of an arc of a circle about the axis upon which the lever is mounted, a roller, rotatably mounted on said lever, an inclined support mounted on the main frame, a groove in the arc-shaped portion of said lever, a cable extending along said groove and secured to the lever at one end of the groove, and means for exerting a pull on said cable on a line parallel with the elevating frame for swinging said lever and causing said roller to ride up said inclined support for swinging the elevating frame upwardly with respect to said main frame.

22. An underground loading machine comprising a base, an operating frame movably mounted with respect to said base, a scoop mounted on said operating frame adapted to be forced into a pile of material to be moved, said scoop being provided with a movable wall portion adapted to be displaced for dumping the contents of the scoop, supporting lugs mounted on the outer face of the movable wall portion, and backing blocks mounted on the operating frame adapted to engage said lugs for supporting the scoop during the operative scooping movement of the operating frame.

23. An underground loading machine comprising a base, an operating frame movably mounted with respect to said base, a scoop pivotally mounted on said operating frame on a movable pivot adapted to be shifted vertically with respect to said operating frame, lugs on said scoop, and backing blocks on said operating frame adapted to be engaged by said lugs for limiting the backward swinging of said scoop, the bearing faces of said blocks being diagonally-disposed for permitting the scoop to swing backward to an increased extent as the pivot of said scoop is lowered with respect to the operating frame.

WILLIAM H. SCHACHT.